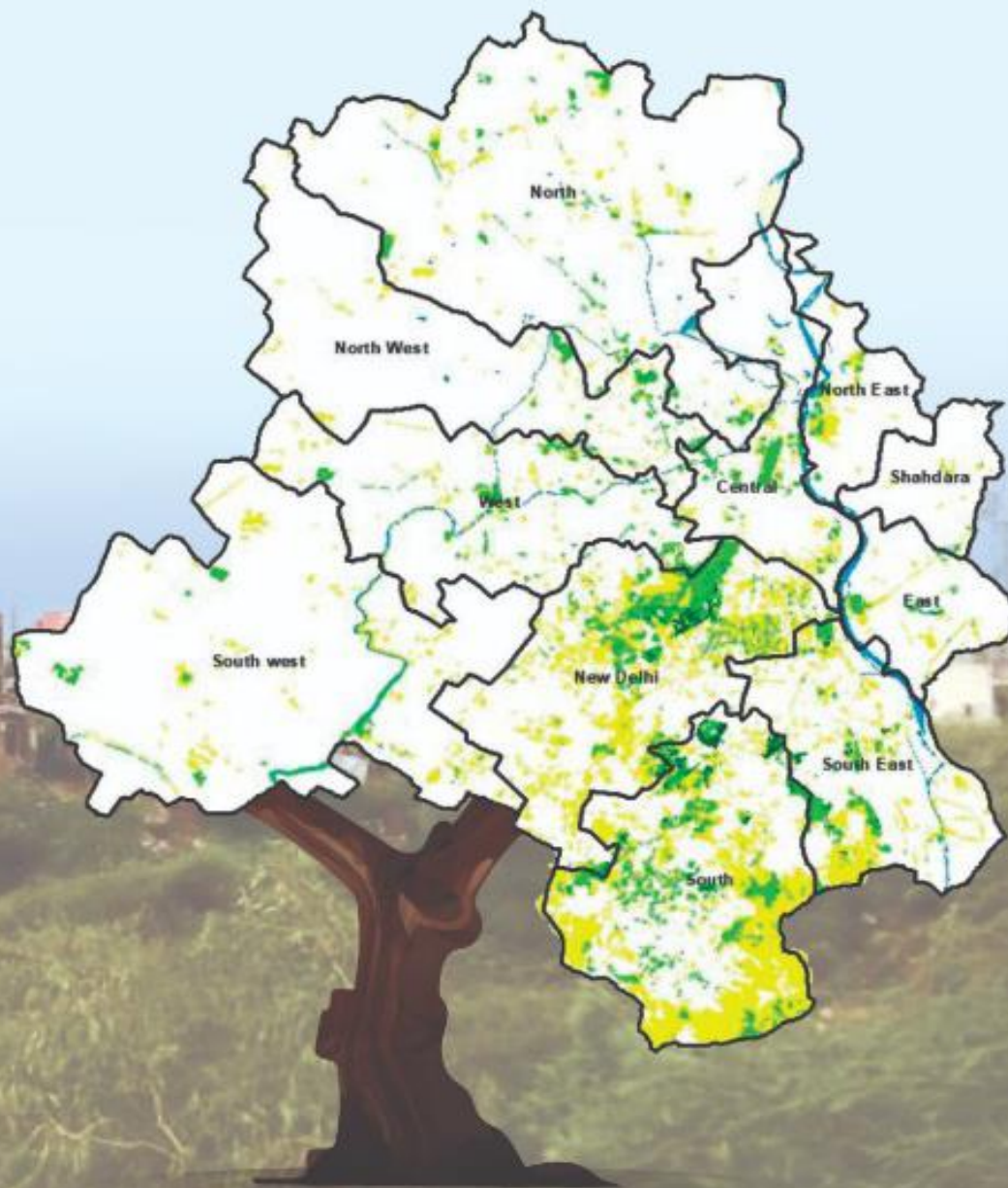


Delhi's Forest at a Glance



Department of Forest & Wildlife
Government of NCT of Delhi

[http: forest.delhigovt.nic.in](http://forest.delhigovt.nic.in)

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D.O. No

Dated 17-03-2022

MESSAGE

Forests are the storehouse of Biodiversity. They play a vital role in the protection and improvement of environment, foster a wide variety of fauna apart from giving life saving oxygen, acting as a sink for the greenhouse gases, play a vital role in Soil and Moisture Conservation and ground water recharge. To maintain ecological balance and to ensure environmental stability, it is essential to propagate, protect and preserve our valuable forest resources.

I am happy to note that the Department of Forests and Wildlife, GNCTD has brought out a book 'Delhi's Forests at a glance' encompassing the forest resources of Delhi, the growth of forests over last two and a half decades and the present status of faunal and floral heritage of the city. It also gives good insight to the functioning of the department & enforcement of various forests and wildlife statutes in the city for effective preservation & protection of forests and wildlife. I hope this handy book Delhi's forests at a glance will help one and all to understand the dynamics of forestry in the city.

As reflected in the book, the concerted efforts of the Department of Forests and Wildlife along with all Greening Agencies and the active participation of RWAs, NGOs, educational institutions and the citizens of Delhi have played a vital role in the qualitative and quantitative growth in the forest and tree cover of NCT of Delhi over a period of time.

On the occasion of World Forestry Day, I take great pleasure in releasing the book 'Delhi's Forests at a glance'. I appreciate the untiring efforts of the officers and staff of the Department for taking all possible measures for establishment of modern nurseries, supplemented with the latest technology to improve the biodiversity of existing forests and establishment of city forests in various parts of the city. I hope and trust that the same zeal and enthusiasm will continue to make the city greener, cleaner and eco-friendly.

I extend my best wishes to the entire Forest Department, all Greening Agencies and every participant involved in the greening campaign and wish them all success in their endeavours.


(Ishwar Singh)
PCCF & HoD



TABLE OF CONTENTS

S.No.	NAME OF THE CHAPTERS	Page No.
CHAPTER-1		
1	INTRODUCTION	
1.1	Delhi and its Forests	
1.1.1	Significance of Forests in an Urban Environment	
1.1.2	Temporal Variation in Green Cover of Delhi	
1.1.3	Present Status of Forests and Green Cover in NCT of Delhi	
1.1.3.1	India State of Forest Report 2021	
CHAPTER-2		
2	POLICY AND LEGAL INSTRUMENTS	
2.1	National Policies and Legislations Implemented by Delhi Forest Department	
2.1.1	National Forest Policy, 1988	
2.1.2	Indian Forest Act, 1927	
2.1.3	Forest Conservation Act, 1980	
2.1.4	Wildlife Protection Act, 1972	
2.1.5	The Biological Diversity Act, 2002	
2.1.6	Wetlands (Conservation and Management Rules), 2010 and Wetlands (Conservation and Management Rules), 2017	
2.2	State Level Policies and Legislations	
2.2.1	Delhi Preservation of Trees Act, 1994	
2.2.1.1	Salient Features of DPTA, 1994	
2.2.1.2	Compensatory Plantation Under Delhi Preservation of Trees Act, 1994	
2.2.1	Tree Transplantation Policy	
2.2.1.1	Salient Features of the Policy	
2.2.1.2	Appointment/ Empanelment of a Technical/Expert Agency for Tree Transplantation	
2.2.1.3	Committee at Divisional Level	
2.2.1.4	Tree Preservation Plan	
2.2.1.5	Social Audit	
2.2.3	Delhi Wetland Authority	
2.2.4	Biodiversity Council	
CHAPTER-3		
3	AN OVERVIEW OF THE FORST RESOURCES OF NCT OF DELHI	

3.1	Forest Types of Delhi	
3.1.1	Characteristics of Delhi's Forest Types	
3.1.2	Ecological Sub-Divisions of Delhi	
3.2	Notified Forest Areas (Recorded Forest Area) in NCT of Delhi	
3.2.1	Reserved Forests	
3.2.2	Protected Forests	
3.2.3	Wildlife Sanctuary	
3.3	Non-Recorded Forest Areas in NCT of Delhi	
3.3.1	Morphological Ridge	
3.3.2	Deemed Forest	
3.3.3	City Forests	
3.4	Plantation Sites under Department of Forest and Wildlife, Govt. of NCT of Delhi	
3.5	Nurseries under Department of Forest and Wildlife, Govt. of NCT of Delhi	
3.6	Biological Diversity of Asola Bhatti Wildlife Sanctuary	
3.7	Water bodies and Wetlands under Department of Forest and Wildlife, Govt. of NCT of Delhi	
CHAPTER-4		
4	ECOLOGICAL RESTORATION OF RIDGE FORESTS	
4.1	Project on Ecological Restoration of the Ridge	
4.2	Reclamation of Bhatti Area of Asola Bhatti Wild Life Sanctuary through Eco Task Force (ETF)	
4.2.1	Objective	
4.2.2	Plantation Status	
4.2.3	Soil Moisture Conservation Status	
CHAPTER-5		
5	STRATEGIES AND INITIATIVES TO INCREASE GREEN COVER OF NATIONAL CAPITAL TERRITORY OF DELHI	
5.1	Afforestation Activities	
5.2	Celebration of Van Mahotsav	
5.3	Rejuvenation of Yamuna Flood Plains	
5.4	Conservation Education Centre at Asola Bhatti Wildlife Sanctuary	
5.5	Eco-tourism Activities	
5.7	Consolidation of Forests	
5.7.1	Notification of Reserved Forests	

5.7.2	Notification of Protected Forests	
5.8	Third Party Audit of Plantations	
5.8.1	Internal Audit of Plantations	
5.8.1.1	The Methodology Adopted	
3.9	Soil Moisture Conservation	
3.10	Strengthening of Forest Department	
3.13	Working Plan	
Chapter 6		
6	STRATEGIES AND INITIATIVES TO CONSERVE WILDLIFE OF NATIONAL CAPITAL TERRITORY OF DELHI	
6.1	Habitat Restoration of Asola Bhatti Wildlife Sanctuary	
6.1.1	Habitat Restoration of Rhesus macaque (Monkey)	
6.1.1.2	Weed Eradication	
6.2	Rescue and Release Protocols of Wild Animals into Asola Bhatti Wildlife Sanctuary	
Chapter 7		
7	FOREST AND WILDLIFE EXTENSION	
7.1	Strengthening of Forest Department	
7.2	Capacity Building	
7.3	Awareness Campaigns	
7.4	Conservation Education Centre at Asola Bhatti Wildlife Sanctuary	
7.5	Celebration of World Environment Day	
7.6	Celebration of Van Mahotsav	
7.7	Celebration of Wildlife Week	
7.8	Calendar of Forestry Extension Programmes for 2022-23	
Annexures		



CHAPTER 1



CHAPTER 1

1. INTRODUCTION

1.1 Delhi and its Forests

National Capital Territory of Delhi, situated between 28° 22' to 28°54' north and 76°48' to 77°23' east, is one of the greenest capital cities in the world and the greenest city in the country. Despite several infrastructural projects and large scale construction taking place in Delhi, i.e., Metro, National Highway Project, High Capacity Bus Service (HCBS), flyovers, underpasses, subways, and general road widening, the forest and tree cover of Delhi has been increasing on a sustained basis from 151 sq. km. (10.2%) in 2001 to 342 sq. km. (23.06%) in 2021. The State of Forest Report published in 2021 by the Forest Survey of India, Dehradun, has recorded the extent of Forest and Tree Cover in NCT of Delhi as 195 sq. km (13.15 %) and 147 sq. km (9.91 %), respectively which covers 23.06% of its total geographic area which is 1483 sq. km. The map given in Figure 1.1 depicts the present Forest Cover scenario of NCT of Delhi.

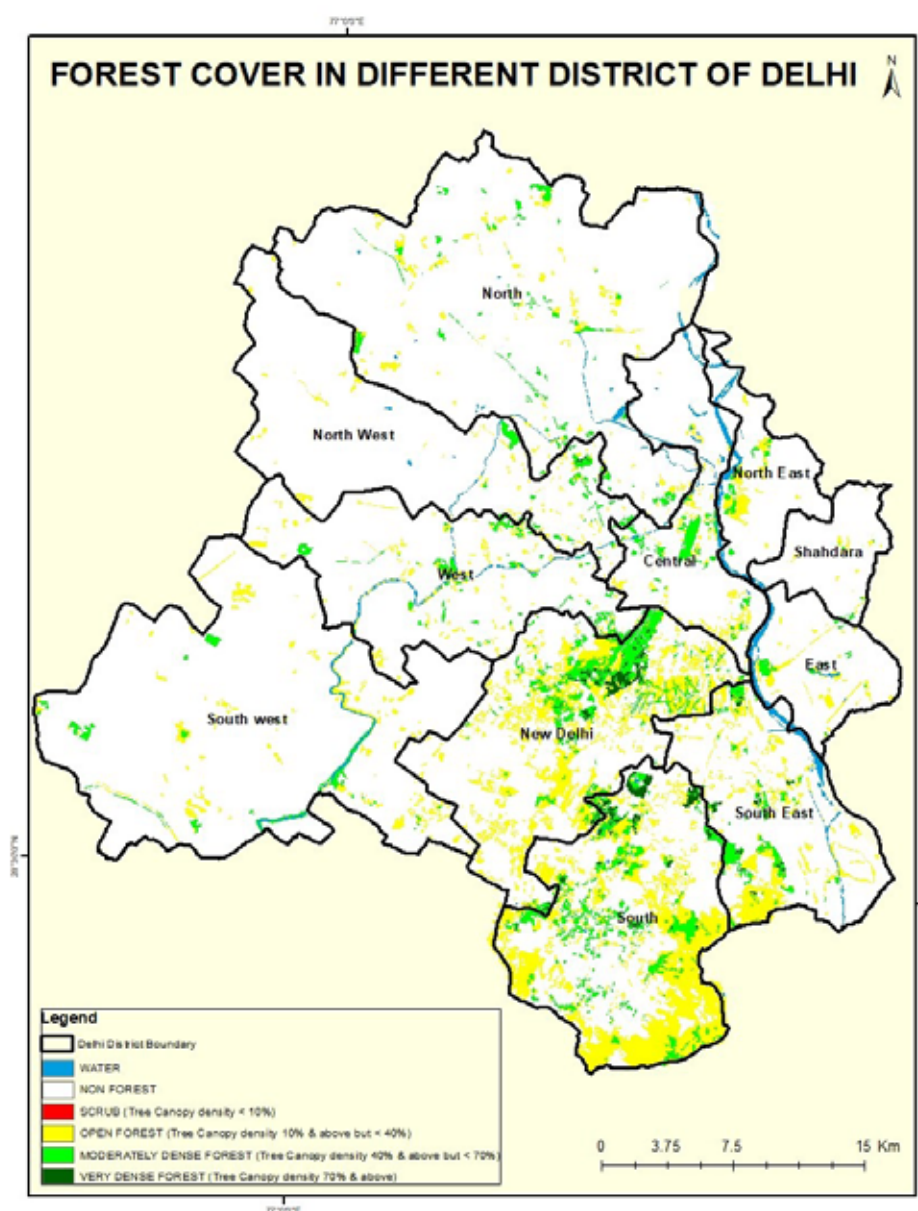


Figure 1.1: Forest Cover Map of NCT of Delhi

1.2 Brief History of the Department of Forest and Wildlife, Govt. of NCT of Delhi

1.2.1 Management of Forest before British Period

Delhi is one of the most historic capitals in the world, finding mention in the ancient epic Mahabharata. Two natural features of the city – the Ridge and river Yamuna, have made it a protected and favourite place for rulers over the ages. Therefore, the battle for protecting Delhi's "Green Lungs" started long ago. In the 14th century, the Ridge forest was covered with thorny scrubs with very little green cover. Emperor Feroze Tughlaq, who 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.

1.2.2 Forest Management during British Period

The massive afforestation of the Ridge forest was started by the British in the 19th century. The British map of 1807 shows the Ridge extending from north to south continuously unlike the present day scattered Ridge forests. In the early 1900s, the British began restoring some of the Mughal gardens, and when their Imperial capital shifted from Calcutta (now Kolkata) to Delhi, the British focused on the development of the new city in the form of impressive buildings, wide and well-ordered roads, etc. that still get attention today. They envisioned the Ridge as an appropriately majestic backdrop to the new city and thus, the Ridge again became the focus of attention, and afforestation work began in full swing. The idea was that the new Imperial capital would be "a sea of foliage". Various exotic species were introduced, including *Prosopis juliflora*, a Mexican mesquite tree now known in India as *Vilayati kikar* (foreign), which created extensive monocultures on the Ridge. While this greatly increased Delhi's green cover, it was not an entirely positive development.

Afforestation of the Delhi Ridge Forest by the British shows the exclusivity and colonial nature of British forestry. People living in villages near the Ridge were displaced, and locals who depended on the Ridge for fuel and fodder were kept out by fences and guards. In 1913, the British rulers decided to preserve the natural wealth of the Central Ridge Forest by protecting it under Section 4 of Act VII of the Indian Forest Act, 1878. The Chief Commissioner of Delhi declared an area of 796.25 ha. in 8 villages namely, Dasghara, Khanpur, Shadipur, Band Shikar Khatun, Alipur Pijanji, Malcha and Narhauas Reserved Forest vide notification dated 6th December 1913, and appointed Mr. Vincent Connolly, ICS, Additional District Magistrate, Delhi, as Forest Settlement Officer, thus placing it under more stringent British control.

Then again in 1915, the Chief Commissioner of Delhi declared part of the land under Patti Chandrawal village as Reserved Forest under Section 19 of Indian Forest Act VII, 1878 vide notification no. 5911-R & A, dated 7th September 1915, placed these forests under the charge of CPWD 'Notified Area Committee' and declared the Secretary of the Notified Area Committee as Forest Officer under Section 2 of Act VII of 1878 vide notification no. 5913-R & A, dated 7th September, 1915.

But due to rapid urbanisation, pressure on the land increased, and during 1920-30, a major portion of the Ridge near Delhi University was blasted to provide access to the residential colonies and business premises and the new colony of Karol Bagh. Therefore, vide notification no. F. 14(122)/41-LSG dated 16th September 1942, which superseded and replaced Chief Commissioner's notification No. 59 11-R & A dated 7th September 1915, part of the land under the Patti Chandrawal Mahel village was declared as Reserved Forest under Section 4 of the Indian Forest Act, 1927 and Secretary of the Civil Station Notified Area Committee was appointed as Forest Officer vide notification No. F. 14 (122)/41-L. S. G. dated 10th April 1944. Thus, it shows that British employed a model of imperial forestry that still has some echoes in the modern environmental policy.

1.2.3 Forest Management After Independence

After India's Independence in 1947, Delhi exploded into the megacity it is today, and the stress

on the natural resources of the city increased manifold as a series of intrusions, legal and illegal, have devoured more and more area. The Ridge Forest became prey to rampant 'urbanization' and 'development' which included construction work, road widening, quarrying, garbage dumping and encroachments, and this led to swallowing up of large chunks of the Ridge by the city. Refugees were given land in the Central and Southern Ridges, causing severe damage to the natural flora and fauna, consequent ecological disruption through erosion caused due to the indiscriminate and unscientific denudation of forests. With the immigration increasing with time, the plateau-like arms that bounded the various cities over time were blasted to provide the area to accommodate thousands of new migrants. With the birth of the forest wing in 1950, the Administration had taken up the planned work of managing the Ridges through norms of forestry. The Delhi Administration vide their notification dated 19.11.1958 appointed the Soil Conservation Officer (SCO) as Forest Officer and under his able auspices, the charge of management of both the Ridges was given to Development Department to maintain the Ridge with its natural status and keep encroachers at bay. Both the Ridges were fenced up, encroachments were removed and work of plantation was initiated. The power of the Forest Officer to deal with forest offences was given by notification to the SCO.

The Chief Commissioner of Delhi decided to hand over the Southern Ridge, for its maintenance, to CPWD in the year 1962, and the Southern Ridge was transferred to CPWD on 01.04.63, for its beautification as parks and gardens. Further the Hon'ble Lt. Governor of Delhi ordered the transfer of the Northern Ridge to DDA in the year 1968, which was done on 30.11.1968, for maintenance and beautification. However, with the efforts of the then Development Commissioner, two nurseries namely Birla Temple and Kamla Nehru Ridge remained with the Forest Department, Delhi Administration.

However, some encroachments were still occurring, so to preserve the Ridge as forest land, some non-profit organizations and citizen's groups working on environmental issues started protesting in 1979 against encroachments and destruction of the Ridge. In response to these efforts, Lt. Governor of Delhi declared 25 sites in the Northern, Central and South-Central Ridge as Protected Forests under the Indian Forest Act, 1927 on 10th April, 1980. In 1982, it was stated in a note of the Town and Country Planning Organization (TCPO) that 40% of the Ridge had already been destroyed (found in a study done by Delhi School of Planning and Architecture) due to a large number of encroachments and use of the Ridge land for non-forest purposes, which led the Ridge to be left with only a few, lone kikar trees and a closely cropped rocky mound, a pathetic vestige of what once was a flourishing ecosystem.

On 18.03.1987, the Department of Environment, Forest and Wildlife was separated from Development Department vide order of the Joint Secretary (Services), Delhi Administration, Delhi.

In 1995, MoEF&CC, GOI for the first time, provide three posts of IFS in NCT of Delhi after cadre review as below:

1. Conservator of Forests & Chief Wildlife Warden – 01
2. Dy. Conservator of Forest (Rural, Urban & Reserve Forest) – 03

Thereafter the Conservator of Forest was declared as Head of the Department, GNCTD vide order of the Joint Secretary (Services), Delhi Administration, Delhi. This cadre strength was not increased during the cadre review in 2002, however, post of Deputy Conservator of Forests were named as Deputy Conservator of Forest (South & Wildlife, Central & West).

Further vide Gazette Notification dated 24th March, 2009 fixed the cadre strength in the AGMUT. Vide this notification there were 07 posts under the government of National Capital Territory of Delhi, which included the following post:

1. Addl. Principal Chief Conservator of Forests – 01

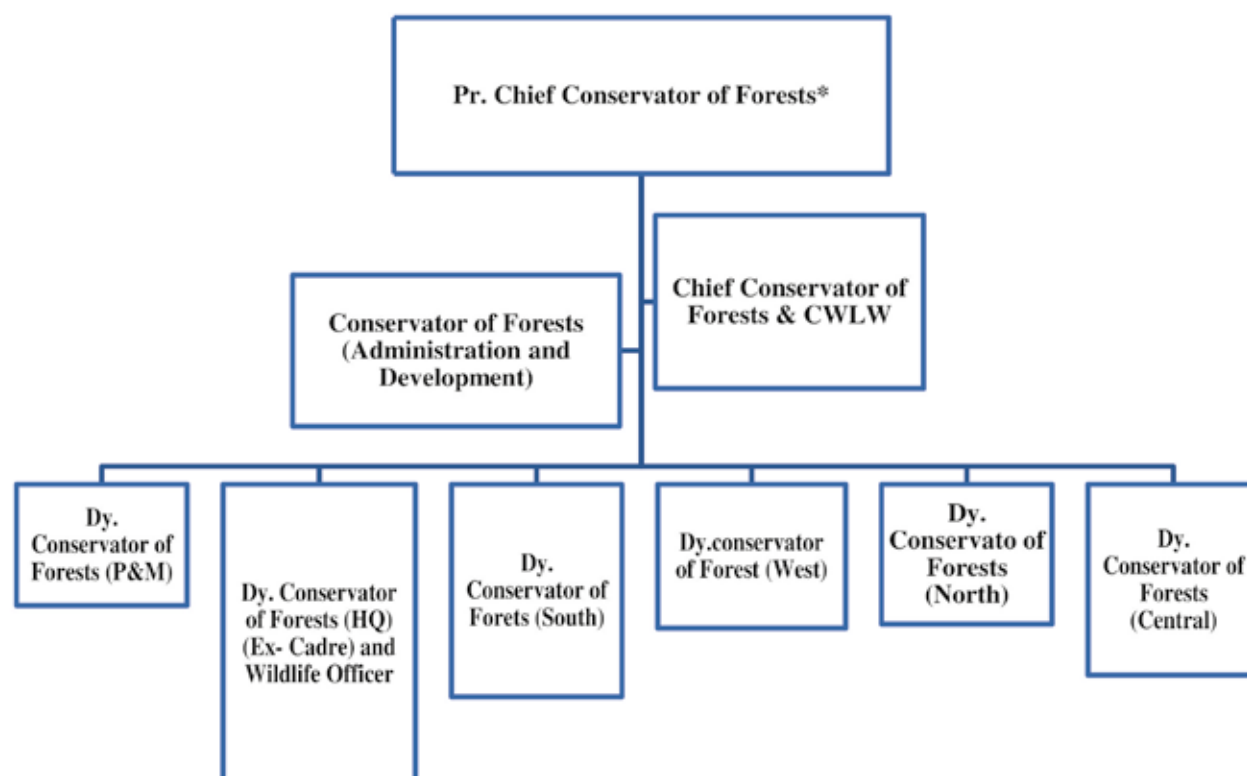
2. Chief Conservator of Forests & CWLW – 01
3. Conservator of Forests (Administration and Development) – 01
4. Dy. Conservator of Forest (North, South and West) – 03
5. Dy. Conservator of Forests (Protection and Monitoring) – 01

Furthermore vide Gazette Notification dated 17th March, 2017 fixed the cadre strength in the AGMUT. Vide this notification there were 07 posts under the government of National Capital Territory of Delhi, which included the following post:

1. Addl. Principal Chief Conservator of Forests – 01
2. Chief Conservator of Forests & CWLW – 01
3. Conservator of Forests (Administration and Development) – 01
4. Dy. Conservator of Forest (North, South and West) – 03
5. Dy. Conservator of Forests (Protection and Monitoring) – 01
6. Dy. Conservator of Forests (Territorial) – 01

*The post of Addl. Principal Chief Conservator of Forests has been upgraded to the post of Principal Chief Conservator of Forests till October, 2022. Annexure 1.1 highlights the contact details of the Department of Forests and Wildlife, Govt. of NCT of Delhi.

Hierarchy of the IFS Posted at Department of Forest & Wildlife Govt. of NCT of Delhi



1.2.1 Significance of Forests in an Urban Environment

In the rapidly urbanizing world which we live in, the significance of urban forests cannot be ignored. Urban forests not only refer to forested regions within cities and towns, they also include other green spaces, big and small. From parks and gardens to avenue trees and vacant lots, trees, plants and fungi leave no space behind. Birds, insects, reptiles, amphibians, small and big mammals all rely on this diverse flora. Yet no species gains as much from urban forests as human beings do. When the high population density of cities is balanced by urban forests, they transform into beautiful, healthier, and bio-diverse habitats.

- Urban forests act as carbon sinks, countering the harmful effects of carbon generated by automobiles and industries.
- They improve air quality by removing harmful pollutants like particulate matter, ozone, and smog and replacing it with fresh oxygen.
- Forests in towns and cities also mitigate the heat island effect by reducing temperatures through shading and evapotranspiration.
- Urban forests improve the physical health of urban residents by providing inviting spaces for exercise. They also improve mental health by facilitating meditation, yoga, and fostering a connection with nature.
- Urban forests provide naturalists with opportunities to discover diverse microhabitats and the species of birds, butterflies, fungi and other life-forms living within.

Urban forests are just as exciting as any other forests, since they are a culmination of ecological, social, and cultural processes. They are home to a wide-range of species which are adapting and evolving to urban spaces. Together, these creatures are generating novel, fascinating urban ecosystems for humans to explore and benefit from.

Delhi has historically been a city of importance; this is partly due the presence of two important geographical features – the Yamuna River and the Delhi Ridge. The Delhi Ridge is the northernmost extension of the ancient Aravalli range, which dates back 1500 million years. Presently, it is a rocky, undulating landform which traverses the city from north to south. Over the decades, parts of the Ridge have been chipped away for urbanization, but what remains is a large urban forest, which has been categorized as a tropical, open-canopied thorn forest. This forest supports both perennial vegetation and also a wide variety of annual species. By preserving the Ridge and planting the right assemblage of native plant species, it can be restored into its near pristine form, providing generations of citizens with ecosystem services.

1.2.2 Temporal Variation in Green Cover of Delhi

As per India State of Forest Report, the detailed assessments of the forest cover, growing stock, annual increment, species composition, biodiversity, non-timber forest products etc. is being done by Forest Survey of India (FSI). Since 1987 the forest cover of the country is being assessed by FSI using Remote sensing technology. Over the time the country has experienced major technological changes in data collection and processing which reflects in the changes of Green Cover of any State. Table 1.2 and Annexure 1.2 narrate the journey of the technological advancement in assessment of forest and tree cover of the country.

Over the past 2 decades the Green Cover (forest and tree cover) of Delhi shows a manifold increase from 151 sq. km in 2001 to 342 sq. km in 2021, which depicts the gradual improvement in percentage share of the geographical area of the state from 10.2 % in 2001 to 23.06 % in 2021. The details of this change as reflected in the Indian State of Forest Reports published by Forest Survey of India are summarized below (Table 1.1 and Figure 1.2).

- **Forest Cover** broadly signifies the expanse of forest resources in a country or region. Forest cover includes all lands having trees more than one hectare in area with tree canopy density over 10% irrespective of ownership, legal status of the land and species composition of trees, including tree orchard, bamboo, palms etc. within recorded forests, on other government lands, private community or institutional lands etc.
- **Tree Cover** is defined as all tree patches of size less than 1 ha occurring outside the Recorded Forest Area (RFA).
- **Green Cover** is the sum total of Forest and Tree Cover of an area.
- **Tree Outside Forest** refers to tree resources found outside the forests as defined in the Government records.
- **Green Wash** is the extent of wooded areas generally shown in light green colour on the Forest Survey of India toposheets.

Table 1.1: Temporal Variation in Green Cover of NCT of Delhi

S. No.	State of Forest Report	Forest Cover (sq km)	Tree Cover (sq km)	Total (sq km)	Percentage of Geographic Area(%)
1.	1993	22	NA	22	1.48
2.	1995	26	NA	26	1.75
3.	1997	26	NA	26	1.75
4.	1999	88	NA	88	5.93
5.	2001	111	40	151	10.2
6.	2003	170	98	268	18.07
7.	2005	176	107	283	19.09
8.	2009	176.58	123	299.58	20.20
9.	2011	176.20	120	296.20	19.97
10.	2013	179.81	118	297.81	20.06
11.	2015	188.77	111	299.77	20.22
12.	2017	192.41	113	305.41	20.58
13.	2019	195.44	129	324.44	21.88
14.	2021	195	147	342	23.06



Figure 1.2: Green Cover of Delhi 1993-2021

**Table 1.2: Major Technological Changes in Data Collection and Processing
Between 1997-2003**

Major changes between 1997-1999	Major changes between 1999-2001	Major changes between 2001-2003
A. In the fifth assessment before that, the data of Linear Imaging and self-scanning sensor LISS II of IRS-IB with a resolution of 36.25mts and LISS III data of IRS-1C and 1D satellites with a resolution of 23.5 mts have been used in assessment.	A. In this Assessment of forest cover for the entire country using digital method Forest cover of the entire country has been assessed by interpreting satellite data using digital image processing (DIP) technique.	A. In this assessment significant changes in canopy density within this class would thus go unreported. In the 2003 ISFR, the earlier category of “Dense Forest” has been sub-divided into two classes: “Very Dense Forest” (where canopy density is above 70 percent) and “Moderately Dense Forest” (where canopy density lies between 40 and 70 percent). Now with maps showing three classes of forest cover (instead of only two till now), it will be possible to monitor changes in forest quality more closely.
B. Thereafter, since 1989 the assessment is being done on 1: 2,50,000 scale. To enrich the information on forest cover and to make out most useful information 1:50000 scale is desirable, visually the quantum of work is likely to be increased manifold as the country is covered by 5200 sheets on this scale. Here the application of DIP has significantly reduced the time taken for interpretation.	B. This is in contrast with the previous assessments where visual interpretation of satellite data had been the main mode of interpretation for most of the states. Although, in 1999 assessment, forest cover of this state was interpreted digitally at 1: 50,000 scale, the information was reprocessed at 1: 250,000 scale to compare it with the 1997 assessment. The forest cover data given in ISFR 1999 was based on visual interpretation at 1:250,000 scale. Digital interpretation at 1:50,000 scale has several advantages over visual interpretation done at 1: 250,000 scale.	B. The assessment is based on digital interpretation of satellite data for the entire country. The satellite data was procured from the National Remote Sensing Agency (NRSA), Hyderabad in digital form. For the assessment, LISS-III sensor data of IRS-1D satellite with a resolution of 23.5 m has been used.

(Source: Based on the India State of Forest Report, 1999 to 2003)

Conservation of Forests and plantation of trees have always figured high in the governance priorities in NCT of Delhi and these consistent initiatives to protect and increase the forest and green cover have culminated monumental growth in the forest and green cover especially post 1993, marked by legislation of Delhi Preservation of Trees Act, 1994.

- **Forest Density:** Forest Canopy density is a major factor in evaluation of forest status and is an important indicator of possible management interventions. Forest Canopy Density refers to the proportion of a forested area that is covered by the crown of trees and is expressed in percentage of the total area (Figure 1.2).



Figure 1.2: Forest Density

- **Tree canopy:** Tree Canopy (Figure 1.3) quantifies the layer of leaves, branches and stems of trees which shelter the ground. This measurement is expressed as a percentage of ground area that is covered by tree crowns, and is proportionate to the branching spread of trees. In a densely forested area with trees that have interlacing branches and no space between them the tree canopy percentage can reach 100. On the other hand, a barren area with mostly grasses and very few trees may have a tree canopy percentage of less than 5. The urban tree canopy of Delhi not only includes protected green areas like the Ridge and city forests, but the tree cover also shades avenues, buildings, houses, and even empty plots of land.

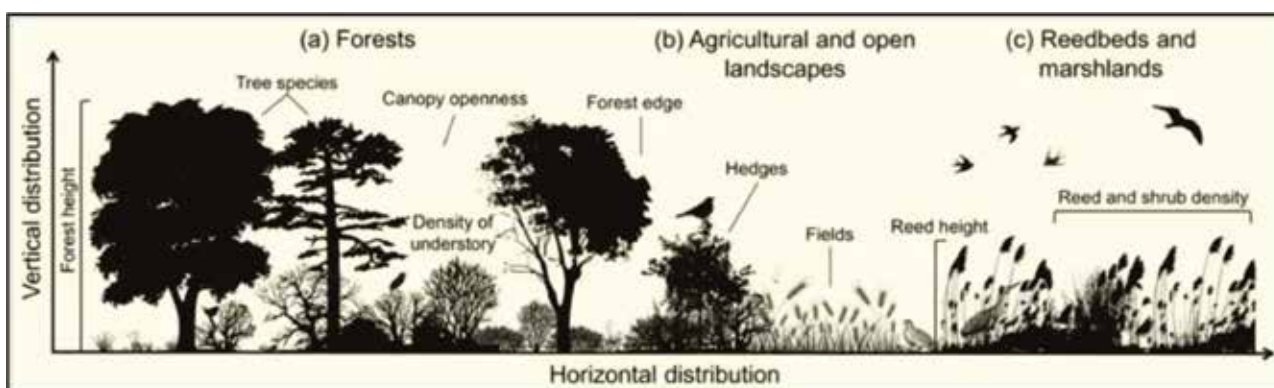


Figure 1.3: Tree Canopy Illustration

Carbon sinks are reservoirs which reduce the carbon dioxide (CO₂) in the atmosphere by storing one or more carbon based compounds. There are three main natural carbon sinks: terrestrial vegetation, the ocean and soil. During the process of photosynthesis, terrestrial plants convert CO₂ and water into sugar and oxygen, and thus they function as a carbon sink. In Delhi, a city with more than 12 million automobiles, the carbon sink function of trees and other smaller plants is particularly relevant

Air Pollution Sink: Plants serve as sinks for a variety of air pollutants. Apart from carbon dioxide, they have been shown to take up pollutants like hydrogen fluoride (HF), lead (Pb) sulphur dioxide (SO₂), chlorine (Cl₂), nitrogen dioxide (NO₂), ozone (O₃), peroxyacetyl nitrate (PAN) and nitric oxide (NO). Trees are particularly effective at filtering particulate matter which comes in the form of tiny particles of organic chemicals, acids, metals and dust, emitted from vehicles, factories, and construction sites.

1.2.3 Present Status of Forests and Green Cover in NCT of Delhi

Of the total 342 sq km of green cover in NCT of Delhi (ISFR 2021), nearly 254 sq km (74.26%) has been added during the period 1997 to 2021 (refer Table 1.1 and Figure 1.2, above). The change in Forest, Tree and Green Cover of Delhi as per the ISFR Report 2021 are given in Table 1.2.

Table 1.2: Change in Forest and Tree Cover in Delhi between 2019 and 2021

(Area in sq km)

Class	2019 Assessment	2021 Assessment	Change
Geographical Area	1483		
Change in Forest Cover in NCT of Delhi			
Very Dense Forest	6.72	6.72	0
Moderate Dense Forest	56.42	56.60	+0.18
Open Forest	132.30	131.68	-0.62
Total Forest	195.44	195	-0.44
Per cent of the Geographical Area	13.18	13.15	-0.03
Change in Tree Cover in NCT of Delhi			
Total Tree cover	129	147	+18
Per cent of the Geographical Area	8.69	9.91	+1.22
Change in Green Cover in NCT of Delhi			
Green Cover (Forest & Tree)	324.44	342	+17.56
Per cent of the Geographical Area	21.87	23.06	+1.05

(Source: India State Forest Report, 2021)

1.1.3.1. India State of Forest Report 2021

The India State of Forest Report 2021 reveals that 'Very dense forest' cover has remained constant and 'Medium dense forest' cover in Delhi has increased over the past two years. This shift towards increase in denser forest areas is a welcome sign as it signifies an increase in the capacity of forests to sequester carbon and mitigate environmental pollution. The ISFR 2021 has recorded a decrease in 0.62 sq km of open forest in comparison to the ISFR, 2019 which has effected a change of 0.44 sq km in the total forest area of Delhi.

Delhi is part of one of most rapidly expanding urban agglomerations in the world and is subject to immense pressures due to rapid urbanization, rapid demographic growth and intense infrastructure development. More than 51 infrastructure projects, as detailed in Annexure 1.3 were permitted for improving the quality of life for the citizens of Delhi between 2019-2021.

However, the number of trees to be felled/ transplanted are rationalized to a minimum before according permissions. Moreover, afforestation/ plantation drives are undertaken which also include compensatory plantations done in lieu of the trees cut. However, these plantations have being of a very young age would not have been accommodate for as their canopies are still small. These

plantations would only come under the medium dense forest or very dense forest after a period of five to 10 years at least.

As per the record of ISFR 2021, the total Forest Cover of Delhi is 195 sq km. The extent of district-wise forest cover of Delhi as per the latest satellite imagery is as under (Table 1.3). From the given analysis it has been observed that the forest cover in North and North-East Delhi districts have significantly increased while districts of West Delhi shows a decline in the forest area which also reflects as an overall decrease of 0.44 sq km area in Forest Cover of NCT of Delhi.

Table 1.3: District-wise Forest Cover of NCT of Delhi

(Area in sq km)

S. No.	Districts	Geographical Area	Forest Cover Area	Change in respect to 2019 Assessment	% of Geographical Area
1.	Central Delhi	21	5.01	+0.07	23.86
2.	East Delhi	63	3.84	+0.09	6.10
3.	New Delhi	35	16.47	00	47.06
4.	North Delhi	61	4.71	+0.13	7.72
5.	North East Delhi	62	4.14	+0.15	6.68
6.	North West Delhi	443	17.53	-0.51	3.96
7.	South Delhi	247	84.64	+0.01	34.27
8.	South West Delhi	421	51.81	-0.38	12.31
9.	West Delhi	130	6.58	00	5.27
	Total	1483	195	-0.44	13.15

(Source: India State Forest Report, 2021)

Tree Outside Forest (TOF) refers to tree resources found outside the forests as defined in the Government records. Extent of TOF therefore is estimated as the sum of extent of forest cover outside the recorded forest areas (RFA) and tree cover. The extent of Trees Outside Forests in Delhi is 283 sq km which is 19.08% of the State's Geographical area and 82.74% of total Green Cover of Delhi. Hence the conservation and protection of TOF in NCT of Delhi is equally important. Details are summarized as below in Table 1.4:

Table 1.4: Extent of TOF in 2021 and 2019

(Area Sq km)

Attributes	2019	2021
Forest Cover outside the RFA	136	136
Tree Cover	129	147
Extent of TOF	265	283

(Source: India State Forest Report, 2021)

Government of NCT of Delhi (GNCTD) has taken initiative through annual tree plantation and seedling distribution with active engagement of Forest Department, Green agencies and public to increase Green Cover area (Tree and Forest Cover) in Delhi. As a result of the initiatives taken by the Government, the Green Cover area has been increasing steadily over the years. As per the biennially published India State of Forest Report (ISFR) by FSI, from 2011 to 2021 the Green Cover of NCT of Delhi has increased over the years to 342 sq km.

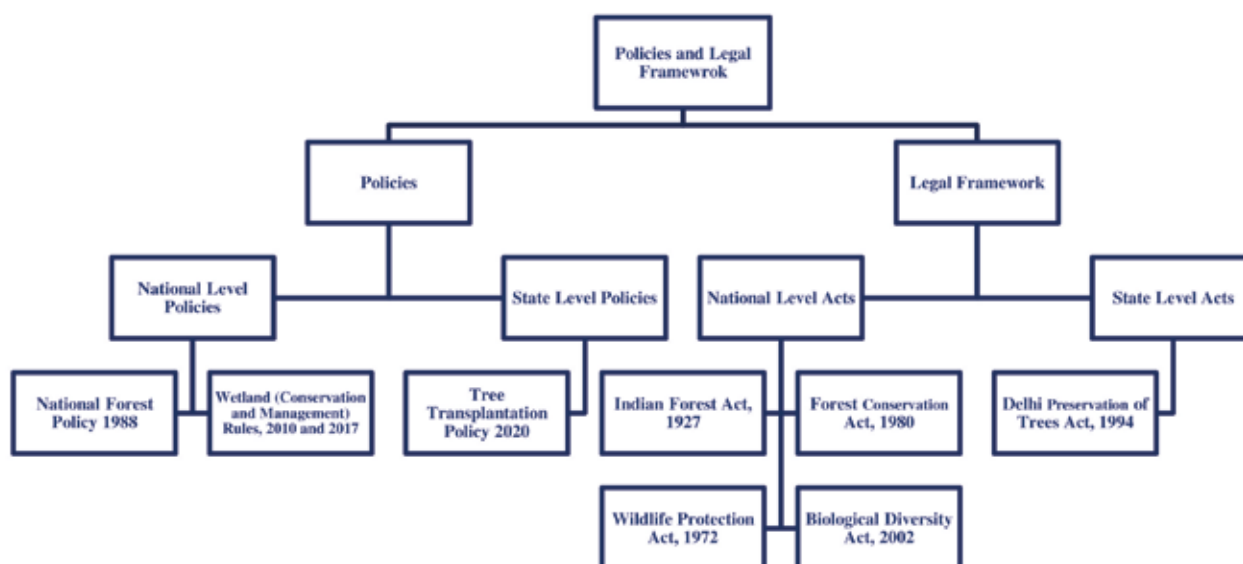
CHAPTER 2



CHAPTER 2

2. POLICY AND LEGAL INSTRUMENTS

Delhi has the unique distinction of being the second most populous city in the world with a population of 16.79 million people as well as one of the greenest city in the country with 23.06% area of total geographical area of the state under Green Cover. Maintaining and improving this status of Green Cover in a scenario of an ever increasing population and resultant urbanization and infrastructure development has been possible with the help of a strong legal framework and policies that bolsters sustainable development with a high priority on conservation of trees and forests. The forest policy and legal framework that has helped to conserve and improve the forests of Delhi are elaborated in this chapter.



2.1 National Policies and Legislations Implemented by Delhi Forest Department

2.1.1 National Forest Policy, 1988

According to the Section 4.1 of the National Forest Policy (NFP), 1988, “the national goal should be to have a minimum of one-third of the total land area of the country under forest or tree cover”. For the hilly regions that policy states that “in the hills and in mountainous regions, the aim should be to maintain two-third of the area under such cover in order to prevent erosion and land degradation and to ensure the stability of the fragile eco-system”. Taking the above in view, the Govt. of NCT of Delhi has made all endeavors to meet the national goal as set by the NFP, 1988 and is constantly adding to the green cover of the State through various activities which is reflected as the change in forest and tree cover.

2.1.2 Indian Forest Act, 1927

Indian Forest Act (IFA), 1927 is an Act to consolidate the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce. As per Section 3 of the Act, the State Government may constitute any forest-land or waste-land which is the property of Government, or over which the Government has proprietary rights, or to the whole or any part of the forest-produce of which the Government is entitled, a Reserved Forest and can issue notification in Official Gazette as per the provisions of Section 4. As per Section 6 of the Act, when a notification has been issued under section 4, the Forest Settlement Officer (FSO) shall publish in the local vernacular in every

town and village in the neighbourhood of the land comprised therein, a proclamation. After settling disputes or claims over the notified land by FSO, as per Section 20, the State Government shall publish a notification in the Official Gazette, specifying definitely, according to boundary-marks erected or otherwise, the limits of the forest which is to be reserved, and declaring the same to be reserved from a date fixed by the notification. The State Government may, by notification in the Official Gazette, declare any forest land or waste land which is not included in a Reserved Forest but which is the property of Government, or over which the Government has proprietary rights, or to the whole or any part of the forest produce of which the Government is entitled as protected forest.

2.1.3 Forest Conservation Act, 1980

An Act to provide for the conservation of forests and for matters connected therewith or ancillary or incidental thereto. As per its Section 2, this Act provides restrictions on de-reservation of forests or use of forest land for non forest purpose. It states that---

“notwithstanding anything contained in any other law for the time being in force in a State, no State Government or other authority shall make, except with the prior approval of the Central Government, any order directing-

- (i) that any reserved forest (within the meaning of the expression “reserved forest” in any law for the time being in force in that State) or any portion thereof, shall cease to be reserved;
- (ii) that any forest land or any portion thereof may be used for any non-forest purposes;
- (iii) that any forest land or any portion thereof may be assigned by way of lease or otherwise to any private person or to any authority, corporation, agency or any other Organization not owned, managed or controlled by Government.
- (iv) that any forest land or any portion thereof may be cleared of trees which have grown naturally in that land or portion, for the purpose of using it for afforestation.”

As per the provisions of the Section 2 of this Act, the user agency who wants to undertake any construction project on any of the notified forest land has to obtain permission from Central Government and need to provide land equal in area to the land they want to divert for non-forestry purpose. The land is provided for compensatory afforestation which is to be done by the State Forest Department from the funds provided by Ministry of Environment, Forest & Climate Change, Govt. of India under Compensatory Afforestation Fund Management and Planning Authority (CAMPA), Act.

2.1.4 Wildlife Protection Act, 1972

Wildlife (Protection) Act, 1972 is an Act to provide for the protection of wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensuring the ecological and environmental security of the country.

As per Section 9 of the Act, no person shall hunt any wild animal specified in Schedule I, II, III and IV except as provided under Section 11 and Section 12, according to which hunting of wild animals has been permitted in certain cases and special purposes. The Section 18 provides power to State Government for declaration of Sanctuary. As per Section 49 no person shall purchase, receive or acquire any captive animal, wild animal other than vermin, or any animal article, trophy, uncured trophy, or meat derived therefrom otherwise than from a dealer or from a person authorised to sell or otherwise transfer the same under this Act.

2.1.5 The Biological Diversity Act, 2002

India is a party to the United Nations Convention on Biological Diversity (CBD) signed at Rio de Janeiro on the 5th day of June, 1992 which came in force on the 29th December, 1993. The said Convention has the main objective of conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of utilization of genetic resources. It is considered necessary to provide for conservation, sustainable utilization and equitable sharing of the benefits arising out of utilization of genetic resources and also to give effect to the said Convention.

The Biological Diversity Act, 2002 is the Act enacted by the Parliament of India to meet the obligations under the Convention on Biological Diversity (CBD).

The Biological Diversity Act, 2002 is an Act to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto.

As per Section 22 of the Biological Diversity Act, 2002, notwithstanding anything contained in this section, no State Biodiversity Board shall be constituted for a Union territory and in relation to a Union Territory, the National Biodiversity Authority shall exercise the powers and perform the functions of a State Biodiversity Board for that Union Territory. As per Section 7 of this Act, no person, who is a citizen of India or a body corporate, association or organisation which is registered in India, shall obtain any biological resource for commercial utilisation, or bio-survey and bio-utilisation for commercial utilisation except after giving prior intimation to the State Biodiversity Board concerned, which is for NCT of Delhi would be National Biodiversity Authority.

2.1.6 Wetlands (Conservation and Management Rules), 2010 and Wetlands (Conservation and Management Rules), 2017

Wetlands are the vital parts of the hydrological cycle, are highly productive ecosystems which support rich biodiversity and provide a wide range of ecosystem services such as water storage, water purification, flood mitigation, erosion control, aquifer recharge, microclimate regulation, aesthetic enhancement of landscapes while simultaneously supporting many significant recreational, social and cultural activities, being part of the Indian's rich cultural heritage.

An intergovernmental treaty on wetlands was signed in 1971 in Ramsar, Iran to provide the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources which is known as Ramsar Convention. It came in force during 1975.

During 1982 India signed the Ramsar Convention for the conservation and wise use of wetlands, which includes in its ambit a wide variety of habitats, such as rivers and lakes, coastal lagoons, mangroves, peatlands, coral reefs, and numerous manmade wetlands, such as ponds, farm ponds, irrigated agricultural lands, sacred groves, salt pans, reservoirs, gravel pits, sewage farms, and canals. 49 designated wetlands are recorded as Ramsar Sites, spread over 10,936 sq km in 18 states and two Union Territories, which is the largest network of Ramsar Sites in South Asia.

As many wetlands are threatened by reclamation and degradation through drainage and landfill, pollution (discharge of domestic and industrial effluents, disposal of solid wastes), hydrological alteration (water withdrawal and changes in inflow and outflow), overexploitation of their natural resources resulting in loss of biodiversity and disruption in ecosystem services provided by wetlands, Govt. of India published the Wetlands (Conservation and Management) Rules, 2010 in Indian Gazette

for conservation and management of the wetlands.

As per these Rules of 2010 State Governments and Union Territory Administrations need to take into account wetland ecosystem services and biodiversity values likewise within their developmental programming and economic well-being, also taking into cognizance that land and water, two major ecological constituents of wetland ecosystems, are enlisted as State subjects as per the Constitution.

Section 7 of the Wetlands (Conservation and Management Rules), 2017 delegates power to State Government and Union Territories for conservation and management of the wetlands come under their jurisdiction. According to the provisions of these Rules Delhi Wetland Authority was constituted in April 2019 (the same is elaborated later in this chapter). Sanjay Lake located in East Delhi was declared by MoEF&CC, GOI as a potential Ramsar site (Communication dated 22.09.2021).

2.2 State Level Policies and Legislations

2.2.1 Delhi Preservation of Trees Act, 1994

The pressures of exponential population growth coupled with the consequential urban growth and infrastructure development the forests in NCT of Delhi had dwindled to a mere 22 sq km in 1993. This rampant deforestation eventually manifested in the devastating environmental degradation of the city. Hence, in order to protect and preserve the trees and thereby safeguard the environment, the Delhi Preservation of Trees Act (DPTA) was passed on 12th October 1994 by the legislative Assembly of the National Capital Territory of Delhi.

Under the provision of this Act a Tree Authority had been established for governing all the issues related to tree preservation and conservation in whole National Capital Territory of Delhi.

2.2.1.1 Salient Features of DPTA, 1994

Important definitions under DPTA, 1994 (Section 2)

- “Tree” means: any woody plant whose branches spring from and are supported upon a trunk or body and whose trunk or body is not less than five centimetres in diameter at a height of thirty centimetres from the ground level and is not less than one metre in height from the ground level”.
- “To fell a Tree” means: with its cognate expression, means severing the trunk from the roots, uprooting the tree and includes bulldozing, cutting, girdling, lopping, pollarding, applying arboricides, burning or damaging a tree in any other manner
- “Tree Officer” means: a forest officer appointed as such by the Government for the purpose of this Act.

Important definitions under DPTA, 1994 (Section 2)

- No person shall fell or remove or dispose of any tree or forest produce in any land, whether in his ownership or occupancy or otherwise, except with the previous permission of the Tree Officer.
- However, if the tree is not immediately felled, there would be grave danger to life or property or traffic, the owner of the land may take immediate action to fell such tree and report the fact to the Tree Officer within twenty-four hours of such felling.

Restrictions: Tree Pruning (Section 8)

Pruning means cutting off or removing dead or living parts or branches of a tree to improve shape or growth. It is horticultural and silvicultural practice involving selective removal of parts of a plant, such as branches, buds or roots. However, the pruning cut should not be too large so as to damage the tree.

Term	Branches of girth size	Permission Required Yes/ No	Remarks
Regular pruning/ general tending	Upto 15.7 cm	No	Done by civic agencies at regular intervals
Light Pruning	Greater than 15.7 cm but less than and equal to 40 cm	Yes	From concerned Tree Officer on submission of prescribed Form B and other documents on e-Forest Web Portal https://www.treeremoval.delhigovt.nic.in .
Heavy Pruning	Greater than 40 cm	Yes	

Procedure of Obtaining Permission (Section 9)

- An application be accompanied by self attested copies of such documents as may be prescribed in support of ownership over the land, the number and kind of trees to be cut, their girth measure at a height of 1.85 metres from ground level and the reasons therefor, copy of sajra showing clearly the site and khasra numbers of the property to be submitted to the concerned Tree Officer for permission on e-Forest Web Portal.
- Approving Authority

Condition	Approving Authority
10 Trees or less	Dy. Conservator of Forests Concerned
11-20 Trees	Conservator of Forests
More than 20 Trees	Secretary (Environment and Forest)
Area affected more than 1 Hectare	State Government

Obligation of Compensatory Plantation

(Section 10)

Every person, who is granted permission under this Act to fell or dispose of any tree, is bound to plant 10 trees for felling of a single tree as compensatory plantation.

Preservation of Trees (Section 11)

It shall be the duty of the owner of the land to comply with an order made under section 9, or a direction issued under section 10 and to plant trees in accordance with such an order or direction and to ensure that they grow well and are well preserved.

Penalties and Procedures

(Section 15)

- Where the Tree Officer has reasons to believe that an offence under this Act has been committed in respect of any tree, he may seize the tools, implements, any boats, vehicles, animals or other conveyances used for the commission of the said offence, along with the tree or part thereof, which has been severed from the ground or the trunk, as the case may be.

(Section 18)

- Any Tree Officer or a Forest Officer not below the rank of a Forest Ranger or a Police Officer not below the rank of a Sub-Inspector may, without a warrant, arrest any person reasonably suspected of having been concerned in any offence under this Act, and such person refuses to give his name or address or gives a name or address which the concerned officer has reason to believe to be false or if he has reason to believe that the person will abscond.

(Section 20)

- Every Tree Officer or his subordinates or any Forest, Revenue or Police Officer shall prevent and may interfere, for the purpose of preventing the commission of any offence under this Act.

(Section 23)

- If the person committing an offence under this Act, is an organisation, the organization as well as every person in charge of, and responsible to, the organization for the conduct of its business at the time of the commission of the offence shall be deemed to be guilty of the offence and shall be liable to be prosecuted against and punished accordingly.

(Section 24)

- Any person who contravenes any of the provisions of this Act or rules or orders made thereunder shall, on conviction, be punished with imprisonment which may extend to one year or with fine or with both.

Power to Compound Offence

(Section 21)

- The Government may, by notification empower a Tree Officer or any Forest Officer not below the rank of Deputy Conservator of Forest:
 - (a) to compound any offence committed under this Act on payment of:
 - a sum not exceeding rupees ten thousand by way of composition for the offence which such person is suspected to have committed;
 - the value of timber and other produce, if any, from the tree in respect of which the offence has been committed.
 - (b) to release any property seized or liable to confiscation, on payment of the value thereof as estimated by such officer and the amount determined 'as payable for composition of the offence, as of ordered by the Tree Officer or any Forest Officer, as the case may be.

Penalties for Compounding of offence under Section 21

Offence	Penalty
Concretization of each Tree	Rs. 10,000/-
Pruning without permission	Minimum Rs. 20,000/-
tree felling without permission	Minimum Rs. 60,000/-

Additional Provisions

(Section 33)

- This Act empowers the Government to give general or special directions from time to time to the Tree Officer, other officers of the tree Authority and officers subordinate to them regarding discharge of their functions and for carrying out effectively the purpose of the Act, and such Tree Officers and other officers shall comply with the directions issued.

2.2.1.2 Compensatory Plantation Under Delhi Preservation of Trees Act, 1994

In view of the above, to reduce the tree felling practice and make people aware about tree preservation, the Act provides for Compensatory Plantation, i.e., if any person seeks for tree removal permission that person is requested to plant trees that will be ten times equal to the number of trees to be felled. Initially a security amount of Rs.1000/- and a time limit of 9 months were decided for planting 10 trees on account of each tree permitted for felling. Upon failure to raise the compensatory plantation within the stipulated time, deposit amount was forfeited and adjusted for raising compensatory plantation by the Department of Forest and Wildlife, GNCTD. However, within few years of commencement of this rule it was realized that the amount of RS. 1000/- was very negligible, that many times the person seeking permission for felling of trees did not complied with the requirements of compensatory plantation and not even bothered to seek refund of security deposit. At the same time it was also noticed that the Forest Department was also unable to monitor the activities regarding compensatory plantation. To deal with the issue, in 2009 the Department of Forests and Wildlife, GNCTD had moved a proposal for enhancement of security deposit for compensatory plantation and revision of the norms for the same under this Act.

In 2010, Forest Department worked out the cost for plantation by considering various components which came as Rs. 2540/- per sapling (refer Table 2.1 below). The detailed costing is given in Annexure 2.1. For successful completion of the compensatory plantation activities it was decided to split up the ten times compensatory plantation in two halves, i.e., one half of it to be carried out by the Department of Forests and Wildlife, GNCTD in Forest/Government land, for which the required cost of plantation should be given by the applicant which was decided to be Rs. of 14,000/- and other half of the plantation should be done by the applicant at the affected area itself for which the person was required to deposit another Rs.14,000/- as the security amount. As the security amount was quite high it was visualized that there would be pressure on the applicant to carry out the plantation and to get refund of the security amount after getting verified by Forests and Wildlife, GNCTD. This on the other hand would ensure plantation by the Forest Department also upon receiving of the money for the same.

Table 2.1: Abstract of assessment of Compensatory Plantation Budgeting for Projects under DPTA, 1994 (* as per rates prevalent in 2010)

S. No.	Description	*Amount (Rs.)
A.	Cost of creation and maintenance of plantation (5 Saplings) to be raised by the Forest Department including the cost of fencing (Non Refundable).	12,700/-
	Administrative Costs @ 10% of (A)	1,270/-
	Sub-total	13,970/-
B.	Security deposit to ensure compensatory plantation by the applicant (refundable on successful compensatory plantation)	
	Cost of creation and maintenance of plantation (5 saplings) to be raised by the Forest Department including the cost of fencing.	12,700/-
	Administrative Costs @ 10% of B (i)	1,270/-
	Sub-total	13,970/-
	Total amount to be realized from the applicant at the time of granting permission to fell a tree (A+B).	27,940/- rounded off to 28,000/-

It has been decided vide Cabinet decision No. 1629 dated 24.02.2010 that the existing amount of security of Rs. 1000/- be raised to Rs. 28,000/- for each tree to be removed under DPTA, 1994 with the refundable/ non-refundable component of Rs. 14,000/- each for ensuring compensatory plantation by the applicant vice-versa the Forest Department. This decision had become effective from 2nd of March, 2010 by the Chief Conservator of Forest of Department of Forest and Wildlife, GNCTD in the National Capital Territory of Delhi.

Being the capital of the country, the population and development in the National Capital Territory of Delhi was always higher. As a response of the increased population and to fulfill the needs of the people developmental projects took a hike in this decade. As a result, massive destruction of trees and greenery of the city made the city vulnerable for pollution, desertification and made it unhealthy to live in. Considering this scenario Department of Forests and Wildlife, GNCTD had placed another proposal in 2015 for re-fixation of the security amount and fixation of the compensation cost for the loss of greenery, under DPTA, 1994.

It was observed that the estimation of compensatory plantation had one shortcoming such that it did not include the cost of plantation for larger area in case of permission of felling of good number of trees due to any developmental projects. In such cases plantation needed to be raised in very odd condition under proper fencing. Due to increased cost of plantation and revision of guidelines for Compensatory Afforestation Fund Management and Planning Authority (CAMPA) for maintenance of tree saplings for 7-10 years, the decision of revision of the compensatory plantation cost for both individuals and developmental projects separately, was proposed by the Department of Forest and Wildlife, GNCTD (refer Table 2.2 and Table 2.3, respectively). In this estimation adversaries of ridge like soil profile, maintenance period etc. were considered. In case of individuals the maintenance time span remained 5 years as before, whereas in case of developmental projects it was considered as 7 years for growth of tree saplings in ridge like shallow soil profile. The detailed estimation for developmental projects is given in Annexure 2.1.

In view of above, the aforementioned proposal from Secretary (Environment and Forest) was placed before the cabinet in meeting of Council of Ministers held on 19th June 2015 where it had been decided vide its decision no. 2161 dated 19.06.2015 that the existing amount for security of Rs.

28,000/- to be raised to Rs. 34,500/- in case of individuals and Rs. 57,000/- in case of developmental & commercial projects for each tree to be removed with refundable component of Rs. 15,000/- and Rs. 25,000/- in case of individuals and projects, respectively. This decision had come in force from 2nd July, 2015 in the NCT of Delhi is still in force.

Table 2.2: Abstract of Assessment of Compensatory Plantation Budgeting for Individuals under DPTA, 1994

S. No.	Description	Amount (Rs.)
A.	Cost of creation and maintenance of plantation (5 Saplings) to be raised by Forest Department including the cost of fencing (Non Refundable).	15,000/-
B.	Security deposit to ensure compensatory plantation by the applicant (refundable on successful compensatory plantation).	
	Cost of creation and maintenance of plantation (5 saplings) to be raised by Forest Department including the cost of fencing.	15,000/-
	Sub-total	30,000/-
C.	Overheads/Administrative costs@ 10 %	3,000/-
D.	Contingencies @5%	1,500/-
	Total amount to be realized from the applicant at the time of granting permission to fell a tree (A+B+C+D).	34,500/-

Table 2.3: Abstract of Assessment of Compensatory Plantation Budgeting for Projects under DPTA, 1994

S. No.	Description	Amount (Rs.)
A.	Cost of creation and maintenance of plantation (5 Saplings) to be raised by Forest Department including the cost of fencing (Non Refundable).	25,000
B.	Security deposit to ensure compensatory plantation by the applicant (refundable on successful compensatory plantation)	
	Cost of creation and maintenance of plantation (5 saplings) to be raised by Forest Department including the cost of fencing.	25,000
	Sub-total	50,000
C.	Overheads/Administrative costs@ 10 %	5000
D.	Contingencies @5%	2,500
	Total amount to be realized from the applicant at the time of granting permission to fell a tree (A+B+C+D)	57,500 or say 57,000/-

As of now plantations are either done by User Agency or the Delhi Forest Department. In case of User Agency Rs. 34,500/- or Rs. 57,000/- is deposited as security deposit which is refundable after completion of successful compensatory plantation. However, if the compensatory plantations are done by Delhi Forest Department the whole amount of Rs. 34,500/- or Rs. 57,000/- is used by the Department for the plantation and maintenance purpose which is non refundable.

2.2.2 Tree Transplantation Policy, 2020

During recent times the issues of greater demand for removal of trees vis-a-vis increased numbers of development projects due to rapid urbanization in the city start come on the scene. Concerns

were raised as the ecological value of a fully grown tree cannot be matched by planting even 10 new saplings, which was the existing norm. Therefore, considering the requests for removal of large number of trees, and to make every possible effort to save the trees affected by developmental activities in Delhi, various forest experts, came together and proposed to comprehensively revise the norms for compensatory plantation as applicable under the relevant provisions of the DPTA, 1994. The objective of the revised norms was to discourage tree felling altogether and ensuring maximum likelihood of survival of existing trees through scientific transplantation.

In light of the aforementioned ground, the Department of Forest and Wildlife, Govt. of NCT of Delhi notified "Tree Transplantation Policy 2020", on 24.12.2020. This was a pioneer move yet again emphasizing the pro-sustainable development stance of the Government. The philosophy of the policy is to promote sustainable infrastructure development by incorporating the principle of an ecologically viable planning for major development projects.

The major objective of the policy says, trees should be properly preserved and no trees should be unnecessarily removed in development projects. Trees that are suitable for preservation should be identified in the planning or feasibility stage and should be properly preserved through careful and proper planning, design, implementation and post construction maintenance. Transplantation or felling of trees should be considered only and only if on-site preservation is not possible. A decision to transplant a tree should be taken based on a balancing consideration of its conditions (e.g. form, health and structure), size, species, conservation status, amenity value, suitability for transplanting, environmental and cultural factors, functional and engineering considerations and cost effectiveness.

2.2.2.1 Salient Features of the Policy

- *Retain maximum numbers of trees at site.*
- *First preference to transplant the trees at the felling site, itself.*
- *Second preference to transplant the trees along PWD roads and Nurseries.*
- *Third preference to transplant the trees nearest to the felling site.*
- *Minimum 80% (excluding exotic species) of the total trees to be transplanted.*
- *Need to ensure 80% survival rate of the trees to be transplanted.*

2.2.2.2 Appointment/ Empanelment of a Technical/Expert Agency for Tree Transplantation

As the Tree Transplantation involves parameters which have multiple variables like age, girth, distance of the proposed site for transplantation etc., the Department has prepared an expert committee under the chairmanship of Conservator of Forests for empanelment of technical agency/ Expert Agency to conduct tree transplantation in the NCT of Delhi. The other members of the committee includes Director (Hort.), South MCD, Director (Hort.), NDMC, Director (Hort.) North MCD and Prof. C. R. Babu (Tree Expert). This expert committee has prepared the Model RFP that to be adopted by User Agency while assigning the task of Transplantation of trees in accordance with the Delhi Preservation of Trees Act, 1994 and Tree Transplantation Policy 2020. Till date four agencies have been empanelled by the committee for Tree Transplantation.

2.2.2.3 Committee at Divisional Level

A committee under the Chairmanship of Dy. Conservator of Forests/ Tree Officer in each division will be constituted to study and recommend the transplantation proposal necessitating less than 80% of the total trees proposed for transplantation. The composition of this committee will include Dy. Conservator of Forests as Chairman and Dy. Director (Hort.) of the Civic Agency along with two members of NGOs as members.

The empanelled agency will assist the User Agency in preparing a Tree Preservation Plan for the site with first priority given to on-site preservation. In a situation where retaining the trees at their existing locations is unfeasible, priority should be given to transplant the affected trees to other permanent locations within the project site where appropriate, so as to increase the tree's survival rate after transplanting and minimize the loss of greenery in the local environment; and if not applicable, transplant the affected trees to suitable permanent location ex-situ. Location of the receptor site should preferably be in proximity to the project site for retention of amenity effect in the vicinity. In any case, a minimum of 80% of trees affected by any developmental activity shall be preserved through tree transplantation.

Salient Features of Tree Preservation Plan

- *The project outline with respect to trees that can be preserved on-site, trees that will need transplantation and trees that need to be felled;*
- *Identification of tree relocation/transplantation strategy;*
- *Identification of land/area where the trees will be transplanted*
- *Allocation of funds for transplantation;*
- *Assessment of development plan in conjunction with the tree preservation plan with timelines*

The Tree Preservation Plan shall be submitted to the concerned Tree Officer along with the application for tree felling. If any, The Tree Officer shall give his/her decision within the time stipulated under Delhi Preservation of Trees Act, 1994 including, for reasons to be recorded in writing, granting a conditional approval subject to making necessary changes in the Tree Preservation Plan. If the Tree Officer fails to communicate his/her permission on request within the stipulated period, the permission shall be deemed to have been granted. If the Tree officer fails to communicate his/her permission within the stipulated period after submission of complete application, the permission shall be deemed to have been granted.

- **Implementation of Tree Preservation Plan:** The Tree Preservation Plan can be put to implementation only after receipt of approval or deemed approval from the concerned Tree Officer. The technical agency in-charge of tree transplantation will be responsible for all the associated activities as illustrated below:

*Pre conditioning
Hardening
Rhizome consolidation
Refuge site preparation
Transportation
Transplanting at refuge
After care*

2.2.2.5 Social Audit

The policy recommends for the Social Audits for survival of transplanted trees as well as Compensatory Plantation carried out in lieu of tree felling/ transplantation. In every Forest Division such Tree Committee will be there to conduct social auditing and to certify tree survival rate at the end of one year.

2.2.3 Ridge Management Board (RMB)

The Ridge Management Board (RMB) was constituted pursuant to the orders of Hon'ble High Court dated 29.09.1995 in IA No. 1820-21 in WP(C) 4677/85 titled 'M.C. Mehta vs. Union of India & ors.' In order to protect and conserve the Ridge Forests. The Board consisted of 8 officers including Chief Secretary, Delhi; Finance Secretary, Delhi; Vice chairman, DDA; Conservator of Forest and Deputy Conservator of Forest. The Chief Secretary being the Chairman of the Board. The Board is entrusted with the following functions:

- Execution of the management scheme for the Ridge forests as the green lungs of Delhi;
- Protection of the boundary and boundary fences of the Ridge;
- Preparation and execution of detailed plans for up gradation of the Ridge in accordance with sound silvicultural practices applicable to city forests and natural resources;
- Control of the usage of by the public of such areas of the Ridge forests as may be declared as 'open' by the 'Board'.
- Ensuring that there are no encroachments in excess of the areas allotted to the lawful allottees, till they are shifted from the Ridge Forest under appropriate orders;
- Any other functions ancillary to the above purposes;
- The Board may co-opt for any of its meetings not more than two persons having special knowledge of forestry, regional ecology, nature conservation and related subjects.

2.2.4 Biodiversity Council

In exercise of the power conferred under sub section (2) of Section 22 of the Biological Diversity Act, 2002 (Central Act 18 of 2003), the National Biodiversity Authority (NBA) has delegated the powers and functions vested with it under section 22 (2) of the Biological Diversity Act, 2002 to the National Capital Territory of Delhi Biodiversity Council (DBC) vide Office Memorandum No. NBA/9/60/2005-SBB/UT-D dated 31.12.2019 for performing the functions within the jurisdiction of the Union Territory as has been vested to the State Biodiversity Boards under various provisions of the Biological Diversity Act.

In compliance of the aforementioned Office Memorandum, the Government of National Capital Territory of Delhi constituted Delhi Biodiversity Council vide notification No.41/CWLW/WL/Constitution of Biodiversity Council/2020/6576-99 dated 29.10.2021 which is responsible for:

- (i) Regulating access to biological resources for commercial utilization as specified under section 7 of the Biological Diversity Act, 2002.
- (ii) Supervising the formation and functioning of Biodiversity Management Committees (BMCs) and People's Biodiversity Register.

The composition of the Biodiversity Council is as follows:

Prof. C. R. Babu, Delhi University	Chairperson
Principal Secretary (Environment & Forest), GNCTD	Member (ex-officio)
Principal Secretary (Urban Development), GNCTD	Member (ex-officio)
Development Commissioner, GNCTD	Member (ex-officio)
Principal Chief Conservator of Forest, GNCTD	Member (ex-officio)
Chief Executive Officer, Delhi Parks and Gardens Society, GNCTD	Member (ex-officio)
Chief Wildlife Warden, GNCTD	Member Secretary of the Council
Prof. Sumit Dookia, Indraprastha University	Member
Sh. Vijay Dashmana, Aravali Biodiversity Park, Curator	Member
Dr. Ritu Singh, Indian National Trust for Art and Cultural Heritage (INTACH)	Member
Sh. Manu Bhatnagar, Indian National Trust for Art and Cultural Heritage (INTACH)	Member

2.2.5 Research Advisory Committee

The Department of Forests and Wildlife, GNCT of Delhi receives research permission applications from various institutes, universities and other government organizations. In view of this, a Research Advisory Committee (RAC) has been formed on 01.11.2019 to scrutinize the research study proposals received and proposed to be taken up in Government of NCT of Delhi by various universities, institutes or individuals. The committee consists of the following member:

Principal Chief Conservator of Forests	Chairman
Chief Conservator of Forests & Chief Wildlife Warden	Member
Conservator of Forests	Member
Director, Mahatma Gandhi Institute of Climate Change, Delhi	Member
Professor C.R. Babu, CEMDE, Delhi University	Member
Dy. Conservator of Forests (HQ)	Member Secretary

The first RAC meeting was held on 05.10.2020 and list of research proposals approved by the Department of Forests and Wildlife is placed at Annexure 2.2.

2.2.6 Delhi Wetland Authority

Delhi is home to more than 1,000 lakes, wetlands and ponds, but most of these are threatened by rampant encroachment (both planned and unplanned), pollution through dumping of solid waste and construction debris and disposal of untreated sewage. Protecting Delhi's wetlands will not only improve the environmental quality of the city but will also enhance local water resources and develop the city's water resilience for the future.

The Delhi Wetland Authority was constituted in April 2019 under the Department of Environment, Govt. of NCT of Delhi according to the Wetlands (Conservation and Management) Rules, 2017. The Authority in coordination with sixteen water body owning agencies has taken up the task of formalizing a framework for restoration, protection and rejuvenation of the water bodies. As the Delhi Forest Department owns 17 water bodies under its jurisdiction, the Department is actively engaged with the activities of the Wetland Authority.

The major issues taken up by the authority are listing of wetlands, preparation of brief documents and

action plans, recommendation of wetlands for regulation and notification.

The actions taken up by the Delhi Wetland Authority is mentioned as below:

- Inventorisation and reconciliation of 1043 water bodies in Delhi has been done through coordination with 16 water body owning agencies of NCT of Delhi.
- Seven Districts have been identified as model ponds (North, North West, South, South West, New Delhi, North East and West) by this Authority and bench marks for these Model Ponds are prepared and sent to all District Magistrates accordingly.
- In the matter of Lt. Col. Sarvadaman Singh Oberoi Vs. Union of India & Ors, in OA No. 325/2015, Hon'ble NGT had directed for preparation of action plans for restoration of all wetlands. These action plans which are proposed for conservation actions of each water body have been completed in respect of 684 water bodies. Brief Documents as per the format of Ministry of Environment Forest and Climate Change, Government of India containing ecological attributes and management challenges of the water body has been prepared in respect of these 684 water bodies of Delhi.
- Citizen engagement and public participation in the conservation of wetlands is planned through declaring Wetland Mitras, who can assist the authority in protection and restoration of wetlands, thus deepening Government's engagement with stakeholders. Twenty seven wetland Mitras are empanelled by Wetland Authority so far, seven more applications has been received which are in the process of being empanelled. First meeting of Wetland Mitras was convened on 31.08.2021. The Authority has celebrated Iconic Week under Azadi ka Amrut Mahotsav on 04.10.2021 with Wetland Mitras creating awareness about their roles and responsibilities. Pledge was taken by Wetland Mitras to dedicate themselves for noble cause of wetland conservation and protection.
- In pursuance of Wetlands (Conservation and Management) Rules, 2017 a Technical Committee under Chairmanship of Dr. Madhu Verma, Chief Economist at the World Resources Institute at Delhi consisting of six wetland experts has been formed on 01.07.2021 for reviewing of brief documents prepared by other water body owning agencies for for notifying the wetlands. Wetland Authority has prioritized 10 waterbodies for immediate notification which includes Sanjay Lake, Hauz khas Lake, Bhalswa Lake, Smriti Van (Kondli), Smriti Van (Vasant Kunj), Najafgarh Jheel, Welcome Jheel, Daryapur Kalan, Sultanpur Dabas and Poth Kalan (Sardar Sarovar Lake).
- Delhi Wetland Authority has prioritized 100 water bodies for beautification based on their size and water quality and free from encroachment.
- In pursuance of Wetlands (Conservation and Management) Rules, 2017 a "Grievance Committee under Wetland Authority of Delhi was constituted on 01.07.2021 as a mechanism for hearing and forwarding grievances raised by the public to the Wetland Authority on Wetlands falling under their respective jurisdiction.
- Delhi was chosen as pilot for on boarding brief documents onto the Govt. of India's National Wetland Portal and user training for Wetlands of India Portal by Ministry of Environment, Forests and Climate Change, Govt. of India on 24.09.2021. The portal will be a single point access system that synthesizes information on wetland sites, projects, initiatives and trainings and will be a platform for people to learn more about wetlands and get involved in their conservation and management.
- The future plan of the Delhi Wetland Authority is to prepare a protocol for catchment area management, evolving low cost restoration techniques, and actively engage, coordinate and help land owning agencies to prioritize wetlands based on the brief documents prepared and notify by them, thus ensuring long term protection and conservation of wetlands in Delhi.

CHAPTER 3



CHAPTER 3

3. AN OVERVIEW OF THE FORST RESOURCES OF NCT OF DELHI

3.1 Forest Types of Delhi

The forest type (or vegetation type) of an area refers to its physiognomy, structure and floristic features which are determined by geography, topography and anthropogenic factors. In A Revised Survey of Forest Types of India (1968), Champion and Seth classified Indian forest ecosystems into 16 type groups. These groups are further divided into sub-groups based on compositional patterns and region specific formations . As per this classification the forest types of Delhi fall broadly into two groups:

- (i) Tropical Dry Deciduous Forests (Group 5)
- (ii) Tropical Thorn Forests (Group 6)

Further, they can be classified into three sub-groups:

- (i) Northern Dry Mixed Deciduous Forest (Sub-group 5B/C2)
- (ii) Ravine Thorn Forest (Sub-group 6B/C2)
- (iii) Plantation/ Trees outside forests (TOF)

The photographs below presents the Forest types of Delhi.



Ravine Thorn Forest



Northern Dry Mixed Deciduous Forest



3.1.1 Characteristics of Delhi's Forest Types

Trees in dry deciduous forests have low height to diameter ratios, produce leaves with low specific leaf areas, and have high wood densities. These traits indicate slower and more conservative growth strategies in these trees than their evergreen forest counterparts. They have adapted to withstand seasonal water stress. The Delhi Ridge represents the Tropical Thorn Forest group. The bulk of the native vegetation consists of thorny trees and shrubs that are widely spaced and drought resistant. Native species include Bistendu (*Diospyros Montana*), Hingot (*Balanites roxburghii*), Khair (*Senegalia catechu*), Kumththa (*Senegalia senegal*), Dhak (*Butea monosperma*), Phulai (*Senegalia modesta*), and Kareel (*Capparis decidua*). The under-storey vegetation consists of perennials and annuals that emerge during the rains. The Plantation/TOF sub-group includes the trees growing in plantation sites, parks, gardens, avenues, empty lots, agricultural lands, etc.

Delhi's forests also fall into the category of "monsoon" forest in accordance with the climate. While in rainforests, moisture is available throughout the year supporting evergreen vegetation, monsoon forests have a distinct wet and dry season. Trees in monsoon forests shed their leaves in the dry season, which begins in late-January or early February in Delhi. Most trees flower between March and May; this is when they are leafless, thus making the flowers more conspicuous to pollinators.

- (i) **Khadar (Riverain Zone):** Khadar consists of the region adjoining River Yamuna. More precisely, it is land which was either underneath the river before its course changed, or towards the east of it. The soil's pH is towards the alkaline side, and the texture varies from coarse sand to clay. The amount of organic matter is limited. While much of the khadar forests have disappeared due to urbanization, some areas near the river still have Jhau (*Tamarix*) trees which are saline resilient species native to this micro-habitat.
- (ii) **Bangar:** Bangar is the level, fertile zone of Delhi over which much of the city has been constructed. This zone is suited to support a dense forest; it has fertile soil which is neutral in pH, firm and productive. Tree species native to this microhabitat include Ber (*Zizyphus mauritiana*), Jhand, Kanju, Bistendu (*Diospyros montana*), Babool (*Vachellia nilotica*) and Ronjh (*Vachellia leucophloea*)⁸.
- (iii) **Kohi (Hillside):** Kohi zone consists of the Ridge, the rocky northernmost stretch of the ancient Aravalli range. The undulating hills enter the city from the south near Gurgaon and runs in a north easterly direction. Above the rocks, there is a thin layer of sandy soil. Due to the inhospitable conditions, the kohi is best-suited to support an open-canopied thorn forest. Native tree species include Hingot (*Balanites roxburghii*), Khair (*Senegalia catechu*), Kumththa (*Senegalia senegal*), Dhak (*Butea monosperma*), Phulai (*Senegalia modesta*), Kareel (*Capparis decidua*), Kalasiris (*Albizia odoratissima*), and Kulu (*Sterculia urens*)⁹.
- (iv) **Dabar:** Dabar consists of much of the land west of the Ridge. Due to a history of being waterlogged, the otherwise fertile soil was made saline. A large section of Dabar is under construction, apart from the southernmost section near Najafgarh, which is relatively productive. This zone can support trees like Peelu, Jhau (*Tamarix*), Wild Date Palm (*Phoenix sylvestris*) and Babool (*Vachellia nilotica*)¹⁰.

⁵Ratnam, J., Chengappa, S. K., Machado, S. J., Nataraj, N., Osuri, A. M., & Sankaran, M. (2019). Functional traits of trees from dry deciduous "forests" suggest seasonal drought and fire are important drivers. *Frontiers in Ecology and Evolution*, ⁸.

⁶Krishen, P. (2006). *Trees of Delhi: A field guide*. Penguin Books India.

⁷Krishen, P. (2006). *Trees of Delhi: A field guide*. Penguin Books India.

⁸Maheshwari, J. K. (1963). *The Flora of Delhi*. Council of Scientific and Industrial Research.

The Figure 3.1 explains the ecological subdivisions as below:

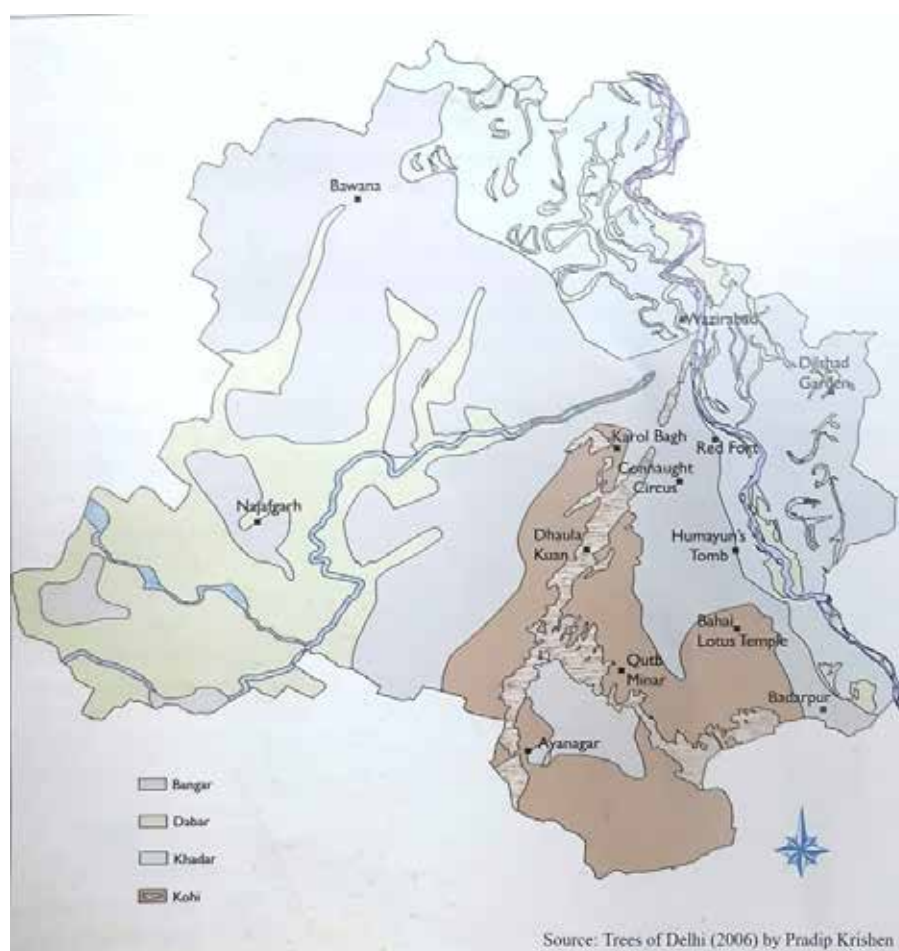


Figure 3.1: Ecological subdivisions of Delhi Forests

3.2 Notified Forest Areas (Recorded Forest Area) in NCT of Delhi

3.2.1 Reserved Forests

“Delhi Ridge”, having an extent of 7,784 Ha, refers to the extension of Aravalli, the oldest mountain chain in the country comprising of rocky outcrop enters Delhi from Haryana near Tughlakabad, Bhatti, Dera Mandi area moves North, covering parts of Delhi Cantt., Lutyen’s Delhi and culminates near Timarpur, North of Delhi University. About 35 km stretch of the Ridge forest falls under NCT of Delhi. This remnant of Aravallis is rich in biodiversity consisting 32 species of mammals, 25 species of reptiles, 434 species of birds, 585 species of vertebrates and 1202 species of invertebrates, reported by the Zoological Survey of India besides 120 plants species. However, the Ridge Areas have undergone massive exploitation for development and upgradation of the city over the past few decades. In order to protect the Ridge Forests and to maintain its pristine glory, the Hon’ble Supreme Court of India, in its order dated 09.05.1996 in the matter of M.C. Mehta vs. UOI & Ors. in WP (C) 4677/85, had directed the following:

⁹ Krishen, P. (2006). Trees of Delhi: A field guide. Penguin Books India.

¹⁰ Maheshwari, J. K. (1963). The Flora of Delhi. Council of Scientific and Industrial Research

¹¹ Krishen, P. (2006). Trees of Delhi: A field guide. Penguin Books India

“Delhi has two distinct natural features. The Ridge which is the rocky outcrop of Aravalli Hills and the River Yamuna. Some parts of the Ridge have been erased in the central city area. No further infringements of the Ridge is to be permitted; it should be maintained in its pristine glory.”

Reserved Forest: The State Government may constitute any forest-land or waste-land which is the property of Government, or over which the Government has proprietary rights, or to the whole or any part of the forest produce of which the Government is entitled, shall be considered as a Reserved Forest as notified under Indian Forest Act, 1927.

In view of the above, Government of NCT of Delhi constituted Ridge Management Board on 6th October 1995 with the Chief Secretary as its Chairman to ensure that Delhi's ridge is protected and conserved with the best management practices. The Ridge forests thereafter notified as Reserved Forest under Section 4 of Indian Forest Act, 1927. The details are as follows (Table 3.1 and Figure 3.2).

Table 3.1: Delhi Ridge at a Glimpse

S. No.	Ridge	Area (Ha)	Managing Agencies
1.	Northern	170.74	DDA, MCD & Forest Department
2.	Central	864 (approx.)	Forest Department, DDA, Army, CPWD, NDMC, MCD.
3.	South Central	626 (approx.)	DDA
4.	Southern	6200 (approx.)	Forest Department, DDA, Sports Authority of India, Revenue Department
5.	Nanakpura South Central	7 (approx.)	DDA
Total		7867 Ha	

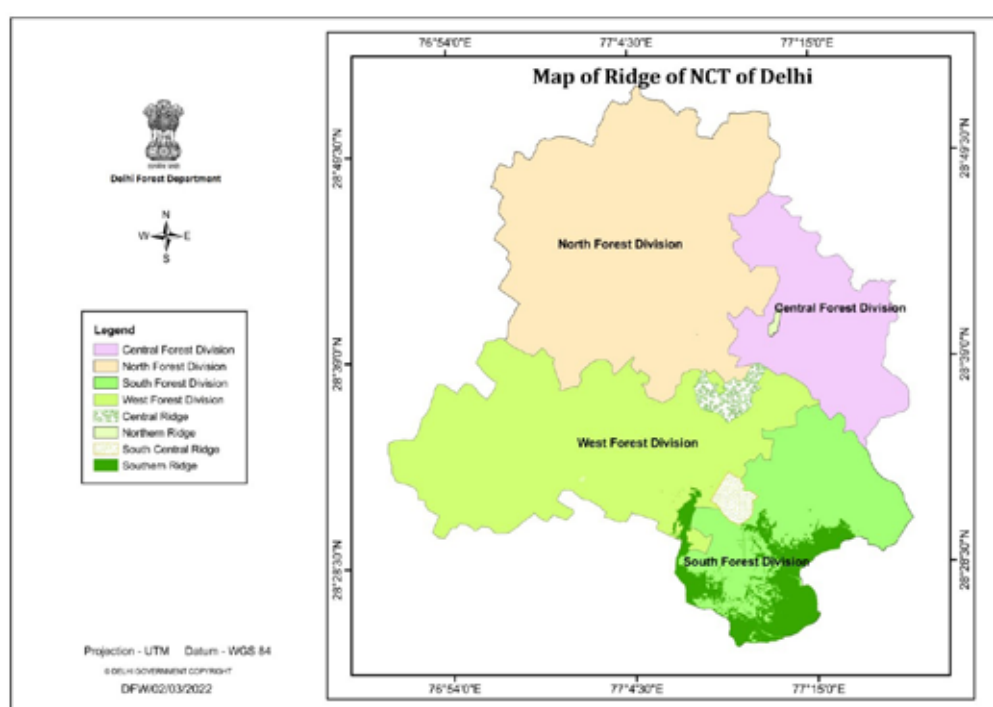


Figure 3.2: Map of Delhi Ridge

3.2.2 Protected Forests

The Government of NCT of Delhi has notified areas having natural/man-made forests as Protected Forests under Section 29 of the Indian Forest Act, 1927 vide notifications mentioned against each. The details are given at Table No. 3.2 and Table 3.38`1.

Protected Forests: The State Government may, by notification in the Official Gazette, declare the provisions of Indian Forest Act, 1927 to any forest-land or waste-land which is not included in a Reserved Forest but which is the property of Government, or over which the Government has proprietary rights, or to the whole or any part of the forest produce of which the Government is entitled. The forest-land and waste-lands comprised in any such notification shall be called a Protected Forest.

Table 3.2: Protected Forests under Govt. of NCT of Delhi

S. No.	Name of Protected Forest and Agency	Area (Acre)
1	Mitraon (Forest)	104.8
2	Sultanpur (Forest)	119.7
3	Mukhmelpur (Forest)	132.7
4	Distt. Park I/c Hauz khas – picnic hut, lake, garden, etc. (DDA)	400
5	Jahanpanah City Forest (DDA)	800
6	Basant Naar, Moradabad Pahari Area (DDA)	200
7	Vasant Vihar Distt. Park (DDA)	20
8	Distt. Park Gokulpuri (DDA)	7.5
9	Distt. Park Jhilmil Taharpur (DDA)	20
10	Zonal Green Area – Kalyanpuri, Trilokpuri, Khichripur, Ghazipur, etc. (DDA)	373
11	Orchard between Sindhora Kalan, Nimri, Gulabi Bagh & Darbar Khan Nursery and Other Areas (DDA)	100
12	Area between Hill Road & Ludlow Castle Row (DDA/L&DO)	17
13	Orchard in Wazirpur near Bharat Nagar and Nimri Colony (DDA)	120
14	Mayapuri Green Belt (DDA)	5
15	Hastal Afforestation (DDA)	40
16	Afforestation MP Green Area Tagore Garden (DDA)	55.26
17	Orchard Nangloi Sayed (DDA)	257.56
18	Distt. Park Rohtak Road Co-operative Society (DDA)	35
19	Afforestation MP Green G 8 Tihar	65
20	Afforestation MP Green Area Najafgarh Drain (DDA)	54.58
21	Distt. Park in between Pitampura Co-operative Society (DDA)	185
22	Near Usmanpur Village (Notified in 2022)	0.3
23	Dhoolsirus (Notified in 2022)	20.04
24	Dhoola Kuan Complex (DDA)	200
Total Area		3332.44 Acrs or 1348.59 Ha

(Source: Govt. of NCT of Delhi)

Table 3.3: Protected Forests also Notified as Reserved Forests under Notification 1994

S.No.	Name of Protected Forest also Notified as Reserve Forest	Area (Acre)
1	V.R. Block Rajender Nagar (DDA)	205
2	Area between Inderpura Narayana JJ Colony (DDA)	32
3	Bhuli Bhatyari area (DDA)	40
4	Nehru University Afforestation (DDA)	200
5	Central Ridge (PF also notified as RF in 1994)	2022
6	Northern Ridge (PF also notified as RF in 1994)	421.9

(Source: Govt. of NCT of Delhi)

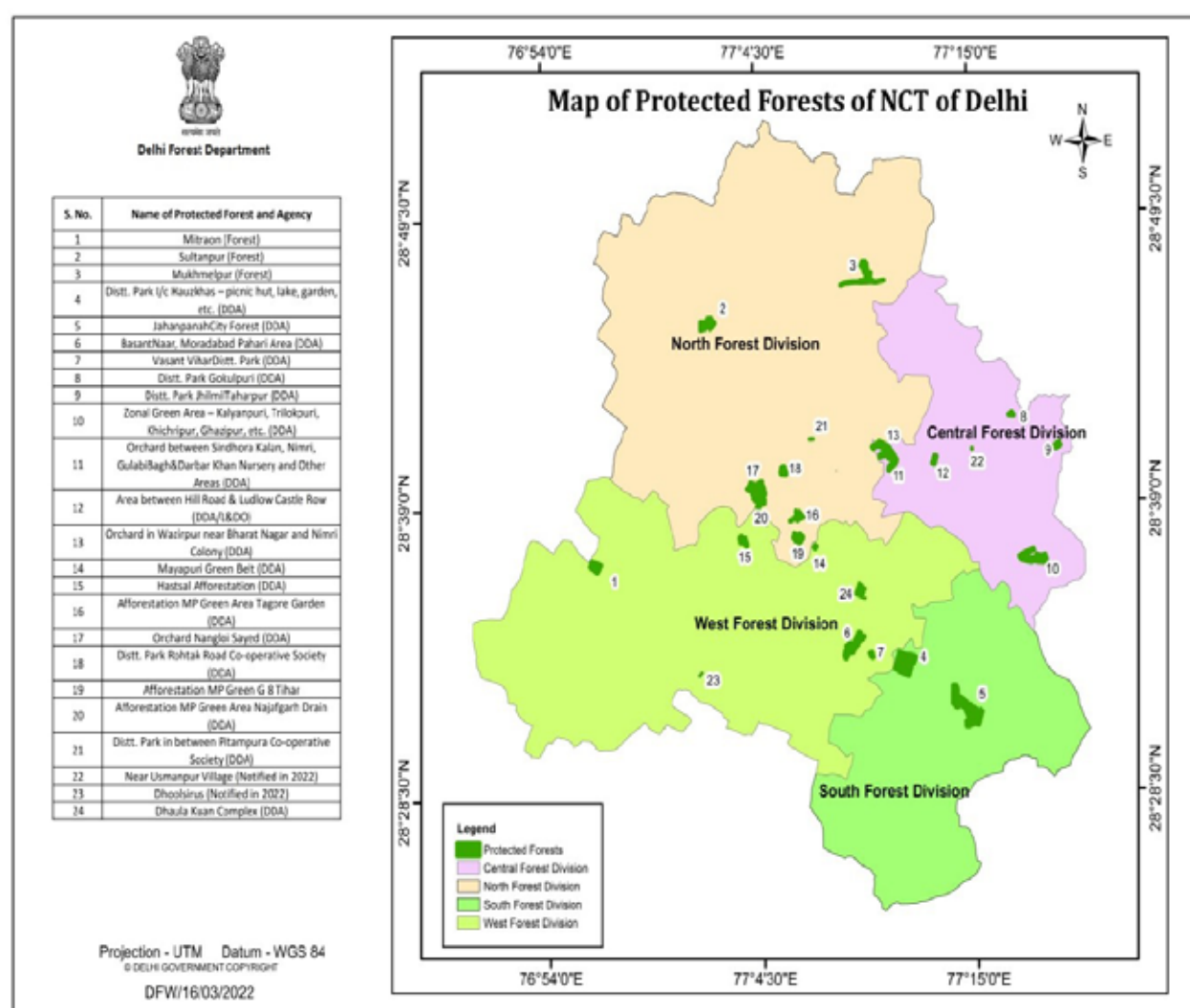


Figure 3.3: Protected Forests under Department of Forest and Wildlife, Govt. of NCT of Delhi

3.2.3 Wildlife Sanctuary

The Asola Bhatti Wildlife Sanctuary is the only Sanctuary in the urban conglomeration of NCT of Delhi, harbouring indigenous flora and fauna of Aravalli hills. The sanctuary is located in the Southern Ridge having following boundaries in North: Sangam Vihar and Durga Vihar colonies bordering Mehrauli-Badarpur Road; South: Interstate border with Haryana; East: Haryana interstate border and road from Tughlaqabad Fort to Suraj Kund; West: Asola, Fatehpur Beri and some other villages of Delhi and Haryana State.

Area of Asola Bhatti Wildlife Sanctuary is 1,972.93 Ha (Notification No. F.3(116)/CWLW/84/897/ to 906 dated 09.10.1986, Notification No. F2 (19)/DCF/90-91/1302-91 dated 15.04.91 and Notification No. F7(34)/90-L&B(1) dated 01.06.1992 (Figure 3.4).

Wildlife Sanctuary: The State Government may, by notification under Wildlife Protection Act, 1972, declare any area to be a Wildlife Sanctuary if it considers that such area is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance, for the purpose of protecting, propagating or developing wild life or its environment.

The vegetation of the Sanctuary falls under 6B/C Tropical Dry Thorn Forest type as per Champion and Seth (1968). The area is mainly dominated by sparsed middle storied thorny trees with open patches. The sanctuary acts as a barrier against the advancing aridity from the southwest direction, but its good soil porosity also helps to act as an aquifer from where Delhi's ground water gets recharged with good quality water and plays a major role in the overall control of the water regime. It further functions as a thermo regulator by creating its own evapo-transpiration regime.

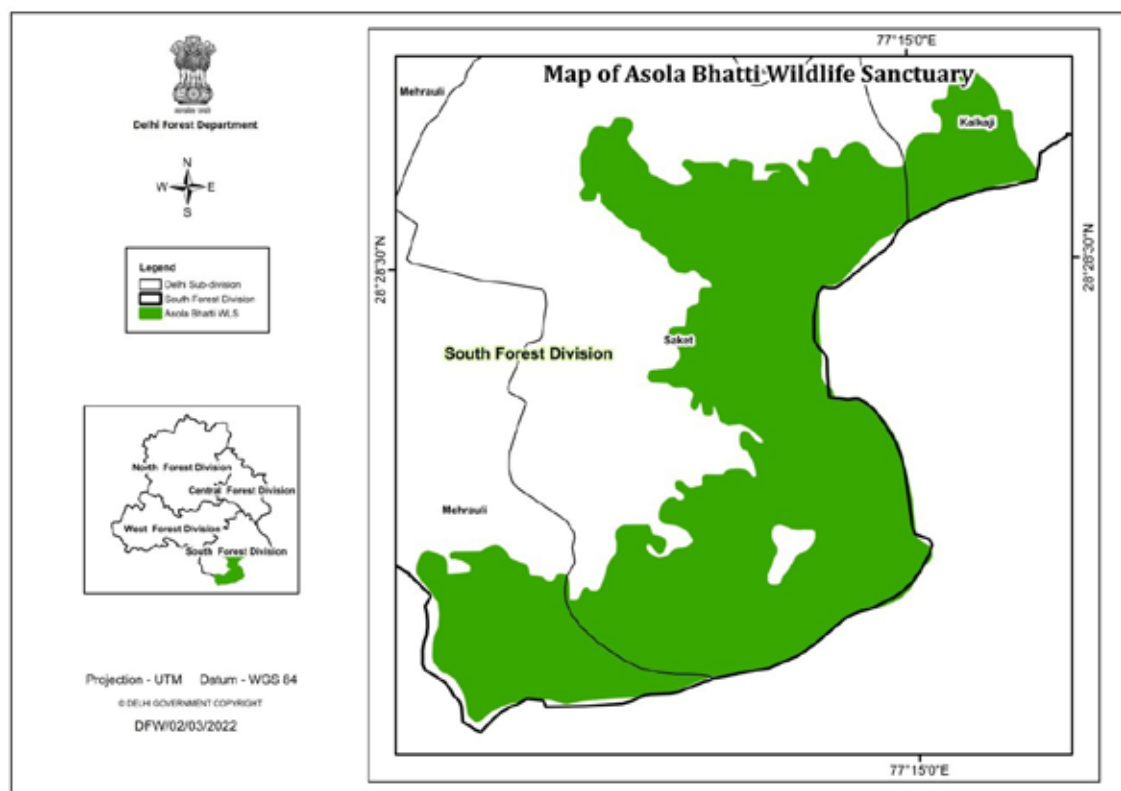
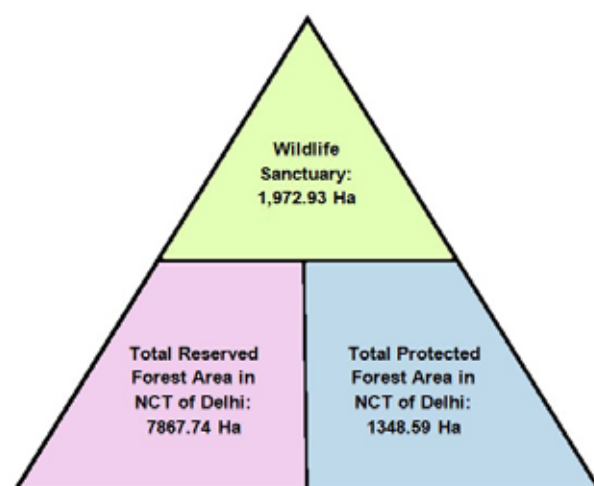


Figure 3.4: Map of Asola Bhatti Wildlife Sanctuary



Recorded Forest Area of Delhi

3.3 Non-Recorded Forest Areas in NCT of Delhi

3.3.1. Morphological Ridge

The Geological Survey of India (GSI) documents the geology and geological processes of the surface and subsurface of India and its offshore areas using the latest and most cost-effective techniques and methodologies, including geophysical and geochemical and geological surveys. The GSI had carried out geological and geomorphological mapping of about 1482 km² on a 1:10,000 scale in Delhi area, to provide a base map for the seismic micro zonation of Delhi.

Morphological Ridge may be defined as that part of Ridge area which is not falling under any notifications, but have similar features as the Ridge, and form part of the extension of the Aravallis. The morphological Ridge is described on the basis of seismic zonation map of Delhi 2006 provided by Geological Survey of India. Though falling outside the notified Ridge forest land, it has Ridge like features in respect of Aravalli outcrop and vegetative cover. Morphological Ridge, having similar features to the notified Ridge, is of immense ecological importance, and should also be conserved and kept free from unrestricted and unplanned development. It should work as a buffer zone to protect the core forest area of the Ridge. Also, morphological Ridge area comes under high risk zone; so, construction of high-rise buildings in the morphological Ridge area may be dangerous. The State Government identified morphological characteristics, land recorded as 'Gair Mumkin Pahar' in Revenue records and area notified as Ridge forests as part of the Delhi Ridge. The map was procured by Department of Forests & Wildlife and the boundaries of Morphological Ridge were digitized by GSDL. This digitized boundary is being used for ascertaining the location of areas falling in the Morphological Ridge.

The Morphological Ridge was granted protection in the case of WP(C) 3339/2011 titled Ashok Kumar Tanwar Vs. Union of India & Ors. Vide orders dated 30.11.2011, relevant extract of the order is reproduced below:

"It is clear from the aforesaid that the area in question is given the character of a 'Geological Ridge' though falling outside the Notified Forest Ridge Land. Even in respect of such a land, clearance from the Ridge Management Board or the Hon'ble Supreme Court through the Central Empowered Committee is to be obtained before carrying out any construction. Such permission is a pre-requisite in view of the directions of the Supreme Court."

In view of the above directions, any upcoming project proposed in the Morphological Ridge needs prior approval from the Ridge Management Board. If recommended by the RMB, the proposal is

forwarded to the Central Empowered Committee (constituted by the Hon'ble Supreme Court). The Committee then submits its report to the Hon'ble Supreme Court which grants the final approval.

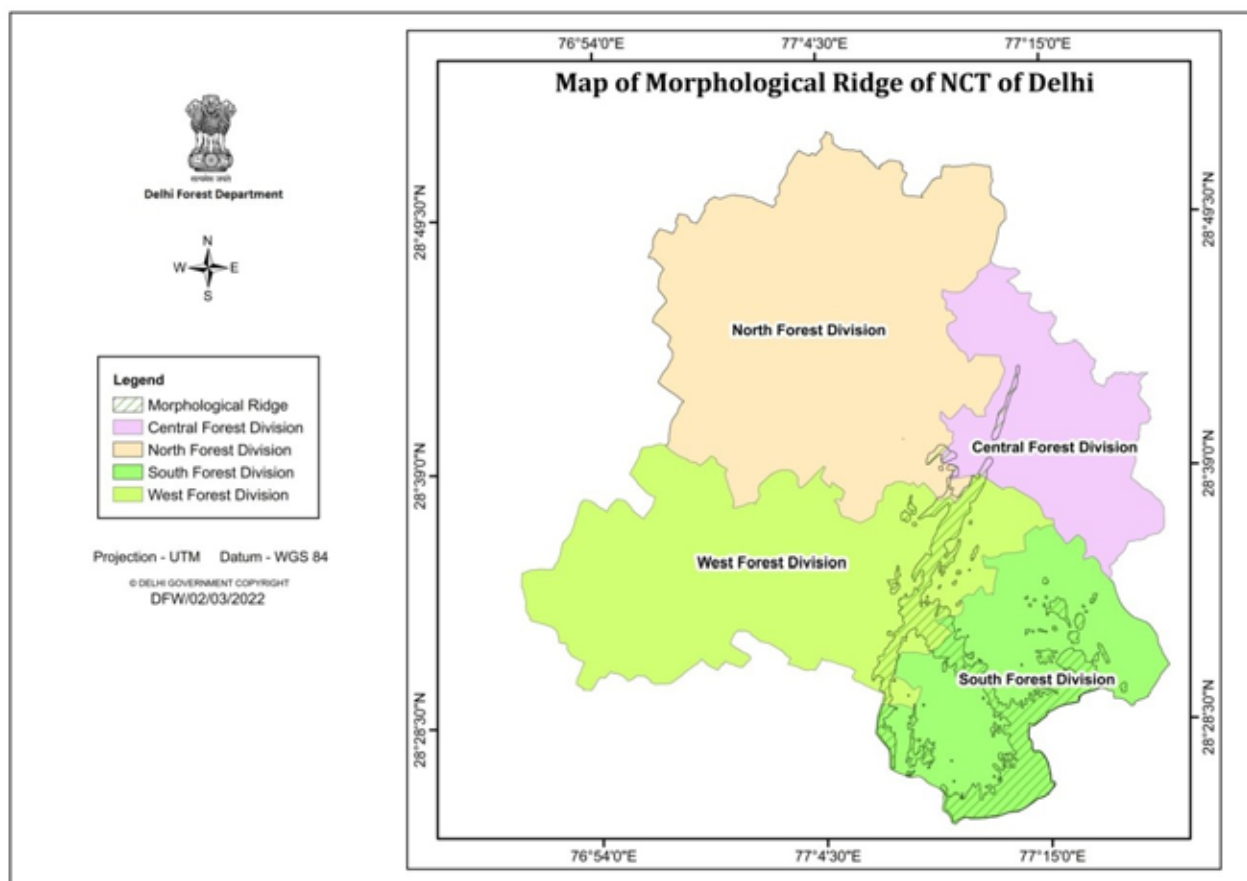


Figure 3.4: Map of Morphological Ridge of NCT of Delhi

3.3.2. Deemed Forest

In 1995, T.N. Godavarman Thirumulpad filed a writ petition with the Supreme Court of India to protect the Nilgiris forest land from deforestation by illegal timber operations. The main highlight of this case was that to conserve the forest. In view of the great significance of the points involved in these matters, relating to the protection and conservation of the forests throughout the country, the Court formed the opinion that the matters required a further indepth hearing to examine all the aspects relating to the National Forest Policy. However, it considered that certain interim directions were necessary in respect of some aspects, to oversee the enforcement of forest laws across the nation. This was to check the enforcement and implementation of forest laws and regulation within the subcontinent of India. The major issues raised in this matter are as follows:

- Areas that fall under the category of 'Forest' should be identified, any law that should classify such forest irrespective of the ownership of the land.
- Those areas should also be classified or identified which were earlier forests but at recent they were stood out to be degraded, denuded or cleared.
- Areas covered with plantation trees should also segregated between government and private belongings.

The Court examined in detail all the aspect of the National Forest Policy, the Forest Conservation Act, 1980, which was enacted with a view to check further deforestation. It emphasized that the word 'forest' must be understood according to its dictionary meaning of the term irrespective of the

nature of ownership and classification thereof. According to this new broader definition, any forest thus defined, regardless of ownership, would be subject to Section 2 of the Forest Conservation Act, 1980. Section 2 of the Act specifies that no state government or other authority may allow the use of any forest land for any non-forestry purpose without prior approval from the central government, and if so, the central government has the authority to cease the premises.

An affidavit was filed by the Department of Forest and Wildlife, Govt. of NCT of Delhi in the above matter, wherein it was declared that a Committee in terms of the court's judgment dated 12.12.1996 had been constituted to identify forest areas in the State.

Deemed Forest: *As per the decision of the Committee, formed as per the Hon'ble Supreme Court's orders (i) areas above 2.5 acres having density of 100 trees per acre and (ii) stretches of land along roads, drains etc. having length of 1 km besides areas already shown as forests etc. in Revenue Land Records shall be considered as deemed forest.*

In view of the above, any development work in the Forest land, besides protected forest, reserved forest and wildlife sanctuary/ protected areas attracts the provisions of Forest (Conservation) Act, 1980. The areas specified as Protected Forest in the affidavit of Delhi Forest Department is annexed as Annexure 3.1.

3.3.3. City Forests

An important function of a forest department, functioning primarily in an urban environment would be to increase and improve green spaces available to communities. Likewise the Department of Forest and Wildlife, Govt. of NCT of Delhi has developed 17 City Forests which perform an important function as urban green spaces in a rapidly urbanizing concrete environment like Delhi. These spaces not only provide physical health benefits but also perform a great role in the mental and psychological wellbeing of the citizens. The city forests under Delhi Forest Department includes Mitraon City Forest-Pkt A, Nasirpur City Forest, Alipur City Forest, Mitraon City Forest-Pkt B, Butterfly Park, Tughlaqabad, Aravali Arenya Kendra, Tughlaqabad, Taj Enclave City Forest, Shastri Park near colony City Forest, Garhi Mandu Pkt A2 City Forest, City Forest at ITO chungli Loop No. 4, City Forest Hauz Rani, City Forest at Shastri Park Metro Station, Mamoorpur City Forest, City Forest Aya Nagar, City Forest Jaunapur, City Forest Dera Mandi and City Forest at Chhattarpur. The Department aims to provide facilities like potable water facilities, public conveniences, meditation huts/eco-vision points, amphitheatre, bio-remediation, water body rejuvenation, open interpretation structures following all directions under DPTA, 1994 and of orders of Hon'ble Courts, appropriate fencing with aesthetic entry gates, signages for visitors, portable cabins for staff deployed for safety of visitors, solar power for all electricity requirements of the city forest with minimum lighting required for protection purposes, seating facility with cement or wrought iron benches, check dams for water and soil conservations, signages about DPTA, 1994, security guards for protection, watch tower etc. Online mode for booking permission is also proposed to be developed for regulating the entry as per Indian Forest Act, 1927 and carrying capacity assessed for the area. Apart from providing green oases for citizens in the city, these city forests would also be acting as an important interface for the Forest Department with citizens. The Department will be moving towards mobilizing citizen centric awareness, citizen participation in forest conservation, fostering scientific temper through citizen science and crowd sourcing of data etc. by evolving the city forests into living labs and open museums of urban forestry. While Delhi boasts of the largest per capita forest area in urban areas of India, the distribution of city forests is not equitable (Figure 3.5). The Department would be working in future towards securing ecological equity by exploring possibilities to create city forests in North and West Divisions of the Department.



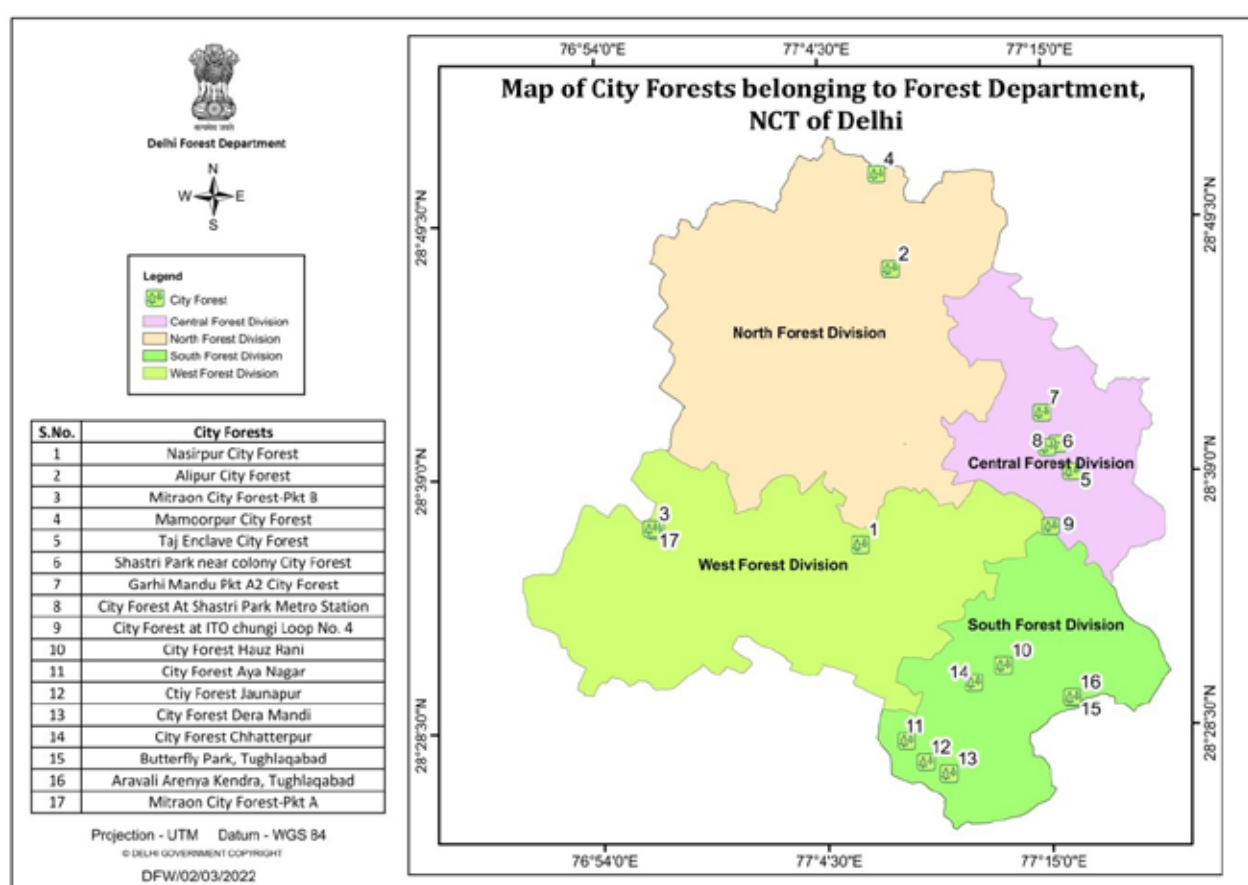
Hauzrani City Forest



Mitraon City Forest



Garhi Mandu City Forests



3.5: Map of City Forests under Department of Forest and Wildlife, GNCTD

3.4 Plantation Sites under Department of Forest and Wildlife, Govt. of NCT of Delhi

The Department of Forest and Wildlife, Govt. of NCT of Delhi each year carries out plantation activities under Compensatory Afforestation Fund Management and Planning Authority (CAMPA) plantation scheme, the Green Action Plan of Delhi and compensatory plantation under Delhi Preservation of Trees Act, 1994.

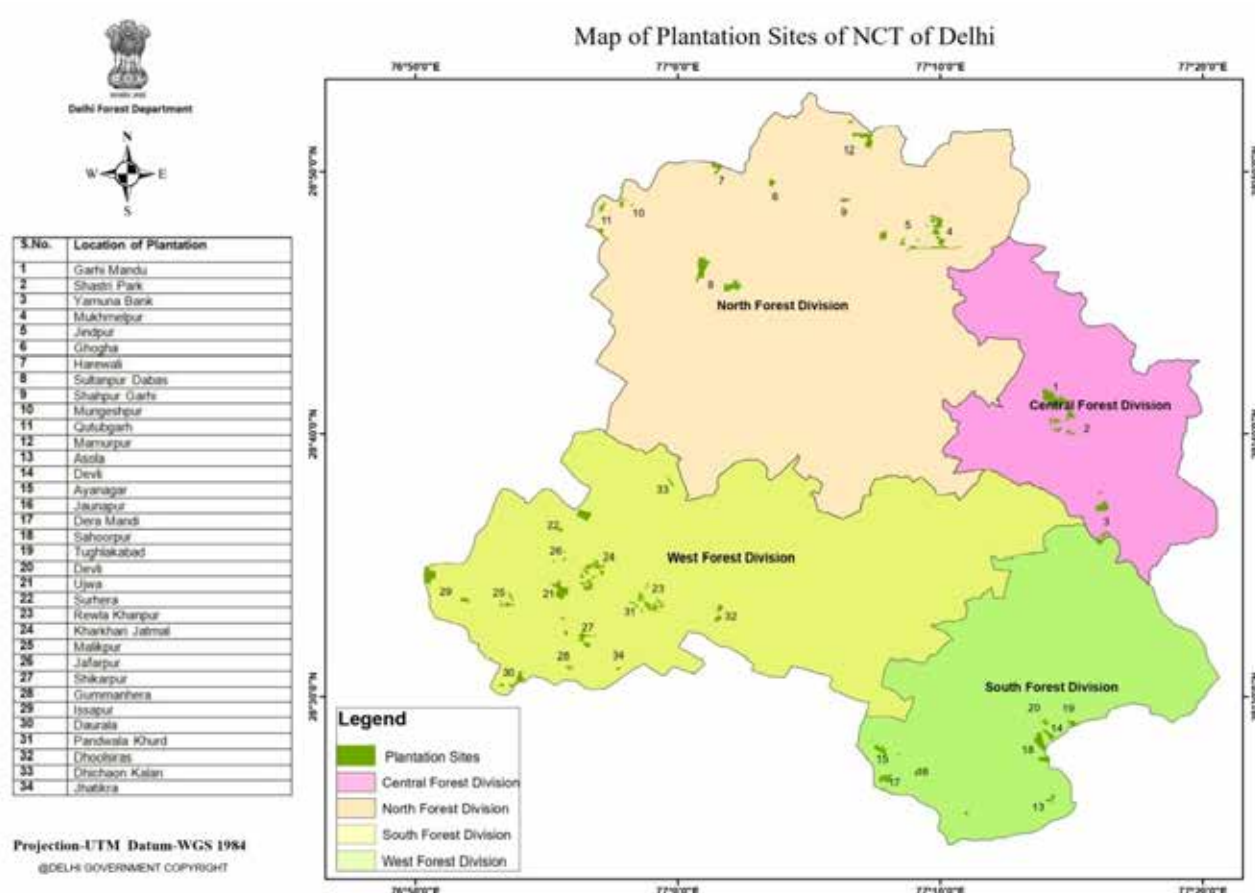
Annual plantations are undertaken by the Delhi Forest Department under various budgetary provisions as described above. These plantations are undertaken on degraded forest land, compensatory afforestation sites, compensatory plantation sites, gram sabha lands etc. Figure 3.6 presents a brief description of plantation sites of the Department and a comprehensive list of departmental plantation

is given at Annexure 3.2. A list of suitable species for plantation according to the physiographic profile of the State is given at Annexure 3.3.





Photographs of Some Plantation Sites under Delhi Forest Department



3.6: Map of Plantation Sites Forests under Department of Forest and Wildlife, GNCTD

3.5 Nurseries under Department of Forest and Wildlife, Govt. of NCT of Delhi

The Department of Forest and Wildlife, Government of National Capital Territory of Delhi has 14 nurseries across the State which cater both to Departmental needs and for distribution to the public. The list of Departmental nurseries along with the contact details is given at Table 3.6.

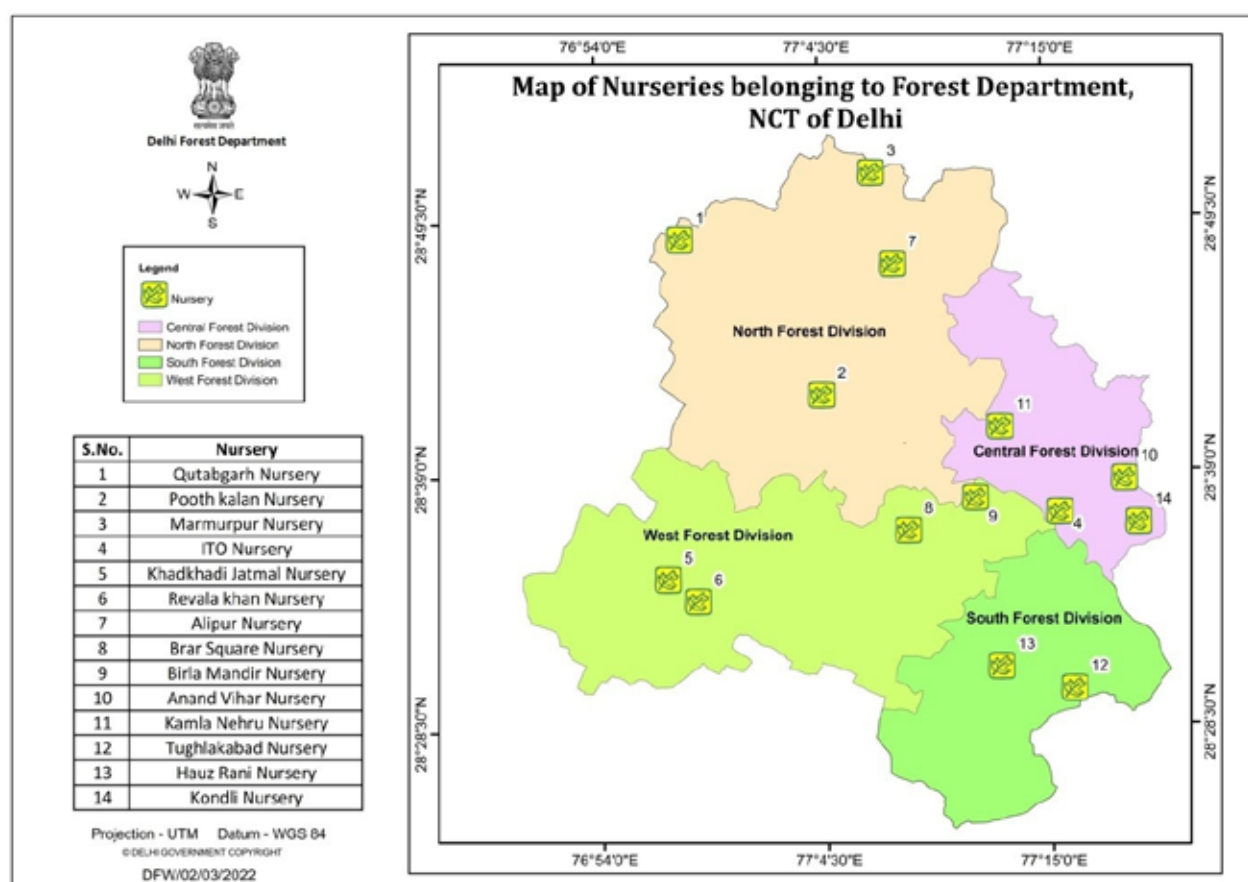
On the occasion of World Forestry Day, 21st, March 2021, the Aravalli Nursery was inaugurated at Asola Bhatti Wildlife Sanctuary, with an aim to promote the revival of indigenous plant species across the State. This nursery which consists exclusively of the indigenous plant species of the Aravallis is the first of its type in the State. About 60 plant species of trees, shrubs, herbs (the detailed list of

species is given at Annexure 3.4) which are native to Aravallis have been selected to be raised in this nursery. Nursery has a capacity of 150 beds which includes mother bed and seedling raising beds. It also has a nature interpretation centre dedicated to the native Aravalli species. A list of nurseries along with the map is given at Table No. 3.4 and Map 3.7.

Table 3.4: Nurseries under Department of Forests and Wildlife, GNCTD

S. No.	Division	Name of Nursery	Location		Address	Contact Details
			Latitude	Longitude		
1.	Central	Anand Vihar	28.6441	77.3102	Behind ISBT, Anand Vihar	Sh. Jaswant Singh, Forest Guard (9871283412)
2.		ITO	28.6121	77.2519	Bhairon Marg, Near Pragati Maidan Ring Road	Sh. Sunny, Forest Guard (9211232000)
3.		Kamala Nehru	28.6809	77.2137	Near Delhi University North Campus	Sh. Brijanand, Forest Guard (8285476583)
4.		Kondli			Kondli Near Hindon Cut	Sh. Kundan (9310280814)
5.	West	Rewla Khanpur	28.5633	76.9756	Pandwala Village Road, Relwa Khanpur	Shree Devender (8920970379)
6.		Khadkhadi Jatmal	28.5786	76.9524	Main Road Khadkhadi Jatmal, Near Govt Seed Farm Kharkhari Village	Shivji Manjhi (9971735704)
7.		Brar Square	77.14082	28.61075	Near War Cemetery, Opposite Delhi Cantt. Ring Road Near Railway Crossing	Sh. Shree Shishpal (9013292843)
8.		Birla Mandir	28.63285	77.1938	Office of DCF (W), Birla Mandir Lane	Shree Gitanand (9899609461)
9	North	Pooth kalan	77.0746	28.7044	Near Sultanpur Bus Terminal	Sh. Dharamvir, DRO (9868726875)
10		Qutabgarh	28.8126	76.9654	Qutubgarh	
11		Mamurpur	28.8570	77.1159	Near Sindhu Border	
12		Alipur	28.7940	77.1316	Old Govt. Seed Farm Alipur, Delhi	

13.	South	Tughlakabad	28.50071	77.26892	O/ o the DCF South, Tughlakabad- 44	Sh. Tajuddin, DRO (9718155798) Sh. Sewa Ram, Forest Guard (9810858438)
14.		Hauz Rani	28.51673	77.21202	M.B.Road, Saket, Near DC's Office	Sh. R. P. Mishra, DRO (92138 29275) Sh. Sudhir, Forest Guard (84779 09899)



3.7: Map of Nurseries of Forests under Department of Forest and Wildlife, GNCTD

3.6 Water bodies and Wetlands under Department of Forest and Wildlife, Govt. of NCT of Delhi

The entire geographical area of NCT Delhi is broadly divided into seven drainage basins, finally flowing into the river Yamuna. Along the floodplains of Yamuna, swampy regions are quite common. In Yamuna basin, the rechargeable areas for aquifers fall in the districts of North-East Delhi, Shahadra, East Delhi, South East Delhi and Central Delhi. Delhi Ridge acts as a water nursery for all the natural streams and nurseries which feed the drainage basins of the Yamuna.

Ground water is the water that seeps through soil and rocks and is stored below the ground. The rocks

in which ground water is stored are called aquifers. Aquifer constitutes of gravel, sand, sandstone or limestone and water moves through these rocks as these are permeable. These are great source of fresh water supply. However, due to excessive extraction of ground water and low recharge rate, these aquifers are at the greater risk of overexploitation. In today's scenario, with increasing population and rapid urbanisation and industrial development, human interference in the ecosystem is ever growing. It poses a great challenge for ground water management. Recharge of aquifers require permeable ground as a pre-requisite. This is completely fulfilled by forest areas where natural permeable ground with vegetation ensure slower movement and greater permeation of water into the ground. Hence, forests act as overground sponges that absorb rainwater and feed aquifers.

Wetlands: As per the broad definition of Ramsar Convention, Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

In Delhi, inland natural and man-made water bodies are not much in numbers as well as in area (FSI, 2019). There are a total of 17 small wetlands and only one lake/pond recorded in NCT of Delhi. The State covers an area of 1483 sq km, where quartzite ridge area occupies around 145 sq km. The availability and quality of water in different regions is threatened by overuse, misuse and pollution due to increasing population and water demand. The declining ground water levels especially noted in southern and south western parts of the state is the result of over-exploitation of ground water resources. Potential areas for artificial recharge to ground water have been identified which is 699.86 sq km in area. A number of micro watersheds originate from the quartzite ridge. Forest Department undertakes plantation around such water bodies to create regional sinks in the villages to counter various sources of pollution, add the aesthetic value to these water bodies and enhance soil and moisture conservation in periphery of these water bodies.

A list of water bodies along with an indicative map is presented below at Table 3.5 and Figure 3.8.

Table 3.5: List of Water Bodies under Department of Forests and Wildlife, GNCTD

S. No.	Division	Name of Area	District	Khasra No.	Location	
					Latitude	Longitude
1.	South	Asola	South	1521 (14-9)	28.44141028	77.20904889
2.		Asola	South	1759 (4-3)	28.43829417	77.22849278
3.		Bhatti	South	1865(102-9)1873 (15-7) total=117-16	28.42559028	77.18995722
4.		Devli	South	71/26(5-16)	28.48969	77.22108528
5.		Maidan Garhi	South	3(10-6)	28.50344194	77.19273278
6.		Maidan Garhi	South	527(12-2)	28.48179167	77.20944028
7.		Maidan Garhi	South	1004/598(1-14)	28.4631	77.23024722
8.		Maidan Garhi	South	1006/667 (34-13)	28.47092333	77.22296944
9.		Neb Sarai	South	516 (12-09)	28.49969778	77.20582306
10.		Neb Sarai	South	435 (15-5)	28.50368722	77.20167361
11.		Sahoorpur	South	92(9-1)	28.47205	77.1920833
12.		Sahoorpur	South	371 (18-11)	28.46664722	77.19463611

13.	North	Mukhmel pur	North West	299/1 (1-0) Forest	28.79038833	77.16253722
14		Mukhmel pur	North West	312 min (2-0) forest	28.7947875	77.16421833
15.	West	Rajokri	New Delhi	1689 (32- 16)	28.51042722	77.11402222
16.		Rajokri	New Delhi	1698-(4-7)	28.50861528	77.11327611
17.		Rajokri	New Delhi	1817 (1-18)	28.50725333	77.12808167

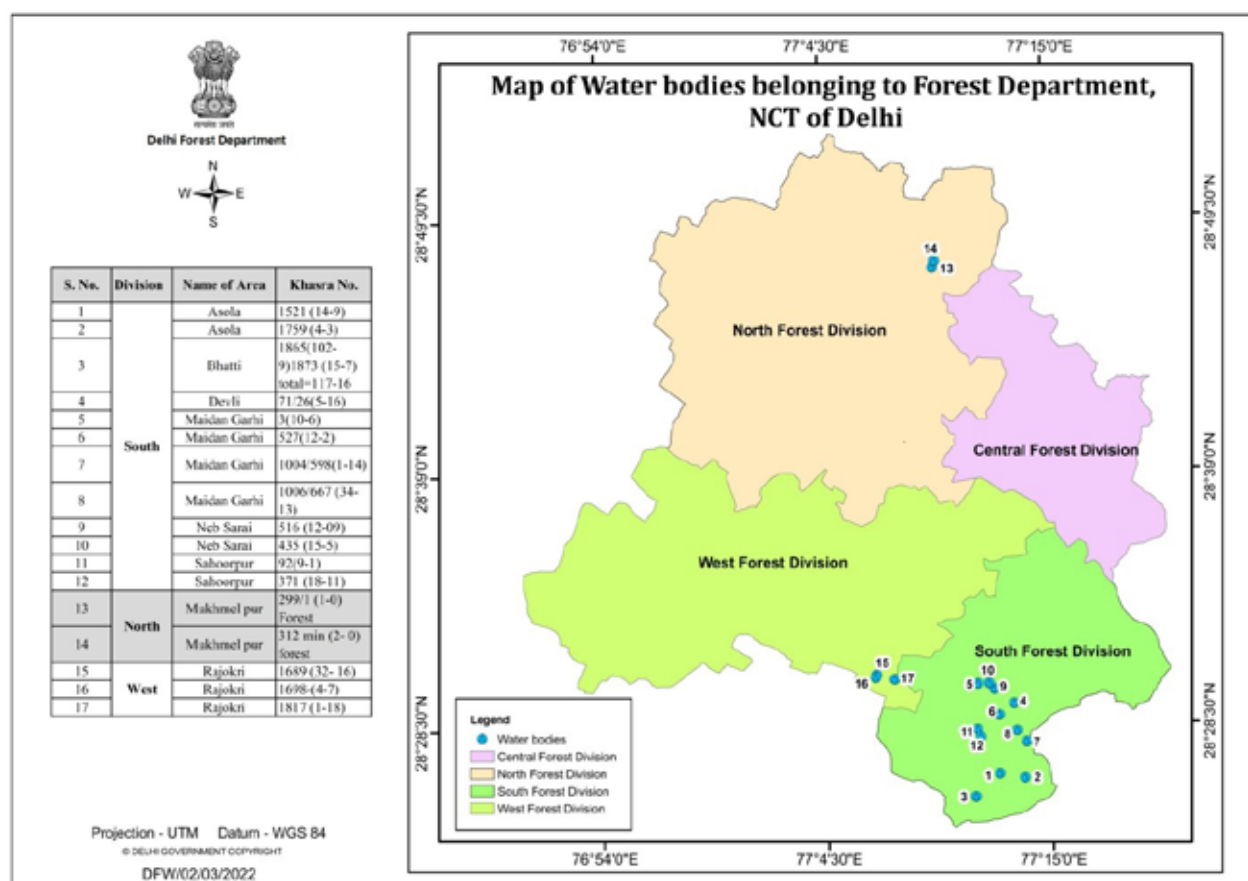


Figure 3.8: Map of Water Bodies of Forests under Department of Forest and Wildlife, GNCTD

1 lake and 17 wetlands comprising approximately 18 ha full with the total recorded forest area in Delhi as per the ISFR, 2019 based on the National Wetland Atlas, 2011.

CHAPTER 4



CHAPTER 4

4. ECOLOGICAL RESTORATION OF RIDGE FORESTS

The Ridge is one of the two life supporting systems of Delhi, the other being the River Yamuna. Geologically it represents the last spur of Aravalli mountain ranges. It spreads over 35 km stretch from Bhatti Mines to southeast of the 700 year old Tughlaqabad, branching in different directions, and finally tapering towards the northern end near Wazirabad on the western banks of Yamuna river. It encompasses undulating terrain having plateaus, gentle slopes, shallow valleys, deep ravines, natural drainage channels, ridges, rocky outcrops and loose weathered boulders. The Ridge used to harbour pristine dry deciduous forests represented by *Adina*, *Mitragyna*, *Terminalia*, *Butea holoptelea*, *Prosopis cineraria*, *Tecomella undulata*, *Albizia-Acacia* etc. besides a wide range of tropical thorn forest communities such as *Balanites aegyptiaca* *Dichrostachys cinerea*. This mosaic of forest communities used to support rich avifauna and wildlife in the past. Because of degradation due to urbanization, other human induced factors and biological invasion by alien species like *Prosopis juliflora* and *Lantana* the Ridge lost its pristine nature as well as the ecological services and goods (such as, combating desertification, recharging the groundwater, buffering local weather) rendered by Ridge ecosystem to the city, which resulted in deterioration of environmental quality over a period of time. The present status of major invasive species in forest areas of Delhi as recorded in ISFR 2021 is given in Table 4.1.

Table 4.1: Dominancy Status of *Prosopis juliflora*, *Leucaena leucocephala*, *Eucalyptus* spp in NCT of Delhi

Assessment Category	Unit	Species recorded
<i>Prosopis juliflora</i>		
Diameter class (in cm) distribution inside RFA in Delhi	10-30 cm range	475 sq km area
	30-60 cm range	25 sq km area
	>60 cm range	6 sq km area
Status w.r.t Tree Outside Forest (Rural Delhi)	Relative Abundance (%)	29.52 (%)
Status w.r.t Tree Outside Forest (Urban Delhi)	Relative Abundance (%)	8.11 (%)
<i>Eucalyptus</i> spp		
Status w.r.t Tree Outside Forest (Rural Delhi)	Relative Abundance (%)	8.07 (%)
<i>Leucaena leucocephala</i>		
Status w.r.t Tree Outside Forest (Rural Delhi)	Relative Abundance (%)	7.72 (%)

Data clearly states that invasive species like *Prosopis* have a free run as a result of which even though the tree cover indicates a healthy environment, the preponderance of *Prosopis* translates to a forest that is not very beneficial in terms of water conservation, support to the avian and mammalian fauna, pollution mitigation etc. Hence to restore the native ecology of the Ridge the Govt. of NCT of Delhi has embarked on various ecological restoration projects.

Prosopis juliflora (vilayati or kabulikeekar)

- *It is a medium-sized thorny tree with crooked branches and a spreading feathery canopy.*
- *It is native to the dry coastal regions of Mexico, Columbia, Venezuela and the Caribbean, and was first introduced in India from England in 1877. During the construction of New Delhi (1911-1931), this tree was planted in the barren sections of the Delhi Ridge by the British imperial government.*
- *It flourished due to its suitability for the arid habitat available, absence of natural pests and herbivores, and its ability to release bio-chemicals in the soil eliminating native flora.*
- *Prosopis juliflora has damaged Delhi's ecosystem by eliminating native tree species from various parts of the Ridge, it also reduces sub-canopy diversity. Ultimately its presence has had a detrimental impact on the city's biodiversity*
- *Today, Prosopis juliflora dominates large sections of the Ridge, from where it has ousted species native to the rocky micro-habitat. There have been attempts to replace this invasive species, many of which have been successful.*

4.1 Project on Ecological Restoration of the Ridge

The Department of Forest and Wildlife, Govt. of NCT of Delhi has approved a project on ecological restoration of Central and Southern Ridge with the main objective to develop native Aravalli forest communities using ecological restoration methods and eradicating/ managing invasive alien species of *Prosopis juliflora* and *Lantana*. This project aims to develop facilities for promoting conservation, education and cultural activities including ecotourism and towards qualitative improvement of the Ridge forest.

The proposed plan for eradication of *Prosopis juliflora* and *Lantana* and restoration of Ridge area is as below:

Based on the available high resolution maps of land use and land cover of Delhi, Forest area dominated by invasive species (*Prosopis juliflora* and *Lantana*) will be demarcated in the Central and Southern Ridge for biodiversity enrichment. In the first instance the area in Central Ridge will be taken up for ecological restoration.

Lantana will be removed by the cut rootstock method developed by Centre for Environmental Management of Degraded Ecosystems (CEMDE), Department of Environmental Studies, University of Delhi. As the Ridge has fully grown species of *Prosopis juliflora* the process of eradication of this invasive species will be initiated by opening canopy of *Prosopis juliflora* by pruning the dead and live branches of the canopy zone so that light can penetrate to the ground. The other weedy bushes will be removed by the cut rootstock method.

Three-storeyed vegetation of 70-100 m wide will be developed all along the periphery of each block to form greenways. Native trees, shrubs and herbs of dry deciduous forest communities will be used for the development of greenways. In areas close to Hotel Complexes/institutional Areas/ Residential Areas, Recreational zones will be developed.

Some deep -depressions, which receive rainwater, will be developed into water bodies by erecting small earthen bunds that will be grassed. Water harvesting will be done by channelizing the excess monsoon flow on the roads into deep depressions after passing through settling pits.

The following dry deciduous forest communities will be developed in shallow valleys where the

soil layer is thick: (i) Adina-Mytragyna community, (ii) Mytragyna-Terminalia community, (iii) Butea-Holoptelea community, (iv) Albizia amara-Cassia fistula community, (v) Madhuca-Kusum community, (vi) Anogeissus serecea-Terminalia chebula community (vii) Albizia procera-Dalbergia latifolia community, (viii) Dalbergia sissoo -Emblica community (x) Holoptelea-Acacia catechu community.

On rocky terrain slopes and some plateaus, the following tropical thorn and scrub forest communities will be developed: (i) *Acacia leucophoea*, (ii) *Balanites-A. Senegal*, (iii) *Prosopis cineraria-Capparis aphylla*, (iv) *Dichrostachys-Anogeissus*, (v) *Dichrostachys-Maytenus*, (vi) *Sterculia-Boswellia*, (vii) *Clerodendrum-Grewia*, (viii) *Helictis-Oroxylum*, (ix) *Carissa spinarum-Ziziphus*, (x) *Lycium-Flacourtia* (xi) *Adhatoda-Capparis*. The rocky outcrops will be used for the development of bio-edaphic communities represented by Euphorbia scrub and other native succulents which are almost on the verge of extinction.

The plateaus and hill tops will be restored to grasslands that will have bulbous/ tuberous herbs. A medicinal plant groove will be developed along the meadows. Scattered bamboo thickets will be developed. Nursery is being modernized for raising saplings of native plant species.

4.2 Reclamation of Bhatti Area of Asola Bhatti Wild Life Sanctuary through Eco Task Force (ETF)

The Delhi Forest Department has undertaken a project for eco- rehabilitation of 2100 acres of degraded and abandoned Bhatti Mines in the Southern Ridge (which is a part of Asola-Bhatti Wild Life Sanctuary) w.e.f. October 2000 through 132 Infantry Battalion (TA) ECO Rajput (Eco-Task Force).

Eco Task Force (ETF)

Background: The Govt. of NCT of Delhi in order to arrest the sharp decline of the green cover in the State and with an aim to rehabilitate the ex-servicemen paying homage and tribute to the gallant martyrs of OP Vijay facilitated the Commissioning of 132 Inf Bn (TA) Eco RAJPUT in coordination with Ministry of Defence on 9th October 2000. The Unit was later shifted to Bhatti Mines Area in the year 2001.

The unit is based on 02 Eco Coy (TA) and a Bn HQ with an authorized strength of 04 Officers, 09 Junior Commissioned Officers (JCOs) and 261 Other Ranks (OR).

Role: The major task of this force is to reclamation of degraded Asola Bhatti Wildlife Sanctuary areas through-

- *Afforestation,*
- *Low cost soil moisture conservation,*
- *Grassland development, pasture development and waste land development,*
- *Improving ground water regime of the area (water harvesting),*
- *Protection and conservation of wildlife indigenous to Delhi,*
- *Ensure protection and development of biodiversity of Aravalli ecosystems,*
- *To enhance bio aesthetic and ecotourism in the Sanctuary.*
- *To provide disciplined force to contain expansion of encroachment and reclaim the quality forest of indigenous species in Southern Ridge area.*

4.2.1 Objective

- (i) Rehabilitation of degraded forest land in the Southern Ridge area of Asola Bhatti, Dera Mandi, Maidangarhi, Ghittorni and Rajokri through afforestation and grassland development;
- (ii) Restoration of habitat for wildlife indigenous to Delhi;
- (iii) Improving the soil quality and fertility of soil in the area and adjoining areas as well.

The Task Force had successfully protected the forest land from encroachment and illegal mining in the area under their control. Over the passage of time the Gaon Sabha lands of Dera Mandi were also handed over by the Government of NCT of Delhi to ETF for raising plantations. ETF has successfully carried out plantation activities and taken measures to improve the soil quality and fertility of soil in the area and adjoining areas as well.

4.2.2 Plantation Status

Till date ETF has carried out afforestation activities by planting around 37,62,521 saplings (Figure 4.1) in 3,861.11 Ha forest area consisting of project area Asola, Bhatti, Dera Mandi, Ghitorni, Jaunapur, Devli, Tughlaquabad, Rajokari and Rangpuri.

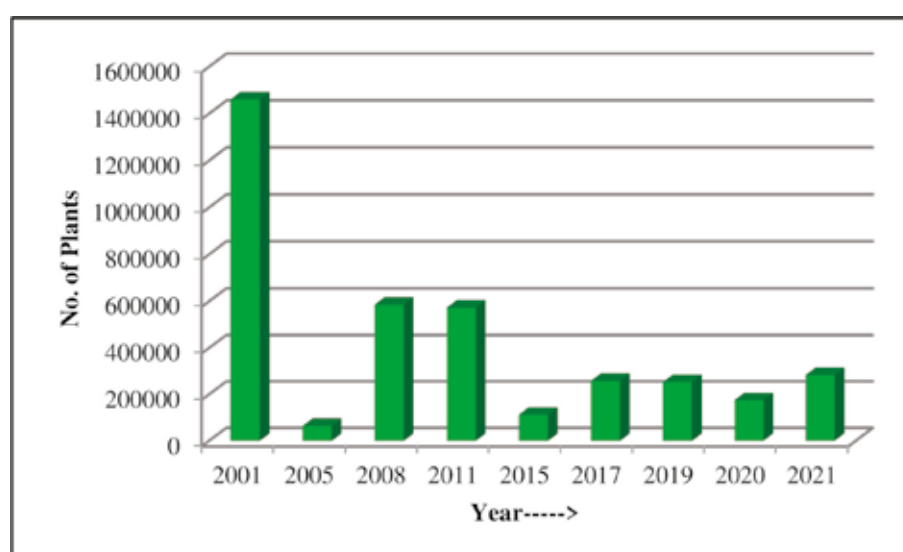


Figure 4.1: Plantation done by Eco Task Force

(Source: Commanding Officer – 132 Inf. Bn. (TA), ECO Rajput (ETF))

4.2.3 Soil Moisture Conservation Status

During the year 2021-22 ETF has created around 40 check dams at Dera Mandi and Jaunapur and 3 constructed water bodies at Tughlakabad .

4.3 Management Plan of Asola Bhatti Wildlife Sanctuary

The first Management Plan of Asola-Bhatti Wildlife Sanctuary of NCT of Delhi was prepared by Wildlife Institute of India (WII), Dehradun in 1995. This was the first Management Plan after creation of the sanctuary in 1986 (Asola Wildlife Sanctuary – 4707 acres) and 1991 (Bhatti Wildlife Sanctuary

¹ECO Rajput (ETF)

²ECO Rajput (ETF)

– 2107 acres). Both Asola and Bhatti Wildlife Sanctuaries fall within the Southern Ridge and are continuous to each other.

The Management Plan activities oriented towards restoration of these degraded lands using nature's own processes and supplemented by human efforts and preservation of its ecological values by seeding, planting and restricting human presence began fast and by the time the last Management Plan was prepared it had begun and now after 15 years the entire area is green with lush growth of trees & shrubs harbouring good population of Nilgai & Peafowls along with many other faunal species including birds and butterflies. The striking canyon like features created by deep mining now present aesthetic landscape including creation of a large perennial lake which attracts large number of migrating birds. There is a cursory mention of this lake in the last Management Plan as an aquifer in the mined pit and unavailable to ungulates but this is now a huge lake of depth at centre exceeding 100 ft or more. The restoration process that has taken place so remarkably is of significant educational value. These efforts have brought back the floral & faunal communities to a great extent in this ancient landform of Aravali hills which is of unique bio biogeographical importance. The citizens of Delhi whose quality of life was severely affected by high level of pollution, must now recognize and appreciate the value of this green patch of forest which is an oasis in the vast expanse of concrete jungle all around, as the "green lungs" of our capital city. This small fully green patch of forested lands along the Aravali Ridge remains the only green area in the vicinity which for over 12 million people of Delhi has a crucial role in pollution absorption and environmental amelioration and also as barrier against the sand storms from west. It is the seat of conservation for various indigenous flora and fauna. Asola Bhatti Wildlife Sanctuary is located in the south eastern part of the southern ridge. This incidentally falls amidst urban conglomeration of Delhi, Gurgaon and Faridabad and potentially is very good platform for conservation education plan for students as well as scholars and ultimate beneficial aspect is that it is a natural line of defence against soaring mercury for denizens of NCR.

Presently the Department of Forest and Wildlife Govt. of NCT of Delhi is preparing another management plan in respect to the present perspective of the area by Forest Research Institute of Delhi with the following objectives:

1. To restore and conserve the characteristics biological, abiotic and other categories of associated attributes represented in Aravali mountain range.
2. Rejuvenation and enrichment of vegetation conforming to Aravali ranges in the highly impacted habitats to improve natural food base for fauna.
3. To establish a dynamic system of nature interpretation and conservation education in providing meaningful wilderness experience.
4. Enhancing the management capability.

4.4 Forest Restoration and Reforestation

Forest Restoration is the process of improving the health, productivity, and array of life of a forest and reforestation refers to replanting of trees on recently deforested land. A comparative account on Forest Restoration and Reforestation is given at Table 4.2.

Table 4.2: Comparative Account on Restoration of Forests and Reforestation

Restoration of Forests	Reforestation
1. Forest Restoration is the process of improving the health, productivity, and array of life of a forest. 2. It involves Planting of new trees, improvement of soil, protection of wildlife corridors, sustainable management of land etc. 3. Forest restoration is the ongoing process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes. 4. It is more than just planting trees – it is restoring a whole landscape to meet present and future needs and to offer multiple benefits and land uses over time. 5. It is not site based, but applied to larger landscapes areas 6. IUCN states 7 guiding principles of Forest Restoration: ● Focus on landscapes. ● Maintain and enhance natural ecosystems within landscapes. ● Restoration of functionality. ● Engage stakeholders and support participatory governance. ● Tailor to the local context using a variety of approaches. ● Restore multiple functions for multiple benefits. ● Manage adaptively for long-term resilience.	1. Reforestation refers to replanting of trees on recently deforested land. 2. It helps forests to adapt to climate change by decreasing human pressures and enhancing landscape connectivity and reducing fragmentation (thus facilitating species migration under climate change conditions). 3. Reforestation may also contribute to preserving biodiversity hotspots, avoiding soil degradation and protecting other natural resources of a deforested area. 4. It involves planting trees for economical as well as ecological reasons. 5. Reforestation is a site specific activity for a particular parcel of land.

CHAPTER 5



CHAPTER 5

5. STRATEGIES AND INITIATIVES TO INCREASE GREEN COVER OF NATIONAL CAPITAL TERRITORY OF DELHI

In the post-independence period, with the enunciation of the National Forest Policy, 1988, there has been a paradigm shift in the objectives of management of forests laying greater emphasis on maintenance of environmental stability through preservation and where necessary, restoration of ecological balance that has been adversely disturbed by serious depletion of forests as also increasing substantially the forest/ tree cover in the country through massive afforestation to bring one-third of the total land area of the country under forest or tree cover to prevent erosion and land degradation and to ensure the stability of the fragile ecosystem. The Department of Forest and Wildlife, Govt. of NCT of Delhi is actively engaged in implementation of various strategies and schemes for protecting and increasing the Green Cover of the State.

5.1 Green Action Plan

National Capital Territory of Delhi has 21.88% of its geographical area under green cover and is one of the Greenest Capitals in the world. Each year, the Department of Forest and Wildlife, Government of National Capital Territory of Delhi in collaboration with 19 other Greening Agencies, such as Municipal Corporations of Delhi (MCDs), Delhi Development Authorities (DDA), Public Works Department of Govt. of NCT of Delhi (PWD) and Public Works Department of Central Government (CPWD), Delhi State Industrial and Infrastructure Development Corporation Ltd. (DSIIDC), Delhi Urban Shelter Improvement Board (DUSIB), Tata Power Delhi Distribution Limited (NDPL), BSES Rajdhani, Delhi Transport Corporation (DTC), Horticulture Division of Environment Department, Delhi Parks and Garden Societies (DPGS), Delhi Metro Rail Corporation (DMRC), Delhi Cantonment Board (Delhi Cantt.), Northern Railways, Education Department and Delhi Jal Board undertakes drives for plantation throughout the State with great zeal and vigour under Delhi Green Action Plan. Additionally free distribution of seedlings is undertaken by the Department of Forest and Wildlife, Govt. of NCT of Delhi and Delhi Parks and Garden Societies for engaging citizens in planting saplings to contribute towards greening the city.

All efforts of the Greening Agencies for protection and increasing the green cover of Delhi stand validated as per latest India State of Forest Report, 2021 published by Forest Survey of India, which shows the overall Green Cover of National Capital Territory of Delhi has increased manifold from 150 sq. km in 2001 to 342 sq. km in 2021. Details of plantation and free distribution carried out by Greening Agencies over the past 9 years are consolidated in Table 5.1 below:

Table 5.1: Details of past 10 Years Plantation and Free Distribution of Saplings under Green Action Plan

Year	Plantation (No.)	Species Distribution (No.)	Total No. of Saplings
2012-13	9,15,717	8,01,901	17,17,618
2013-14	551104	459278	1010382
2014-15	9,66,032	6,46,857	16,12,889
2015-16	9,73,822	6,77,626	16,51,448
2016-17	21,04,246	3,71,419	24,75,665
2017-18	16,08,105	3,74,000	19,82,105
2018-19	24,59,730	4,36,086	28,95,816
2019-20	23,45,274	5,24,242	28,69,516
2020-21	25,80,144	6,60,678	32,40,822
2021-22 (upto February 2022)	25,75,377	6,96,315	32,71,692

(Source: Govt. of NCT of Delhi)

In next financial year (2022-23) the Department of Forest and Wildlife, Govt. of NCT of Delhi has decided to plant more shrub and bamboo species and to create about 42 ha grasslands in the State along with tree species plantation and free distribution of saplings. The tentative target for the year 2022-23 set by Govt. of NCT of Delhi for plantation and free distribution of saplings is given at Table 5.2 below:

Table 5.2: Tentative Afforestation Target of Govt. of NCT of Delhi for 2022-23

S. No.	Name of the Department/ Agency	No. of Saplings (Including trees, shrubs and bamboo species)
Plantation		
1.	Forest Department	6,34,000
2.	Delhi Development Authority	6,00,000
3.	South MCD	1,50,00
4.	North MCD	35,000
5.	East MCD	66,266
6.	Education Department	90,000
7.	DSIIDC	31,444
8.	Delhi Urban Shelter Improvement Board	18,448
9.	Delhi Metro Rail Corporation (DMRC)	2,500
10.	NDPL (TATA Power DDL)	10,000
11.	BSES	30,000
12.	PWD (NCT Delhi)	2,55,550
13.	C.P.W.D	60,000
14.	N.D.M.C.	2,74,142
15.	Delhi Jal Board	50,100

16.	Northern Railways	14,300
17.	DTC	1,292
18.	Deptt. of Env. (Horti.)	1,000
19.	Delhi Cantonment Board	13,150
Sapling Distribution		
20.	Forest Department	3,00,000
21.	Delhi Parks and Garden Societies	2,50,000
Distribution Total= 5,50,000		
Total Proposed Target under GAP 2022-23= 28,87,192		

(Source: Govt. of NCT of Delhi)

5.2 Rejuvenation of Yamuna Flood Plains

The landscape of Delhi geographically is divided into three major regions, viz., the low-lying Yamuna Flood Plains, the Aravalli Ridge and the Great Gangetic Plains that cover most part of the city. The Yamuna is a perennial source of water at the gateway to the vast Indo-Gangetic plains. The Ridge is a part of the Aravalli Range which enters Delhi from the South, forking into two and expanding into a wide tableland. One part stems from Mehrauli to the bank of the Yamuna, while the other passes by Tughlaquabad fort to culminate at South Delhi. The Ridge forms the principal watershed in the area, the eastern drainage passing into the Yamuna and western into the Najafgarh basin.

The 22 km stretch of Yamuna in Delhi contributes 80% pollution load due to various reasons. The major issues due to which the flood plains of the River Yamuna is affected are dumping of malba, habitation/settlements of unauthorized colonies. Rapid water runoff due to degraded forest and poor infiltration in urban and peri-urban areas of Delhi is another cause of pollution and siltation even after receiving enough rainfall every year.

During 2015, the “Air Pollution Case”, the matter called, Court in its Motion-Air Pollution in Delhi Vs. UOI and Ors in W.P.(C) 1346/2015 was filed in the Hon’ble High Court of Delhi wherein direction for rejuvenation of O-Zone area of the River Yamuna was issued.

In pursuance of the above direction, Govt. of NCT of Delhi brought O-Zone area (Yamuna Flood Plain) under tree plantation using best silviculture practices to stabilize the Yamuna Flood Plains and protect the river bed from siltation. Delhi Development Authority being custodian of the area, it was essential that the area should be transferred to Forest Department who are technically competent to develop such areas as carbon sink with enhanced annual CO₂ sequestration, conserving biodiversity and other related hydrological services. To follow the Hon’ble courts direction and to rejuvenate the Yamuna Flood Plains the Delhi Development Authority started transferring its land in the riparian area of Garhi Mandu and its surroundings to the Department of Forest and Wildlife, Govt. of NCT of Delhi for conducting plantation activities. The details of the plantation are given as below:

- Details of Old Plantation at Garhi Mandu and Sonia Vihar:
 - Total 398.7 ha of land has been handed over by DDA to Forest Department, Delhi in phases during the period w.e.f. 1975 to 2021 for plantation purpose.

¹⁴Detailed Project Report (DPR) for Rejuvenation of Yamuna River Through Forestry Interventions: Volume-I: Approaches and Forestry Interventions prepared by Forest Research Institute, Dehradun (Indian Council of Forestry Research and Education). Project Sponsored by MoEF&CC, GOI

- In 398.7 ha of land 2,08,000 saplings have been planted by Forest Department, Delhi.
- Details of plantations under DPTA, 1994 against tree felling permissions issued in various projects:
 - Total 139.5 ha of land has been handed over by DDA to Forest Department, Delhi for the plantation purpose in phases during the period w.e.f. 2014 to 2020 for plantation purpose.
 - In 139.5 ha of land 165,086 saplings have been planted by Forest Department, Delhi.
- Details of plantations carried out as Compensatory Afforestation against the Forest land diverted under Compensatory Afforestation Act (FCA), 1980:
 - Total 106.024 ha of land has been handed over by DDA to Forest Department, Delhi for the plantation purpose in phases during the period w.e.f. 2014 to 2021.
 - Out of 106.024 ha land, 103.764 ha of land has been afforested with 1,31,450 plant saplings by Forest Department, Delhi.

Till date 5,04,536 plants have been planted in the 641.964 ha area of Yamuna Flood Plains (Figure 5.1). This plantation programme has proven the importance of the potent capacities of different species in ameliorating degraded sites of Yamuna floodplains which were hitherto left fallow. The plants will act as bio-remedial agents which will be proven in controlling water pollution and sewerage of Yamuna banks.

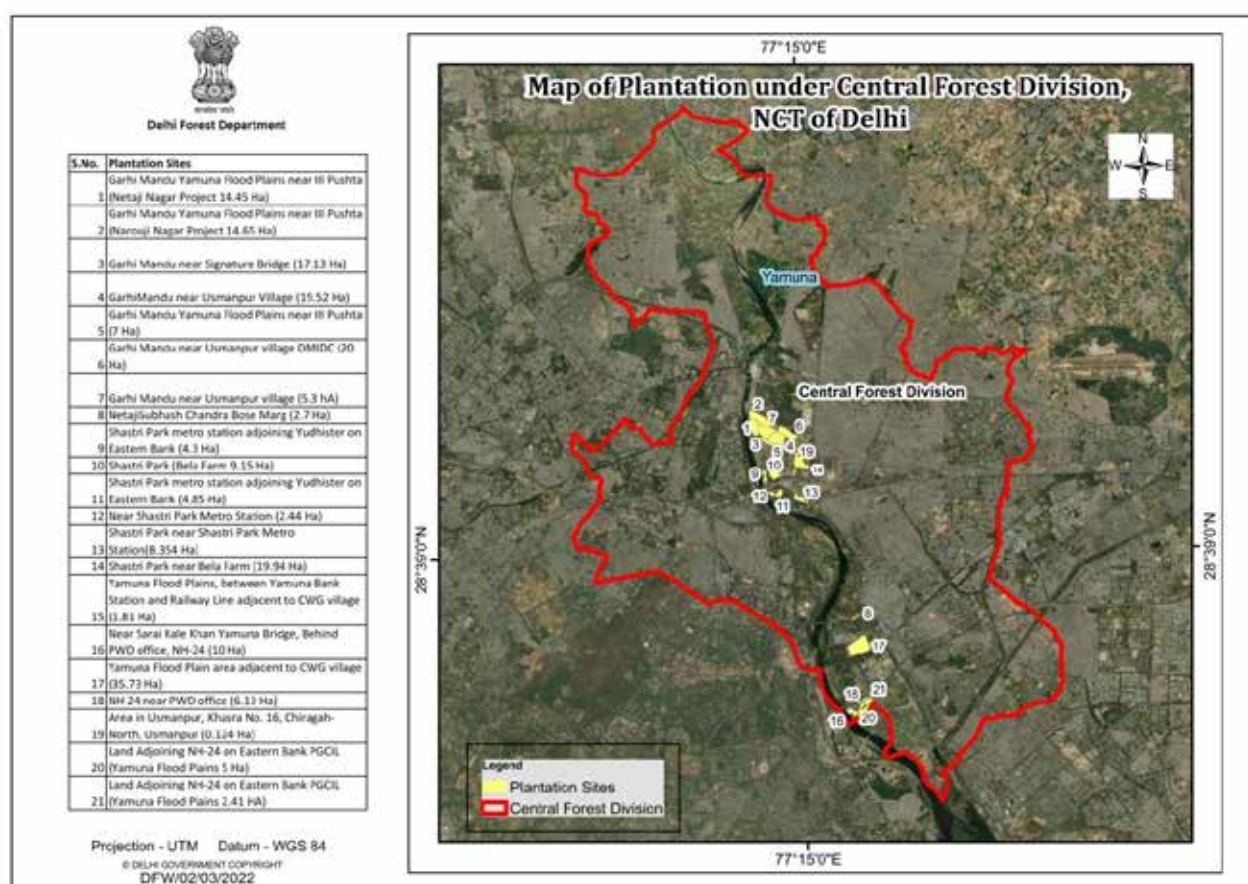


Figure 5.1: Map of Plantation in Yamuna Flood Plains

Besides River Yamuna and Aravalli Ridge, Delhi possess another important natural feature, Najafgarh Jheel, located in Delhi and Haryana border, is the critical natural infrastructure for the region, buffering floods, treating waste water, recharging groundwater (with high potential for water supply to significant population) and providing habitat to numerous plant, animal and bird species. This marsh area is fed by Sahibi River, near the town of Najafgarh from which it takes its name. It was connected to the river Yamuna by a natural shallow nullah or drain called the Najafgarh nullah (Figure 5.2).

The presence of 281 bird species, including several threatened ones such as Egyptian vulture, Sarus Crane, Steppe Eagle, Greater Spotted Eagle, Imperial Eagle and those migrating along the Central Asian Flyway has been reported at the lake .

Despite being the source of several benefits and sustaining habitats of diverse species, Najafgarh Jheel has been highly fragmented and transformed, built upon, used as a waste receptacle, and infested with invasive species. As a result, once spread over 226 sq km, the wetland has shrank to just seven sq km due to rampant encroachment .

In view of the above mentioned facts, Hon'ble National Green Tribunal has taken up the matter for rejuvenation of the trans-boundary Najafgarh Jheel located on Delhi Gurgaon Border in the matter of Indian National Trust for Art and Cultural Heritage Vs. GNCTD of Delhi & Ors., in E.A. No. 16 of 2019, in OA No. 153 of 2014. On 21.01.2022, the Hon'ble NGT has disposed off the matter directing NCT of Delhi and State of Haryana for rejuvenation of one of the most important natural features of the Delhi National Capital Region.

Govt. of NCT of Delhi constituted an Expert Committee in respect of Najafgarh Jheel vide order no. F.1(15)/DGPS/CC/2018-19/828-83 on 29.10.2020. The committee recommended 210 contour as core area of the Jheel, 211 contour as zone of influence and 212.5 contour as zone of high floods. Wetland Authority of Delhi prepared Environmental Management Plan and submitted to CPCB as per the order of Hon'ble NGT on 22.12.2020.

The Ministry of Environment Forest and Climate Change, GOI is in the process of preparing a Joint Environment Management Plan based on EMP's of Delhi and Haryana and notifying the Jheel since the Najafgarh Jheel is a transboundary wetland to be notified by Govt. of India.

In view of the above mentioned facts, Hon'ble National Green Tribunal has taken up the matter for rejuvenation of the trans-boundary Najafgarh Jheel located on Delhi Gurgaon Border in the matter of Indian National Trust for Art and Cultural Heritage Vs. GNCTD of Delhi & Ors., in E.A. No. 16 of 2019, in OA No. 153 of 2014. On 21.01.2022, the Hon'ble NGT has disposed off the matter directing NCT of Delhi and State of Haryana for rejuvenation of one of the most important natural features of the Delhi National Capital Region.

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¹⁵News Article published by PTI on 15th December 2021

¹⁶News Article published by PTI on 15th December 2021

Map of Najafgarh Jheel

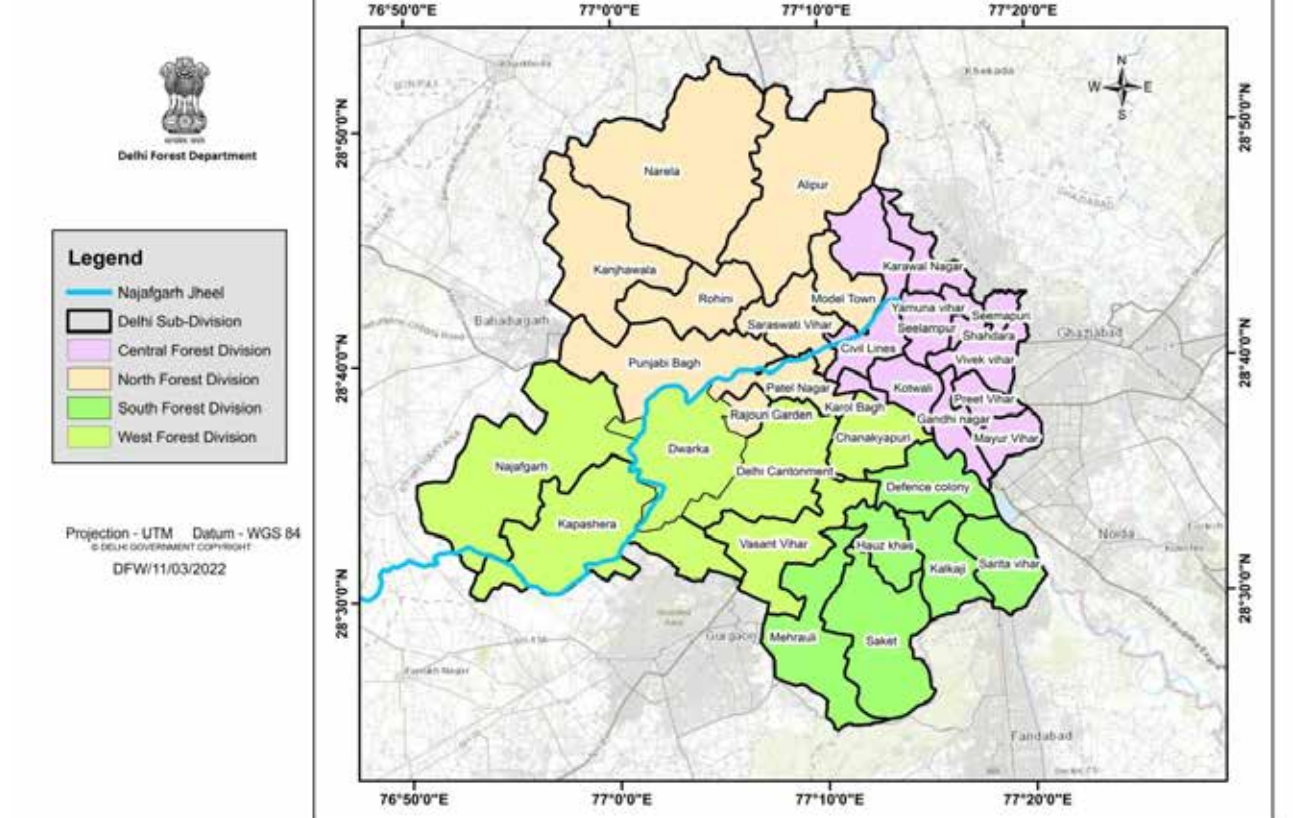


Figure 5.2: Map of Najafgarh Jheel

The following action points have been shared with the Department of Forest and Wildlife, Govt. of NCT of Delhi by the Wetland Authority of Delhi which to be taken up by the Department for rejuvenation of the wetland:

- Commissioning species inventory
- Training communities in bird watching
- Regular monitoring of waterbird population following standard protocols as the Asian Water Bird Census at all the major congregation sites within and around Najafgarh Jheel.
- Bird ringing and banding studies to assess movement patterns of key species and connections with other wetlands.
- Signage at entry and exit locations, and at key vantage points to communicate the value of Najafgarh Jheel, management arrangements, and dos and don'ts for people while in wetland.
- Design of incentive systems (monetary and non-monetary) for communities holding private land titles within wetlands to promote their engagement in wetlands conservation and ecological restoration.

¹⁷Office of the Wetland Authority, The Department of Environment, Govt. of NCT of Delhi

- Constructing a wetland interpretation center to educate visitors on the diverse values and functions of the wetland, and create the basis of an affirmative behavior for conservation of wetlands.

5.4 Eco-tourism Activities

Ecotourism is a form of tourism involving responsible travel (using sustainable transport) to natural areas, conserving the environment, and improving the well-being of the general public of the area. The Department of Forests and Wildlife, Govt. of NCT of Delhi has created Butterfly Parks, Cycle Tracks and transform the Blue lake, Peer Baba Majar and Kabarstan as eco-tourism sites located in Southern Ridge to ensure proper maintenance of the areas as well as giving recreation to the citizens of the State.

Table 5.3 depicts the numbers of footfalls recorded during the year 2021-22 in these sites.

Table 5.3: No. of Visitors Recorded in Eco-tourism sites of the Delhi Forest Department

S. No.	Eco-tourism Sites	No. of Visitors during 2021-22
1.	Peer Baba Mazar	1,117
2.	Kabarstan	4,296
3.	Neeli Jheel	706
4.	Buterfly Park	1,228



Photographs of Neeli Jheel

5.5.1 Notification of Reserved Forests

The Notification for the Reserve Forest under Section 4 of Indian Forest Act, 1927 was completed in the year 1994 and 1996. Since the demarcation was not available on the ground, therefore a Special Task Force was setup in 2012 to demarcate the Ridge area. Thereafter, the matter of Sonya Ghose versus Government of National Capital Territory of Delhi O.A. No. 58/2013 was filed in the year 2013 in the court of Hon'ble National Green Tribunal, Principal Bench, New Delhi. This matter relates to demarcation, fencing and removal of encroachment of Southern Ridge in Delhi. In this matter, three steps were to be taken, i.e., complete demarcation of the area in question, fencing of the entire area and removal of encroachments which are in existence therein. Hon'ble National Green Tribunal on March 14, 2013 directed to restrain any person or authority from constructing any roads

or using the road in the forest area for public vehicular traffic. Furthermore, they were also restrained from carrying on any non-forest activity in the area in question. To give effect to these directions, the exercise of demarcation of the boundaries of the reserved forest land was undertaken firstly by the Forest Department and later on jointly by the Forest Department with the Revenue Department.

Hon'ble Supreme Court of India in W.P. (Civil) 4677/1985 in the case of M.C. Mehta vs. Union of India & Ors. directed to the maintenance of the glory of the ridge, and passed the following order on 15.05.2013:

"1. All without exception are hereby prohibited from throwing any malba into the reserved forest area in terms of the provision of the Notification of 24th May, 1994.

2. All the malba that has been collected which ought to have been removed by the authorities now shall be removed by DDA and PWD. The expenses for such removal shall be equally made by both authorities however; the ridge shall be under the charge of the DDA.

3. If any person is found to be throwing any malba in the ridge area subject matter of the present Application, the Police Authorities shall not only prevent him from throwing malba in that area but even be entitled to ask for Rs. 25,000 for removal of the malba per truck from that person. These directions are passed on the strength of Principle of polluter pays as well as the preventive measure to protect the reserved forest in the coming times.

4. ADM (HQ), ADM (South District) and ADM (South West District) who had been declared as the Forest Officer for determination of rights shall complete the settlement of rights and claims in relation to notified area within a period of 6 months from today. The ADM (HQ) shall file before us a report to the steps taken by him. Upon settlement of rights, final Notification shall be issued by the appropriate Government in terms of Section 20 of the Act within a period of 9 months from today. The Chief Secretary of NCT of Delhi is hereby directed to ensure the full implementation of this Order by all three agencies. The DCP South shall ensure complete compliance of these directions and submit interim report on the next date of hearing. The Forest Authorities as well as DDA shall ensure that in the meanwhile the reserved forest area is not put to any unauthorized or impermissible activity and they shall take steps to ensure prohibition of such activity in accordance with law. They shall also ensure that no destruction of forest by construction of roads or otherwise is carried out in the meanwhile."

In order to give effect to these directions, Hon'ble National Green Tribunal directed to exercise of demarcation of the boundaries of the reserved forest land was undertaken firstly by the Forest Department and later on jointly by the Forest Department with the Revenue Department. Vide order dated 05.05.2015.

On 04.02.2016, the Hon'ble National Green Tribunal expressed that the matter is being dragged on and as a result there are fresh encroachment in the forest area. In such circumstances Hon'ble Tribunal directed the Chief Secretary, NCT of Delhi, to hold a meeting of (1) Secretary, Forest Department, (2) Chief Conservator of Forest, (3) Secretary, Revenue, (4) Concerned Deputy Commissioner (5) the Land owning agencies and also directed to take effective steps for declaration of the Notification as directed by order dated 24.07.2015 and reiterated by the subsequent orders including the order dated 03.12.2015.

It was observed by the Hon'ble Tribunal on 09.02.2018 that since enough time had been taken by the Revenue Department and the other concerned authorities to complete the work, further time sought for was granted with a strict direction that the work shall be completed within the next one month (from the date of order); the final demarcation report was directed to submit on 13th March 2018. Further directed the event of failure to comply with this direction, cost of Rs. 2 lakhs shall be paid by

each of the Respondents particularly Revenue Department and Department of Forest, Govt. of NCT Delhi apart from disciplinary proceedings that shall be directed against the concerned personnel.

Vide order dated 20.09.2018 Hon'ble Tribunal directed "NCT Delhi to hand over the area consisting of about 11 villages to the Forest Department immediately. The Forest Department shall ensure that the concerning officer goes to the office of the SDM and from there both shall proceed to the site for taking over the same. As the Learned Counsel for NCT Delhi has submitted taking over process should start from South District. In case the Forest Department notices that there is any deficiency in requisite compliance by NCT Delhi the same may be recorded".

On 20.11.2018 it was noted by the Hon'ble Tribunal that: *"before proceeding further and in view of the fact that different details are being given in respect of the total area i.e. the area specifically demarcated by erection of pillars and the area which is being handed over to the Forest Department. Even the affidavits filed by different departments, from time to time, do not fully reconcile. Therefore, it is necessary to summon Secretary, Department of Revenue and the Secretary Department of Forest, Government of Delhi on the next date of hearing. They are directed to come fully prepared in respect of the present case, along with all the relevant documents in respect of the total area, the measurements done, demarcation by way of erection of pillars and the possession of land actually handed over"*.

On 19.12.2018 the Secretary, Revenue Department was present before the Hon'ble Tribunal. She had broadly submitted that 75% of work of demarcation has been completed and in respect of said area pillars have been erected.

This Hon'ble Tribunal was pleased to issue directions vide order dated 31.01.2019 directing therein that *"After having a threadbare discussion on the matter, the officers have prayed for some more time and assured the Tribunal that on the next date, information, complete in all respect, about demarcation pending over and removal of encroachment etc, shall be furnished"*. In compliance to the directions of the Hon'ble National Green Tribunal on 31.01.2019, in this regards as desired a consolidated and village wise detailed status report was filed in the Hon'ble Tribunal regarding demarcations of forest/Ridge land by DM (South) and DCF (South).

On 11.03.2019 Hon'ble Tribunal directed vide its order that *"the Revenue Department shall give a complete detail with regard to the Khasara number; the total area and the date when such allotments were made. It shall also show as to whether proper approval, in accordance to law, for allotments of forest land had been obtained or not. For the aforesaid exercise, we once again grant opportunity to revenue department to prepare complete maps of all the villages, if required, separately. They should also give the requisite detail as mentioned above. It is further made clear that in case of failure to prepare a complete and proper map before the next date, would entail the officials of the revenue department with coercive orders, which would include cost etc. The map, as well as, other details on an affidavit of Principal Secretary, Revenue Department may be filed before three days of the next date of hearing"*. In compliance to the directions of the Hon'ble Tribunal an affidavit was filed by Sh. Rajeev Verma, Divisional Commissioner cum Principal Secretary, Revenue Department, Government of National Capital Territory of Delhi.

The Hon'ble Tribunal directed the District Magistrate South, District Magistrate South East and District Magistrate New Delhi to file a personal affidavit mentioning therein the total areas to be demarcated and the area remaining, if any, which is yet to be demarcated and also the encroachments identified, removed and yet to be removed. It is made clear that *"the information with regard to the demarcation and the one which is yet to be demarcated and also removal of encroachments should be precise and in accordance to the revenue record which shall be taken as complete and final information from the department. Similarly, the officer of the Forest Department i.e Deputy Conservator of Forest, South Division, under whom Districts of South as well as South East falls, is*

also directed to file a personal affidavit to the effect that as to how much area has been fenced and the one which remains to be fenced by the department.” Vide order dated 26.06.2019.

On 15.01.2021 the Hon’ble National Green Tribunal passed on order stating the following *“We are thus of the view that there is urgent need to take necessary steps to protect the Ridge by taking necessary steps to finalise the notification under section 20 of the Forest Act for reserved forest and protection by appropriate measures. The land about which there is clarity can be included in such notification and the remaining process can be undergone separately but expeditiously. No non-forest activity is permissible in Ridge area. In view of above, we direct that the Delhi Government through the Chief Secretary, Delhi to ensure that requisite Notification under Section 20 of the Indian Forest Act, 1927 is issued within three months in respect of the area about which there is no controversy. Further actions to be taken by the Delhi Government may include suitable protection by fencing/wall and vigilance. Identification of the remaining area and action 10 plan for removing the encroachments be ensured within next three months. Execution of the action plan will be primarily under the Chief Secretary Delhi, who is also the Chairman of the Ridge Management Board.”* In view of the above, O.A. No. 58/2013 was disposed of by the Hon’ble Tribunal.

In pursuance of the direction of Hon’ble NGT Order dated 15.01.2021 in O.A No. 58/2013 in the Matter of Sonya Ghosh Vs. GNCTD, an Oversight Committee (OC) (Table 5.4) headed by Director General Forest, MoEF&CC, GOI has been constituted by Govt. of NCT of Delhi vide order dated 10.02.2021 with following mandates:

Table 5.4 Composition of the Oversight Committee (OC):

Director General Forest, MoEF&CC	Chairman
Addl. Director General of Forests (FC), MoEF&CC, GOI	Co-opted Member (will act as chairman in absence of DGF and SS)
Principal Secretary/ Secretary (Revenue), Govt. of NCT of Delhi	Member
Principal Secretary/ Secretary (E&F), Govt. of NCT of Delhi	Member
Director General (Forest), Forest Survey of India, Dehradun	Member
The Principal Chief Conservator of Forests, Govt. of NCT of Delhi	Member
(Nodal Agency)	
Special Commissioner of Police	Member
Deputy Commissioner (South)	Member
Deputy Commissioner (South-West)	Member
Deputy Commissioner (New Delhi)	Member
Deputy Commissioner (South-East)	Member

(Source: Govt. of NCT of Delhi)

➤ The mandate of the Oversight Committee (OC):

- To oversee progress with regard to the removal of encroachments from the Ridge;
- Its protection by way of fencing/boundary wall and preparation of management plan for its restitution.

The committee monitors the progress very closely with monthly monitoring meetings and close follow up of issues with all concerned Departments. The upto date progress of encroachment removal is given at Annexure 5.1. Till date approximately 95 km boundary wall has been constructed in Southern Ridge.

5.5.2 Notification of Protected Forests

Besides the above, the Department of Forests and Wildlife, Govt. of NCT of Delhi has submitted proposals for Notification of Protected Forest under Section 29 of Indian Forest Act, 1927 for areas given at Table 5.5.

As per the provisions of Section 2 of the Forest Conservation Act, 1980, different user agencies in the National Capital Territory of Delhi apply for obtaining permission for diversion of Forest land for construction of different projects. The user agency has to provide land equal in area to the land they want to divert for non-forestry purpose. The land is provided for compensatory afforestation which is to be done by the Forest Department from the funds provided by Ministry of Environment, Forest & Climate Change, Govt. of India under Compensatory Afforestation Fund Management and Planning Authority (CAMPA), Act. After Stage-I approval of the project the land provided by the user agency for compensatory afforestation is to be taken over by the Forest Department and it has to be declared as Protected Forest only after that the stage-II approval is granted to the concerned user agencies by the MOEFCC, GOI.

Table 5.5: Details of areas proposed for declaration of Protected Forest

Details of CA patches	Forest Division
0.28 ha land at Rithala STP provided by Delhi Jal Board Khasra No. 26/13	North
8.35 ha land at Shastri Park (near Metro Station) Non-Forest Land provided by DDA	Central
19.9 Shastri Park (near Bela Farm)	Central
35.73 ha in Yamuna Flood Plain area in between Yamuna Bank Metro Station & Railway line adjacent to CWG village (Non-Forest Land)	Central
1.81 ha in Yamuna Flood Plains, village indrapath, Near NH-24, Eastern Bank of River Yamuna River, Delhi (Non-forest land)	Central
10 ha near Sarai Kale Khan Yamuna Bridge, Behind PWD office, NH-24 (Non-Forest land)	Central
2.44 ha Near Shastri Park Metro Station.	Central
4.3 ha Shastri Park metro station adjoining Yudhister on Eastern Bank.	Central
5.3 ha Garhimandu near Usmanpur village	Central
6.13 ha NH 24 near PWD office.	Central
4.85 ha Shastri Park metro station adjoining Yudhister on Eastern bank	Central
4.89 ha at Khasra No. 37/1, 37/2, 37/3, 37/4 at DhoolSiras Village, Dwarka (DDA Land)	West
4.61 ha at Khasra No. 37/18 (Part), 37/19 (Part), 37/22 (Part), 37/23 (Part), 37/24 (Part), 46/2 (Part), 46/3 (Full), 46/4 (Full), 46/5 (Full) at DhoolSiras Village, Dwarka (DDA land)	West
6.47 ha Sanoth village, Narela	North
1.52 ha Holambi Kalan, Narela	
35.88 ha Sanoth and Holambi Kalan, Narela	
4.08 ha Sanoth and Holambi Kalan, Narela	
5.01 ha Dhichaon Kalan	West
2.396 ha at Sector-29, Dwarka	West

CA patches at 0.124 ha at Khasra No. 16, Chiragah- North, Usmanpur, Civil lines, Usmanpur and 8.11 ha at DhoolSiras Village, Dwarka (DDA land) has been notified as Protected Forest under Section 29 of Indian Forest Act, 1927.

5.6 Third Party Audit of Plantations

The Hon'ble Minister (Environment and Forest), Govt. of NCT of Delhi had impressed upon the importance of audit of all plantation works by an independent third party in a bid to ensure better transparency and monitoring of all plantation works in the state. In pursuant to the directions of the Hon'ble Minister (Environment and Forest), GNCTD Delhi Forest Department has taken initiative to coordinate with all the greening agencies for pursuing this issue and to carrying out third party audits of the plantations done in the year during 2016-17, 2017-18 and 2018-19.

Agencies like DDA, NDMC, PWD, BSES, DMRC, NDPL, DUSIB, Delhi Cantonment, DJB, EDMC, North DMC, South DMC, CPWD, DSIIDC, Delhi Cantt., Horticulture etc. have already been carried out or in the process of carrying out the third party audit of plantations through various institutions like Indian Agriculture Research Institute, New Delhi, Forest Research Institute, Dehradun, M/s CEIL (Certification Engineers International Ltd.), Mahatma Gandhi Institute for Combating Climate Change (MGICCC), GNCTD etc.

The Department of Forest and Wildlife, Govt. of NCT of Delhi has conducted the third party audit for plantations carried out during the year 2016-17, 2017-18 and 2018-19 by Forest Research Institute, Dehradun in the month of March 2021. The data was collected from 3 forest divisions of the Department, i.e., North, South and West. Central division of Delhi has recently been carved out from some areas of South and West forest Divisions. Therefore, the plantation sites of Central Division were covered under erstwhile two divisions. Total 49 sample sites out of total 25 sites were selected randomly. Plantation area of 184.10 ha out of total area of 306.60 ha was selected in the present study for monitoring and evaluation. The study has been carried out by selecting sample plots in selected sites of forest range. Moreover, the size of plots and category of plantations were also taken into consideration for representation of all units. The random sampling strategy was adopted for the selection of sample plots in all study sites of the forest ranges. The selected plantation sites were traversed and area of the plantations was verified by recording the GPS locations.

➤ **The main indicators which were used for the assessment is summarized as below:**

- (i) Choice of species for the sites
- (ii) Selection of the planting site
- (iii) Planting methods
- (iv) Size of the pits/trenches including earth work done
- (v) Spacing of the pits
- (vi) Time of planting
- (vii) Health of the plants (insect-pests & diseases or other causes)
- (viii) Cultural operations (Hoing, weeding, soil working etc.)
- (ix) Protection measures
- (x) Management of plantations (causality replacement, watering, pruning, thinning etc.)

- (xi) Growth and survival of plants
- (xii) Soil and Water Conservation measures

➤ **Major observations of the audit study of FRI, Dehradun is summarized below:**

The field data collected under the present plantation monitoring study indicates that plantation scheme will be of significant importance in achieving the goal of Delhi Forest Department to increase green cover in the state. Overall survival status of the plantations is given in Table 5.6.

Table 5.6: Status of Third Party Audit of Plantations of Forest Department

S. No.	Forest Division	Forest Range	Plantation Year	Survival Rate (%)
1.	Central	Shahadra	2016-17 2017-18 2018-19	80.21
2.	West	Alipur	2016-17 2017-18 2018-19	78.50
3.	Central	Shahadra	2016-17 2017-18 2018-19	80.21
		Najafgarh	2016-17 2017-18 2018-19	75.68
4.	South	Meherauli-II	2018-19	72.60
		Asola Bhatti	2016-17 2017-18 2018-19	76.20
		ETF	2016-17 2017-18 2018-19	81.33

(Source: Forest Research Institute, Dehradun)

- (i) The plantation survival data also reveals that about 60-70% of the plantation sites were classified as excellent to good in terms of survival. However there were about 5% sites which were classified as poor.
- (ii) The growth of plants is found to be satisfactory but none of the plants have reached to tree level. The growth of plants would have improved if the plantations might have been protected from wild and stray animals and cultural operations could have been carried out timely. However, efforts like presence of fencing and guard wall was found effective against the protection from animals. It was also recorded in the report that watchers were also deployed for the protection and maintenance of the plantation sites.
- (iii) The strategy and plantation techniques and sites selected for taking up plantation in majority of the incidences were suitable for plantation. It is imperative that sites of the plantations and species should be selected keeping in view of ecology of sites and biotic factors.

- (iv) FRI pointed out that, the cultural operations like singling, weeding, pruning, watering, soil working etc. could not have been taken up in most of the plantations properly as per prescriptions. For carrying out the cultural operations in the plantations more funds are required which may be provided regularly up to establishment of plants.
- (v) The protection and maintenance period should be varied for the different sites as per the site conditions.
- (vi) Watering to the plants was provided with the help of water tankers, tube wells and water sprinklers.
- (vii) During the monitoring of plantations no serious and specific symptoms of damages by insects and pests have been recorded by FRI.
- (viii) The major species planted in the years were *Terminalia arjuna*, *Melia azedarach*, *Dalbergia sissoo*, *Albizia lebbbeck*, *Morus alba*, *Bauhinia variegata*, *Acacia catechu*, *Holoptelea integrifolia*, *Phyllanthus emblica*, *Acacia nilotica*, *Albizia procera*, *Terminalia chebula*, *Terminalia bellerica*, *Pterospermum acrifolium*, *syzygium cumini*, *Ficus benghalensis* etc.

5.6.1 Internal Audit of Plantations

The Department of forest and Wildlife, Govt. of NCT of Delhi has initiated the process of internal auditing of plantations done by the Department in last 5 years i.e. from 2017 to 2022. The aim of this exercise is to determine the status of the plantation and to assess the factors playing a role in the tree mortality, as well as to generate a comprehensive dataset. This study will also help the Department to list out the best suited species for a particular region.

5.6.1.1 The Methodology Adopted

- In order to understand the quality of plantations, baseline information has been collected which includes year of plantation, different species planted by the department, total number of trees planted, presence of invasive species, status of boundary wall, presence of herbivore, encroachment (if any).
- The grid based systematic sampling method is used for the assessment and monitoring of the plantations. For this, sample plots have been established in all the plantation sites of size 0.1 ha (31.62m* 31.62m) as per the National Working Plan code-2014 (Figure 5.3). In the centre plot of 0.1 ha, height and girth of all trees has been measured. In addition to this, subplots of size 3m*3m and 1m*1m has been made at 30 m from the centre of the 0.1 ha plot in all the four directions for the collection of shrubs, climbers, and tree regeneration in 3*3 plot and collection of herbs or grasses in 1m*1m plot. This data will help to understand the distribution and abundance of planted species and further can be correlated with soil data.
- Soil testing is also being conducted through Indian Council of Agricultural Research Institute to ascertain the characteristics of soil and to understand if the soil has enough nutrients, moisture and organic content to support the growth of saplings planted. To determine the soil quality, variables such as soil moisture, pH, Nitrogen content, phosphorus content and potassium content has also to be measured. Other than this, micronutrient status will be determined by testing few elements like boron, copper, iron, manganese, sulphur, zinc etc, whether these are sufficient or deficient in the soil.

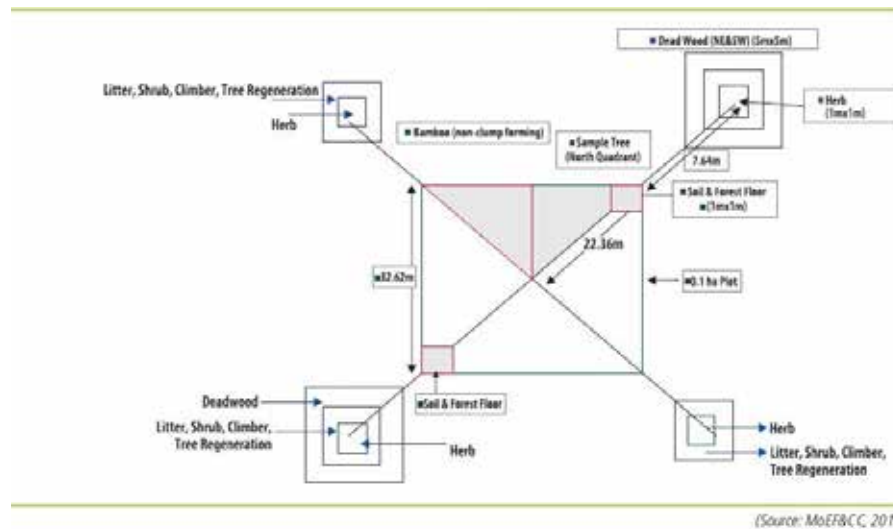


Figure 5.3: Sample Plot Layout: Schematic representation of field enumeration plots ¹⁸

5.7 Soil Moisture Conservation

A natural aquifer regulates the groundwater level contours in the Delhi region. The groundwater level in the alluvial plains varies from 192 to 216 masl (Figure 5.4, below), while the Delhi Ridge and its surrounding area have a broad groundwater level contour of roughly 240 masl (Figure 5.4, below). With a general water level elevation of 170–180 masl, a substantial water level depression can be seen in the south-eastern part of the city (surrounded on three sides by the Delhi Ridge). Groundwater level depressions can also be seen on both sides of the Najafgarh drain (Sahibi River) in the southwest district, with a general water level elevation of 192 masl. Heavy groundwater abstraction in the southwest district has resulted in the regional water trough in Kharkhari region which lies to the west of the Najafgarh drain and Papankalan which is east of the Najafgarh drain (Sarkar and Shekhar, 2015). The convergence of groundwater toward the Najafgarh drain in the southern area of Delhi shows that these depressions have a significant impact on groundwater flow (Shekhar and Sarkar, 2013). The groundwater level contour and depth to water level of Delhi is presented in Figure 5.4.

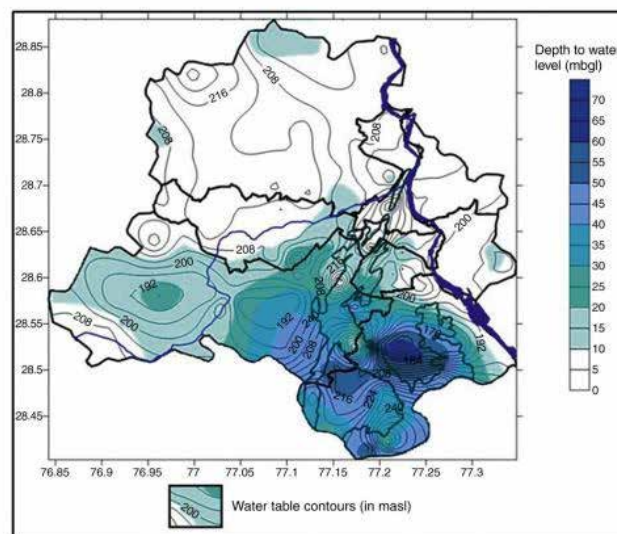


Figure 5.13 The Groundwater Level Contour and Depth to Water Level Map of Delhi.
Source: Based on CGWB dataset. Available from: <http://gis2.nic.in/cgwb/Gemsdata.aspx>.

¹⁸MoEF&CC, 2014

¹⁹CGWB dataset

The forests of Delhi also provide an important ecosystem service by recharging underground aquifers. Soil and moisture conservation is essential for river rejuvenation as it helps in enhancing percolation of water in the soil and lowering surface runoff and also keeping a check on soil erosion by lengthening retention of water in catchment area, improvement of environmental flow and improvement of quality of water. This will eventually helps in enhancing the site quality which ultimately improves the natural regeneration, plant survival and growth, forest productivity and biodiversity conservation. It improves the overall water quantity and quality.

Soil and moisture conservation methods aims at strengthening the soil and moisture measures in forested areas through measures like construction of conservation ditches, contour trenches, contour bunds, earthen check dams, brushwood check dams, loose boulder check dams, ponds, gully plugs and so on. These measures do not disturb the existing land use pattern of the forest area and therefore has been proposed as a treatment model for Delhi. The following representation depicts the typical sizes suggested for various soil and moisture conservation structure:

Conservation ditch	3m * 1.5m * 0.60m size per structure
Contour Trench	3m * 0.45m * 0.45m size per structure
Contour Bund	(40 cm base + 20cm top) 2*25 cm*1m size per structure
Loose Boulder check dam	3m* 0.60m * 0.45 m per structure

The size of brushwood check dam, earthen check and gully plug should be as per the site. In case of pond, the depth should not be more than 1.50m.

Till date around 250 checkdams have been constructed in Southern and Central Ridge by the Forest Department (Figure 5.5 and Figure 5.6). This will enhance the role of forests in acting as natural sponges and enhancing the ground water security of Delhi.



Photographs of Checkdams constructed in Southern Ridge

²⁰Detailed Project Report (DPR) for Rejuvenation of Yamuna River Through Forestry Interventions: Volume-I: Approaches and Forestry Interventions prepared by Forest Research Institute, Dehradun (Indian Council of Forestry Research and Education). Project Sponsored by MoEF&CC, GOI.



Photographs of Checkdams constructed in Central Ridge

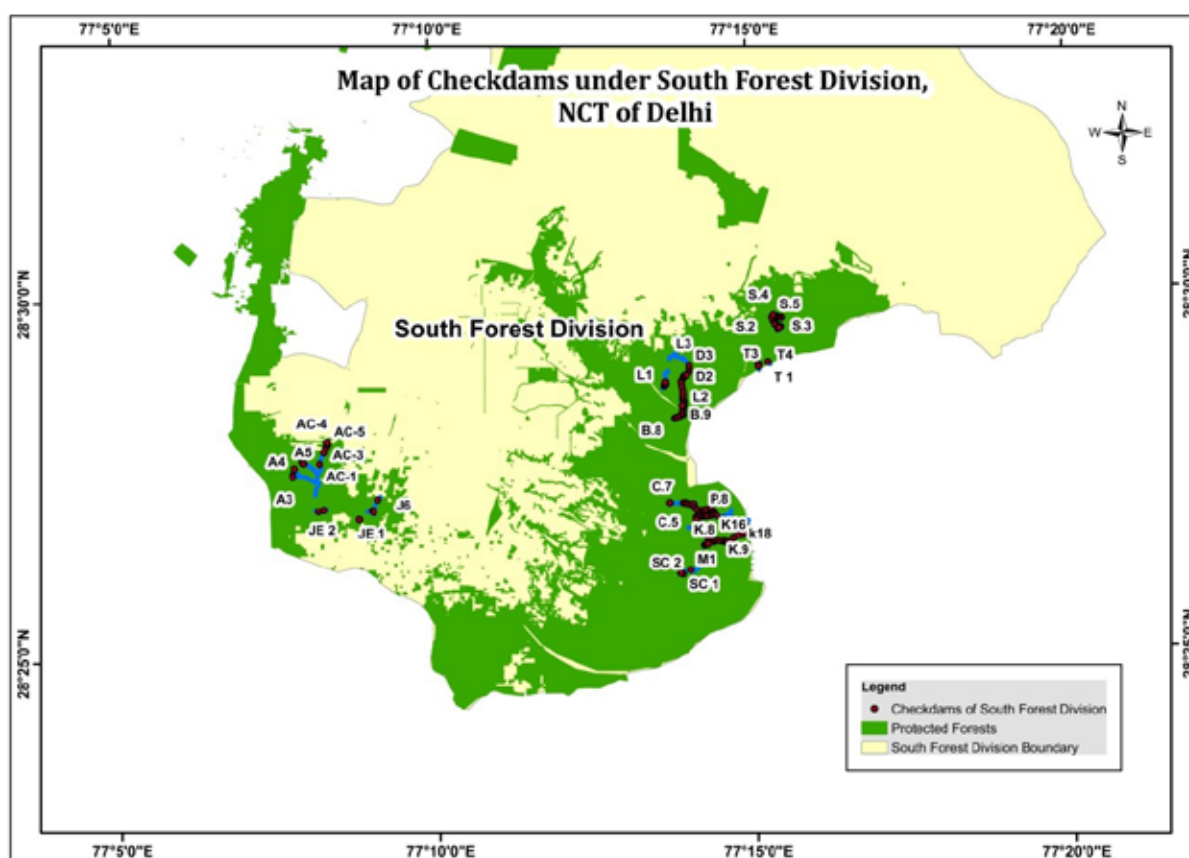


Figure 5.5: Map of Checkdams constructed in Southern Ridge

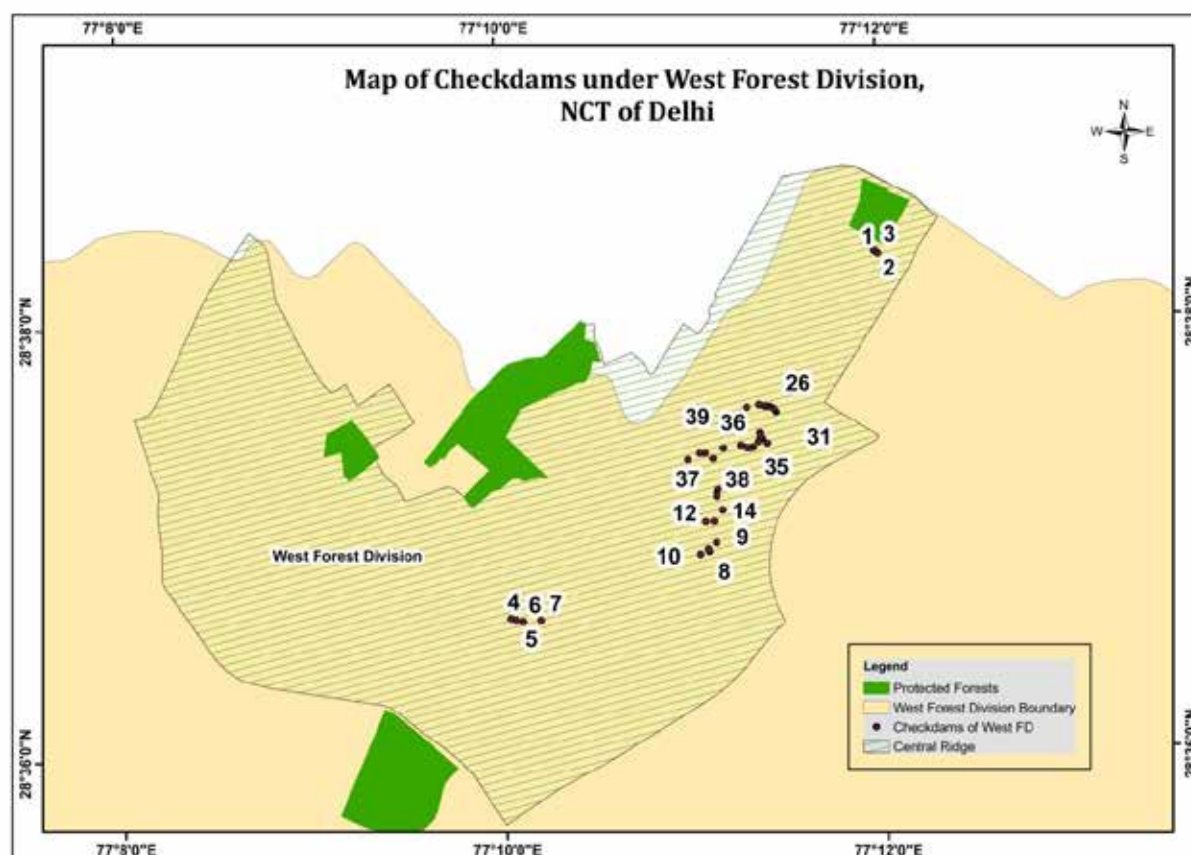


Figure 5.6: Map of Checkdams constructed in Central Ridge

5.5 Working Plan

Working Plan of Forests of Delhi for sustainable Management of Forest and Biodiversity Conservation of National Capital Territory of Delhi as enshrined in the National Forest Policy, encompassing ecological, economic and social (including cultural) dimensions is being prepared by Forest Research Institute, Dehradun. This Working Plan shall be implemented in the NCT of Delhi irrespective of any distinct ownership. The approval for preparation of Working Plan has been given to FRI, Dehradun on 30.06.2021 by Department of Forest and Wildlife, Govt. of NCT of Delhi.

The Working Plan for all the forest divisions of Delhi will be prepared as per the provision of Working Plan Code 2014 as approved by MoEF&CC. This task will be conducted for a period of two years to collect and generate basic data and interpret the same for analysis to draw conclusions.

CHAPTER 6



CHAPTER 5

6. STRATEGIES AND INITIATIVES TO CONSERVE WILDLIFE OF NATIONAL CAPITAL TERRITORY OF DELHI

6.1 Asola Bhatti Wildlife Sanctuary

The Asola-Bhatti Wildlife Sanctuary has a unique place in India's network for protected areas. Among the 421 wildlife sanctuaries and 75 national parks in the country, it is the only area representing the northeastern, rolling outliers as a landform of the country's oldest hill ranges, the Aravallis. Thus it biographically represents a landform not earlier represented in the national P.A. network. This therefore is a value of national significance. As 'Wildlife' Sanctuary it is very different from the popular perception of a sanctuary.

Asola Bhatti Wildlife Sanctuary with an area of 27.498 km² falls between the geo-coordinates 28024'00" to 28030'00" N and 77012'00" to 77017'00" E. It forms a part of Delhi Southern Ridge, an extension of the Mewat branch of Aravalli hills. The Aravalli range is one of the oldest mountain systems in India supposed to have originated in the pre-Cambrian period.

The Wildlife Sanctuary falls in the Kohi or Pahari (hillside) physiographic division which represents highly rocky and undulating landforms. The land is characterized by a weathered low plateau, the highest point being 320 m. above MSL at Bhatti. The area is broken into spurs and is dominated by exposed, irregularly distributed boulders of Precambrian, quartzite rock base. The rock outcrops are the northernmost section of the Alwar formation and are found with several interbanded schist and phyllite. The quartzite is vitreous and coarsely crystalline in texture. Extensive weathering of these quartzite rocks yields high quality silica sand which is locally known as 'Badarpur' or 'Bajri'. The soil is thin, dry and sandy with high porosity and low humus status supporting sparse vegetation of scrubby nature.



²¹Kalpavriksh, 1991

Due to the predominantly sandy nature of the soil, the surface run off is low and rain water quickly seeps down and gets trapped in the underlying rocks. The water table depth varies from 35-50 m in Bhatti. The groundwater is used for irrigation and drinking purposes in the plains and flat areas lying in the vicinity of the wildlife sanctuary. The District Gazetteer of Delhi (1883-84) records that in the latter part of the last century the best drinking water was obtained from springs on the Ridge. There is little evidence that these springs still exist. This reflects the grave status of degradation.

6.1.1 Biological Diversity of Asola Bhatti Wildlife Sanctuary

The sanctuary area is home to the major wildlife population of the Ridge. Adequate conservation and protection activities are undertaken by the Forest Department have given a boost to the wildlife of the region, which is reflected by the sighting of five species of vultures, including red-headed vultures after 27 years in Delhi. A pack of Striped Hyenas is also spotted occasionally in the Bhatti area. The number of individuals of all other species has increased in the last decade. Some other mammals found in the area include Jungle Cat, Palm civet, Flying Fox, Porcupine, Indian Pipistrelle, Fulvous Fruitbat, Bush Rat, Ship Rat, Grey Musk Shrew, Lesser Bandicoot Rat, Little Indian Mouse, etc. The area also harbours a variety of reptiles like Common Skink, Monitor Lizard, Garden Lizard, Fan-throated Lizard, Yellow bellied House Gecko, Spectacled Cobra, Common Krait, Wolf Snake, Rat Snake, Common Sandboa, Saw-scaled Viper, etc. Amphibians like the Common Toad, Bullfrog, Indian Skipper Frog, Marbled Toad, Micro hyalid, etc. are also reported on the Delhi Ridge. The area also harbors a large number of butterflies such as Common Banded Awl, Small Grass Yellow, Salmon Arab, Tailless Lime Blue, Plain Tiger, Blue Pansy, etc. and dragonflies like Common Clubtail, Pied Paddy Skimmer, Crimson Marsh Glider, Ground Skimmer, etc.

- **Fishes:** Three species of fishes Spot-fin Carb (*Puntius sophore*), Brown snake head (*Ophiocephalus gachua*) and Mosquito fish (*Gambusia affinis*) are reported from sanctuary area (Hussain, 2003).
- **Arthropods:** The recent survey data available for the sanctuary area is by Zoological Survey of India Dehradun by Pramod Kumar and S.K Gupta. The systematic account deals with 25 species of butterflies under 5 families.
- **Amphibians:** The recent amphibian survey available for the sanctuary area is by Zoological Survey of India by Akhlaq Husain. Five amphibian species like Common toad (*Bufo melanostictus*), Marbled toad (*Bufo stomaticus*), Ornate frog (*Microhyla ornate*), Skipping frog (*Rana cyanophlyctis*), Cricket frog (*Rana limnocharis*) are reported.
- **Reptiles:** Reptilian survey seems to be lacking for the sanctuary areas. Zoological survey of India, Dehradun (1996-1999) has reported the presence of one species of snake and four species of lizards. The common snake species found is Slender Work Snake (*Typhlops porrectus*). Four species of lizards Garden Lizard (*Calotes versicolor*), Spotted Brooks Gecko (*Hemidactylus brooki*), Snake Eyed Lacerta (*Ophisops feidoni*), Striped Kink (*Riopa punctata*) have been reported.

- **Birds:** Records indicate that around 249 species and 2 subspecies. These included 115 residents, 42 local migrants, 58 winter migrants, 18 passage migrants, 6 summer/breeding migrants, 6 vagrant species and 6 species whose status could not be determined. The threat status of species includes 2 critically endangered, 3 endangered, 7 vulnerable and 8 near-threatened bird species. Analysis of the Wildlife (*Protection*) Act, 1972 deduced 24 Schedule I species and 227 Schedule IV species. These include Little Grebe, Little Cormorant, Cattle Egret, Peregrine Falcon, Grey Francolin, Brown headed Barbet, Coppermith Barbet, Alexandrine Parakeet, Spotted Owlet, Spotted Dove, Jungle Prinia, Red Whiskered Bulbul, Oriental Magpie Robin, Pied Bushchat, Orange-headed Thrush, among others.

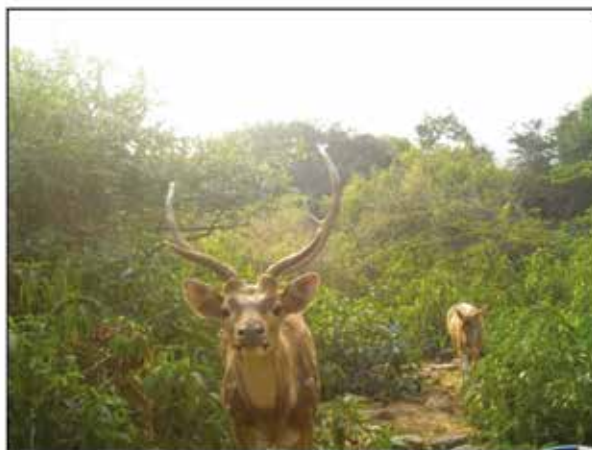
The presence of wetlands, artificial water bodies and seasonal ponds on the Southern Ridge has resulted in its preferential selection by the migratory waterbirds over the Northern parts of the Ridge. Other than the regular migratory visitors arriving in Delhi, there have been some eye-catching sightings of migratory birds in Delhi. The Indian Pitta, mostly found in the Himalayan foothills and Western Ghats, has been spotted in Delhi in recent times after 60 years. Other such rare sightings in the year 2013 include White-capped Buntings, Marbled Teal and Black Stork. Some other noteworthy sightings of the year 2013 include that of Verditer Flycatcher, Greater Adjutant Stork, Brahminy Kite, Upland Buzzard, Imperial Eagle, Green Sandpiper, Red Shank, Scops Owl, Red-breasted Flycatcher, Orphean Warbler, Common Chiffchaff, Yellow-browed Warbler, Brook's Leaf Warbler, Greenish Warbler, Western Crowned Leaf Warbler, Bluethroat, Black Redstart, Blue-capped Rock Thrush, Dark-throated Thrush and Grey necked Bunting.

- **Mammals:** Sinha and Sati (1997), in a recent publication- the Fauna of Delhi have reviewed the studies so far done on mammals of Delhi. Kalpvriksh (1991) reported 29 species of mammals from the ridge area. Zoological survey of India, Dehradun (1996-1999) has reported the presence of 18 species of mammals belonging to 10 families and 7 orders in the Sanctuary area.

The main herbivores of the sanctuary are Blue bull/nilgai (*Boselaphus tragocamellus*), Black buck (*Antelope cervicarpa*), Porcupine (*Hystrix indica*), Rhesus macaque (*Macaca mulatta*), Hanuman langur (*Presbytis entellus*), Common hare (*Lepus nigricollis*). Among the carnivores Jackal (*Canis aureas*), Jungle cat (*Felis chaus*) are found. Presence of Hyena (*Canis hyaena*) is also reported. The other species found in the area are Palm Squirrel (*Funambulus pennantii*), Small Indian civet (*Viverricula indica*), Small Indian Mongoose (*Herpestes javanicus*). Indian Grey Mongoose (*Herpestes edwardsii*) Indian pangolin (*Manis crassicaudata*).



Blackbuck (*Antilope cervicapra*)



Spotted Deer (*Axis axis*) Spotted Deer (*Axis axis*)



Common Leopard (*Panthera pardus*)



Hog Deer (*Axis porcinus*)



Jackal (*Canis aureus*)



Nilgai (*Boselaphus tragocamelus*)



Rhesus Macaque (*Macaca Mulatta*)



Ruddy Mongoose (*Herpestes smithii*)



Indian Hare (*Lepus nigricollis*)



Grey Mongoose (*Herpestes edwardsii*)



Animals captured in Camera Trap



Common Leopard (Panthera pardus)



Common Palm Civet (Paradoxurus hermaphroditus)



Jungle Cat (Felis chaus)



Striped Hyena (Hyaena hyaena)



Indian Hare (Lepus nigricollis)



Indian Porcupine (Hystrix indica)



Small Indian Civet (Viverricula indica)

Photographs of wild animals recorded in Asola Bhatti Wildlife Sanctuary

6.2 Habitat Restoration of Asola Bhatti Wildlife Sanctuary

Asola Bhatti Wildlife Sanctuary is the only Sanctuary which is come under National Capital Territory of Delhi. As discussed earlier in Chapter 3, it has diversified and largely unexplored habitats which are severely threatened by human intervention. Several approaches, as narrated below, are being taken by the Delhi Forest Department to restore these habitats, in turn conserve the biodiversity of the Sanctuary.

6.2.1 Habitat Restoration of Rhesus macaque (Monkey)

Monkeys, mainly Rhesus macaque captured from human habitations in Delhi are being translocated to the sanctuary. In absence of natural predator, their population has increased many fold. 18, 507 numbers of Rhesus macaque have been translocated in the sancuary till January 2015. Asola-Bhatti being tropical thorn forest is unable to meeting up the natural food to these primates. This situation has compelled the authorities to feed vegetable and fruits artificially. There are 18 platforms for feeding the macaques. Approximately Rupees one crore annual expenditure is incurred for this purpose. As this feeding method is unsustainable, plantation of fruit trees species like *Ficus religiosa* (Pipal), *Ficus bengalensis* (Bargad), *Morus indica* (Toot), *Zizyphus mauritiana* (Ber), *Aegle marmelos* (Bael), *Prosopis dichotoma* (lasoda) etc. is being initiated in the areas wherever found Suitable.

6.2.2 Weed Eradication

Weeds Eradication program has been taken up to remove invasive weeds like Lantana and congress grasses. Areas have been identified to remove the weeds by manual uprooting for consecutive three years to ensure that it does not reappear. It has been observed that after uprooting of weeds like Lantana camara grasses have come up naturally which would be beneficial for Herbivores.

6.3 Issue of Monkey Menace in NCT of Delhi

To redress the problem of monkey menace in the inhabited areas of Delhi, the Hon'ble High Court of Delhi passed a milestone judgement on 14.03.2007 in WP (C) 2600/2001 in the matter of New Friends Colony Residents Welfare Association Vs. Union of India and others. The civic agencies were directed to trap the problematic monkeys from their respective jurisdiction with the help of cages to be provided by Forests & Wildlife Department and translocate them to Asola Bhatti Wildlife Sanctuary. The whole process was directed to be carried out within a period of 3 months. This decision highlighted the wisdom behind the judgement as it would prevent the further growth of monkey population in residential areas. However, the work was not carried out in a time bound manner which

resulted into partial removal with simultaneous addition to monkey population in the residential areas of Delhi. As the sanctuary is deficient in fruit bearing trees, and new trees proposed to be planted will take several years to bear fruits, the relocated monkeys need to be fed in the Forest. Since the Court banned feeding of monkeys in public places, it was hoped that food offered as religious offering may be collected by civic agencies in various food collection centres and sent to the forest area to be fed to monkeys. No provision for collection of cooked food was made as it might aid in population growth or epidemic in translocated monkeys. The Court had, however, ordered that in case food collected as religious offering is not sufficient, Forest Department should make arrangements for rehabilitation of the translocated monkeys:

“It will be obligatory upon the Government of NCT of Delhi to provide food and water to these rehabilitated monkeys” and “...principally it would be the obligation of the Delhi Administration and the Chief Wildlife Officer to ensure that the food is provided to the monkeys who are shifted to the Bhatti Mines”.

At present, monkeys are being trapped by the Municipal Corporations of Delhi (MCDs) and New Delhi Municipal Corporation (NDMC) and released into forest area since the second week of March 2007, and till 28.02.2014, a total of 17,138 monkeys had been released. In turn, the Forests & Wildlife Department, Govt. of NCT of Delhi rehabilitates the translocated monkeys by providing supplementary food to them at 20 feeding platforms in the Sanctuary every day. The whole process of supply and feed to monkeys is meticulously monitored within built checks. In addition to this, wild fruiting tree species are also being planted as a source of food for wild animals including monkeys.

6.4 Rescue and Release Protocols of Wild Animals into Asola Bhatti Wildlife Sanctuary

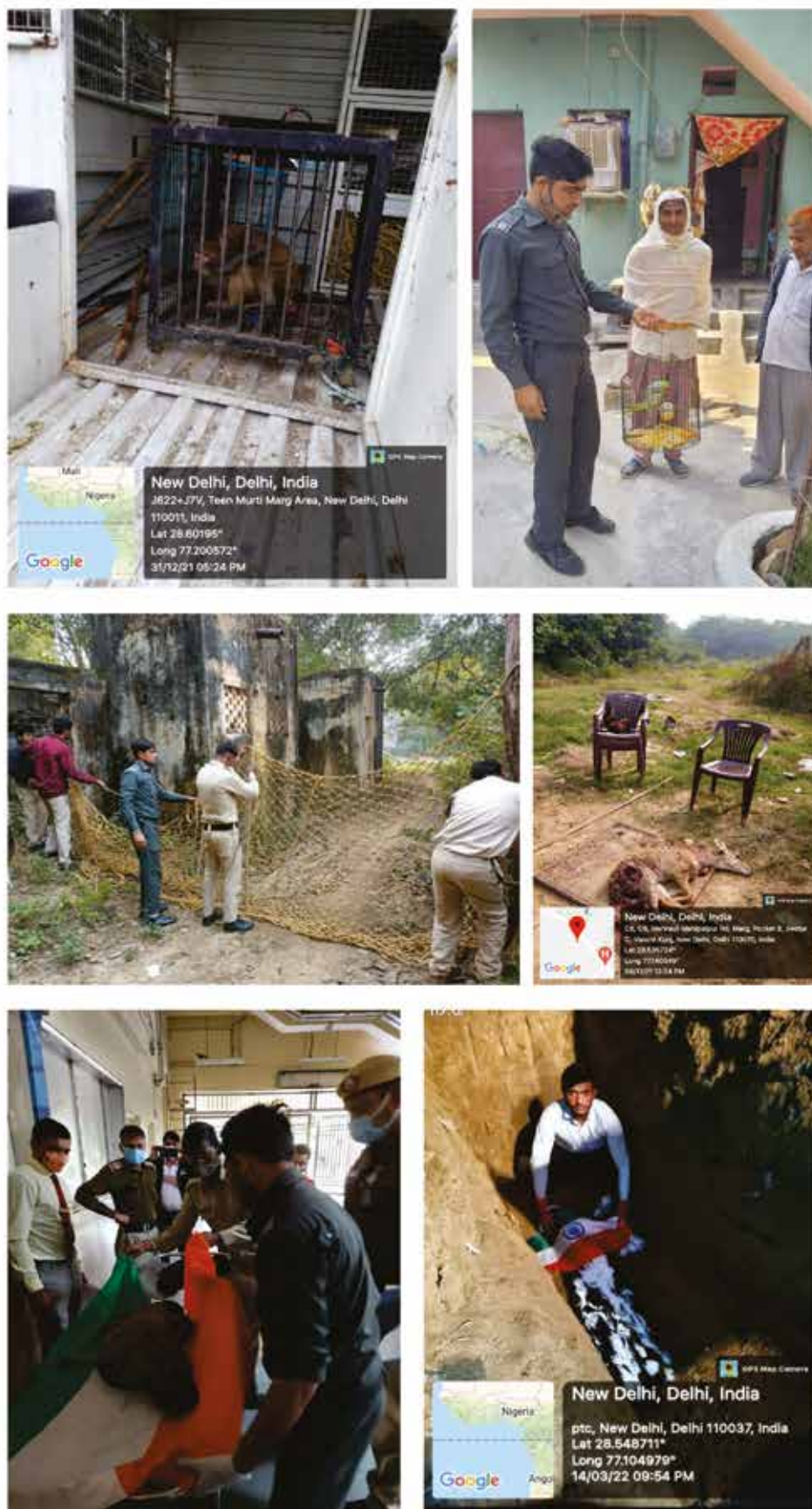
The National Capital Territory of Delhi frequently faces large number of rescue and rehabilitation complaints on daily basis. To deal with such complaints, the Department of Forest and Wildlife, Govt. of NCT of Delhi has issued one public helpline number, known as “**Green Helpline Number 1800-11-8600**” on which the complainants/informer gets their complaint/information registered and that thing is transferred to the concerned division for the successful rescue and rehabilitation operation. The Department majorly receives complaints like snake entered into human inhabitation, monkey got injured or monkey got electric shock due to open electric poles, nilgai (bluebull) got injured or entered into human inhabitation.

To deal with such daily basis complaints, the Department has experienced and dedicated team of wildlife guards and forest guards, who are fully capable and trained to deal with such rescue operations effectively and in efficient manner.

In addition to this, the Department has given rescue and rehabilitation permission to two Non-Government Organizations (NGOs) namely Wildlife SOS and Wildlife Rescue in NCT of Delhi to deal with such complaints/information. In response to this, the Department monthly receives the list of rescued and rehabilitated wild animals operations done by these two organizations.

Also, the Department has recently opened two “Transit Rescue Centre’s” one at Rajokri and one at Asola-Bhatti Wildlife Sanctuary, Tughlakabad. For carrying out smooth and successful rescue operations, the department has engaged one veterinary doctor and one compounder at the rescue centre.

Various protocols prepared by the Department of Forest and Wildlife, Govt. of NCT of Delhi for rescue and release of wild animals, such as Nilgai, Monkeys, Sambar Deer and Snakes into their natural habitats are summarised in *Annexure 6.1*. Approximately, a total of 500 successful rescue operations have been done by the department from 01.04.2021 to till date.



Photographs showing Wildlife Rescue operations of the Department of Forest and Wildlife, Govt. of NCT of Delhi



Habitat improvement in Asola Bhati Wildlife Sanctuary

CHAPTER 7



CHAPTER 7

7. FOREST AND WILDLIFE EXTENSION

7.1 Strengthening of Forest Department

There has been a continuous effort for strengthening of Forest Department to augment its human resource for protection of green cover in Delhi and security of the Ridge area. The Department has created posts of Forest Ranger, Deputy Forest Ranger, Foresters, Forest Guard, Wildlife Guard and other Forestry Staff. 200 security guards have been deployed in entire Forest Area of NCT of Delhi (2019-20). A GIS Cell has been established for effective monitoring of forest boundaries and assets of the Forest Department. The recruitment exams of forest personal have been done and the joining of new staff is in continuous process. The existing strength of the Delhi Forest Department is given in Annexure 1.1.

7.2 Capacity Building

During the financial year 2021-22, the Department has undertaken below training programmes to capacitate the departmental staff as well as officials of law and enforcement to ensure adequate protection and monitoring of green cover of Delhi:

- (i) A meeting/ workshop with all the greening and construction agencies of Delhi was conducted by the Department to sensitizing about de-concretization of trees. Representatives of NGOs and CBOs who are actively engaged in de-concretizing activities in the State were presented lectures elaborating existing judicial interventions on the issue. A manual narrating the restrictions and management measures related to de-concretization were circulated with all the agencies for their future reference.
- (ii) Training workshop of police officials on various penal provisions of Delhi Preservation of Trees Act, 1994 emphasizing the issue of de-concretization was undertaken by the Department during March 2021.
- (iii) Two days training workshop on methodology of audit and monitoring of plantations conducted during the month of December 2021, wherein renowned scientists of Indian Council of Forestry Research Institute and retired forest officials were invited for imparting.

Continuous efforts are being made to improve the skill set of the staff of the Department through regular trainings on various aspects of forest and wildlife management. A broad spectrum of the areas identified for series of training sessions are given in Table 7.1.

Table 7.1: Areas Identified for Training of Field Staff of Forest Department

S. No.	Training Attributes	Specific Area of the Training
1.	Remote Sensing and GIS	- Supervised classification - Monitoring - Making of polygon, map preparation, analysis. - Application in forestry. - Use in wildlife application. - Handling of DGPS & TSM

2.	Nursery Techniques	• Basic knowledge • Development of Nursery • Technique of composting/ vermicomposting • Seed collection • Germination technique • Maintenance of polyhouse, seed beds, green house • Seed treatment • Identification of plant species
3.	Plantation Technology	• Species selection on the basis of topography, edaphic conditions, climate etc. • Assessment of plantation area and soil analysis before commencing plantation. • Maintaining soil card/ water quality data- basic soil parameters like pH, soil depth, moisture composition etc. • How to select species based on soil conditions. • Plantation of Shrubs. • Removal of Lantana & Parthenium
4.	GPS Survey Technology	• Basic features of GPS • Locating area and fixing data coordinates • survey, mapping • Identification of land and Khasra No.s. using TSM & DGPS. • Area calculation.
5.	Plantation Records	• Entry process • Inventory management. • Plantation Journal maintenance.
6.	Nursery Records	• Excel sheet preparation for records of saplings, creation, maintenance & disposal.
7.	Bird Watching	• Species identification • Bird migration • Identification of bird call • Nesting behaviour • Data collection, preparation of bird census etc. • Feeding habit • Handling of Camera Traps • Census of Wild Animals
8.	Computer and Data Handling	• Data management, archived or disposal • MS Word, Excel, PowerPoint, Access, Google Drive. • Handling of different online portals.

9.	Wildlife handling and safety technique, first aid	• First Aid method • Technique of rescue, rehabilitation & release of wild animals.
10.	Wildlife monitoring	Implanting monitoring devices (eg. collars, leg bands, back packs or data loggers).
11.	Communication skill	Team work culture, communication skill etc.
12.	Detection of Offences	• Arrest, taking offenders to Magistrate, release on bail. • Steps to be taken when detecting encroachment. • Steps to be taken when somebody hampers official work. • What are offences under Delhi Preservation of Trees Act, 1994 and how to proceed in tree offences. • What are offences under Wildlife (Protection) Act, 1972 and details of steps to be taken under this Act. • Applicable areas of Forest (Conservation Act), 1980 to detect offences.
13.	Wildlife Crime	• Steps to be taken for evidence collection • Procedure for arrest and seizure • Detection of crimes and steps to be taken for booking of wildlife offences
14.	Gender Sensitization	• Different Forms of violence against women in the workplace. • Types of abuse – Physical, psychological, sexual. • Awareness building on rights, laws and entitlements and how to access. • Processes to access Rights & Acts for violence against women.

Mahatma Gandhi Institute for Combating Climate Change, Govt. of NCT of Delhi is being strengthened as Forest Training Institute to impart training for all stakeholders and The Delhi Forest Department will conduct the series of training sessions through MGICCC, Govt. of NCT of Delhi.

7.3 Awareness Campaigns

The Hon'ble Supreme Court has imposed the task upon Govt. of NCT of Delhi to sensitize the public of the State apropos the urgent need to augment and preserve the ecology of Delhi, since the citizens of NCT of Delhi have had and would continue to have the facility of the metro rail, and other infrastructures in coming years. Therefore, it has been directed by the Hon'ble Court that Govt. of NCT of Delhi may involve greening agencies, school and college students, educational institutions, Non Governmental Organizations, Citizen Welfare Associations, public servants, enforcement agencies and every citizen or person who is interested in the ecology of NCT of Delhi to plant trees/saplings and ensure that they are nurtured and protected so that the NCT of Delhi would in passage of time have more greenery leading to afforestation. The aforesaid direction is issued having regard

to the precautionary principle as well as principle of sustainable development by ensuring citizens' participation in the preservation of the environment and ecology.

To ensure the above, the Department of Forest and Wildlife, Govt. of NCT of Delhi has initiated the process to conduct awareness campaigns in coordination with MGICCC, Govt. of NCT of Delhi.

7.4 Conservation Education Centre at Asola Bhatti Wildlife Sanctuary

The Bombay Natural History Society (BNHS), a pan-India wildlife research organization, has been promoting the cause of nature conservation for the past 134 years, since 1883. Registered under Societies Registration Act in 1920 at Mumbai, BNHS has vast experience about the habits of indigenous and migratory birds which is being effectively utilized at Asola Bhatti Wildlife Sanctuary. The Bombay Natural History Society (BNHS) is working in collaboration with the Delhi Forest Department to aid in better management of Asola Bhatti Wildlife Sanctuary. BNHS set up a Conservation Education Centre (CEC) in Delhi on 18th June 2004 which was inaugurated on 15th February 2005 to create environmental awareness amongst the citizens of Delhi, particularly through Eco-clubs of school children, teachers, teacher trainers, etc. The project aimed at developing and delivering environment education programs to raise visitors' awareness about nature conservation. Currently, CEC is functioning in project mode, a joint venture of the Government of NCT of Delhi and BNHS, and serving as an important link between the Government and students/public for disseminating information/education on wildlife, environment and forestry ecosystem.

It also organizes nature trails i.e. butterfly, palash, teetar and black buck exposing the participants to the wilderness to have firsthand experience of the dynamics of nature. This organization helps Forest Department to create a seed bank for seeds of native trees of Delhi. It is engaged in development of city forests along with butterfly parks, duck ponds, Lily pond, wildlife garden, vegetable garden, spiral herb garden and rockery for outdoor demonstrations for schools programs cactus garden etc in Southern Ridge area. The butterfly park at Asola is created in a 3 acre area with plantation and maintenance of 60 native host plant varieties and recorded 85 butterfly species. Informational boards are also installed in the park. Aravalli forest centre has been developed in a 4 acre area which is designated for plantation and maintenance of 65 native plant varieties of Aravalli hills. Various social awareness programmes are also conducted by BNHS like Swachh Bharat Abhiyan, Wildlife Week, Sparrow Day, World Environment Day, International day of Forests, Van Mahotsav, World Wetland Day, and World Monkey Day. Audio-visuals and film shows on conservation of wildlife and protection of their habitats including climate change are also being regularly arranged in makeshift auditorium in the office complex of the DCF (South) at Tughlakabad for the students and other stakeholders.

7.5 Celebration of World Environment Day

On the 50th year of World Environment Day, The Department of Forest and Wildlife, Govt. of NCT of Delhi had celebrated the World Environment Day on 5th June 2021 with the aim of "Ecosystem Restoration", wherein the focus was on undoing the damages done to ecosystems by restoring them. The Department had reaffirmed its efforts on this auspicious day and carried out the following activities to restore the ecosystem of Delhi:

The World Environment Day is celebrated every year on 5th June throughout the globe. Started off by the UN General Assembly way back in 1972 to commemorate the inaugural function of the Stockholm Conference on Human Environment; annual observance of the World Environment Day with a central theme pertaining to the Environment started from the year 1974.

- **Publishing of Booklet on Immunity Boosting Plant Species:** A booklet on 13 Immunity Boosting Plant Species, namely, Curry Patta, Amla, Neem, Bahera, Jamun, Amrood, Arjun, Sahajan, Bael Patra, Nimbu, Aloe Vera, Tulsi and Giloy was prepared and published by the Department of Forest and Wildlife, Govt. of NCT of Delhi on this auspicious day of environment. The booklet highlights mainly the cultivation package and the medicinal uses of these species. The booklet was inaugurated by Sh. Gopal Rai, Hon'ble Minister (E&F), Govt. of NCT of Delhi and his family, and Pr. Chief Conservator of Forests, Govt. of NCT of Delhi.



Inauguration of Booklet on Immunity Boosting Plant Species

- **Ceremonial Plantation and Distribution Programme in Bungalow of Hon'ble Minister (E&F), Govt. Of NCT of Delhi:** Plantation and distribution of few medicinal plants among the 13 species stated earlier, were been undertaken by Sh. Gopal Rai, Hon'ble Minister (E&F), GNCTD and Senior Officers of the Department in the residence of the Hon'ble Minister (E&F), Govt. of NCT of Delhi.



Delhi's Forest: At a Glance

- **Organization of Webinar:** Bombay Natural History Society (CEC-Delhi) in collaboration with Department of Forests and Wildlife, Govt. of NCT of Delhi had organized an online webinar on “Ecosystem Restoration” for Forest staff.
- **Painting/ Drawing and Storytelling Competition:** Online painting and story telling competitions were organized by all the four Divisions of the Department for school children on the themes of forests, wildlife, nature preservation etc.



- **Waste Collection Drive:** Waste and plastic collection drive was organized by South Forest Division to clear the plastic wastes from Asola Bhati Wildlife Sanctuary and by North Forest Division to clear the waste from both the ranges that come under the division.
- **Ceremonial Plantations:** Ceremonial Plantations were been conducted by Dy. Conservator of Forests (South), (West), (North) and (Central) along with the staffs of territorial divisions of the Department at different locations like the Central Ridge, Asola Bhati Wildlife Sanctuary, Office of DCF (West) etc. In this ceremonial plantation programmes the Department had also involved staff of Delhi Police and Home guards.







Photographs of Ceremonial Plantations of World Environment Day 2021

- Various Competitions: Online essay writing competition, poster making competition, documentary making competition etc. was arranged by the divisions for school children of the State on the theme of Environment.
- Awareness Generation Programmes: To create awareness in common public of the city, banners were been displayed by territorial divisions in prominent locations of the state. Motivational drives to plant and restore ecosystem were also been conducted to motivate the nearby villagers of the DCFs Offices.

7.6 Celebration of Van Mahotsav

- During Van Mahotsav celebrations from 26th June to 9th July, 2021 all the Ministers of Delhi participated in the tree plantation festival and carried out ceremonial plantations and distribution of saplings. Tree plantation and distribution of saplings were also done by the Hon'ble Members of Legislative Assembly, Delhi in all 70 Legislative Assembly Constituencies during this festival.

'Van Mahotsav' is an annual tree planting festival that takes place every year during Monsoon season. During this festival crores of trees are planted all over India. In 1950, it was started by K. M. Munshi, the Union Minister for Agriculture and Food at that time. It was started to create awareness in the mind of the people for the conservation of forests and planting and nurturing of new trees.

'Van Mahotsav' is celebrated by planting trees or saplings in homes, offices, schools, colleges, etc. Awareness campaigns are held at various levels. Novel promotions like free distribution of saplings are also taken up by various organizations and volunteers. The planting of trees during the festival serves various purposes like providing alternative fuel, increase production of food resources, helps create shelter-belts around fields to increase productivity, provide food for cattle, offers shade and decorative landscapes, helps conserves soil deterioration, etc. The festival educates the awareness of trees among people and portrays the need of planting and tending of trees, as trees are one of the best ways to prevent global warming and reduce pollution.

Thirteen medicinal plant species specially identified for their immunity boosting properties against Covid-19, such as Curry patta, Amla, Neem, Bahera, Jamun, Amrood, Arjun, Sahajan, Bael Patra, Nimbu, Aloe Vera, Tulsi and Giloy were distributed to the public apart from other native plant species

of Delhi from nurseries of the Department of Forest and Wildlife, Government of National Capital Territory of Delhi and Delhi Parks and Gardens Society, Government of National Capital Territory of Delhi. A Booklet on the package of practices of these 13 medical plants were also distributed to all the participants.





Celebration of Van Mahotsav by Govt. of NCT of Delhi during 2021-22

7.7 Celebration of Wildlife Week

The Department celebrated Wildlife Week from 2nd October, 2021 to 8th October, 2021. Wildlife Week celebration was inaugurated by Sh. Gopal Rai, Hon'ble Minister (Environment and Forest), Govt. of NCT of Delhi followed by flagging off of Cycle Rally of Environmentalists and Wildlife Enthusiasts, release of Asola Bhati Wildlife Sanctuary Trail brochure, distribution of appreciation certificates to departmental staff by Hon'ble Minister (E&F), Govt. of NCT of Delhi. During this week Department of Forest and Wildlife organized painting and slogan writing contest for school and college students, bird and butterfly walk and on-spot photography contest for public. Photographs of the festival is presented as below:



Celebration of Wildlife Week 2021-22

7.8 Calendar of Forestry Extension Programmes for 2022-23

Every year the Delhi Forest Department celebrates various forestry programmes like World Environment Day, Wildlife week, World Forestry Day, Van Mahotsav, etc., aimed at spreading conservation awareness among the people of Delhi. On this occasion activities like organization of rallies, planting and distribution of saplings, poster painting, photography competition, etc., are organized by the Department. The Forestry calendar for financial year 2022-23 is given at Table 7.2.

Table 7.2: Calendar of Forest and Wildlife Events

Name of the Event	Date of Event	Activities Proposed in 2022-23
World Earth Day	22nd April, 2022	Release of Forest Statistics.
World Biodiversity Day	22nd May, 2022	Release of book on native species of Delhi.
World Environment Day	5th June, 2022	Awareness campaigns, essay writing competitions, drawing competitions, story-telling programmes to be conducted on various themes related to Environment by different divisions of the Forest Department for the school children.
Van Mahotsav	Month of July, 2022	Inauguration of City Forests
World Wildlife Week	1st week of October, 2022	Release of book on Flora and Fauna of Asola Bhatti Wildlife Sanctuary.
World Wetlands Day	2nd February, 2023	Release of booklet on water conservation measures and its importance on ecosystems.
World Wildlife Day	3rd March, 2023	Release of Report on Census done in Asola Bhatti Wildlife Sanctaury.
World Forestry Day	21st March, 2023	Release of Green Action Plan 2023-24.
World Water Day	22nd March, 2023	Release of report on Third Party Audit of plantations done in 2019-20, 2020-21 and 2021-22.

Contact Details of the Department of Forests and Wildlife, Govt. of NCT of Delhi

S. No.	Offices	Name & Designation of officers	Office No.	Office Address	E-mail	Area in HA (Approx.)
1.	Head Office	Sh. Ishwar Singh, Principal Chief Conservator of Forests	011- 23370679	I.P Estate, New Delhi- 110002	pccf-gnctd@delhi.gov.in	148,300
		Sh. Nisheeth Saxena, Chief Wildlife Warden	011- 23370963		cwlw-dofw@delhi.gov.in	
2.	North Forest Division	Sh. Vipul Pandey, DCF (North)	011- 27201033	MGICCC, Bakhtawarpur Road, Bakoli, Alipur New Delhi-110036	dcfnorth.gnctd@gov.in	57,600
3.	West Forest Division	Sh. Navneet Kr Srivastava, DCF (West)	011- 23361879, 23361876	West Forest Division Mandir Marg, Mandir Lane, New Delhi-110060	dcfwest.gnctd@gov.in	44,000
4.	South Forest Division	Sh. Mandeep Mittal DCF (South)	011- 26044711, 26047329	Near Dr. Karni Singh Shooting Range, Tughlakabad, New Delhi-110044	dcfsouth.delhi@gov.in	26,000 includes 1960.932 Ha area of Asola Bhatti Wildlife Sanctuary
5.	Central Forest Division	Sh. Aditya Madanpotra, DCF (Central)	011- 23853561, 23853474	Kamla Nehru Ridge, New Delhi-110007	dcfcentral- gnctd@delhi.gov.in	20,672

TECHNOLOGICAL ADVANCEMENT IN GROUND MAPPING OF FOREST COVER

➤ **Technological Advancement in Data Assessment of Forest Cover From 1987-2005 (As Per India State of Forest Report, 1999 to 2005)**

As per ISFR report, the detailed assessments of the forest cover, growing stock, annual increment, species composition, biodiversity, non-timber forest products etc. is being done by FSI (Forest Survey of India). Since 1987 the forest cover of the country is being assessed by FSI using Remote Sensing Technology.

1. Data Source and Data Period:

- For the forest cover assessment, the satellite imagery is procured from the National Remote sensing Agency(NRSA), Hyderabad in digital form as well as FCC prints. The first report published in 1987 was based on Landsat data of US satellite having a resolution of 80mts.
- From the 2nd assessment, the resolution of the sensor has been improved to 30mts resolution.
- The IIRS satellite data has been used in fifth assessment before that, the data of Linear Imaging and self-scanning sensor LISS II of IRS-IB with a resolution of 36.25mts and LISS III data of IRS-1C and 1D satellites with a resolution of 23.5 mts have been used in assessment.
- The reflectance from the forest is dependent on the growth of the crown and its chlorophyll content.
- The data period most suitable for interpretation for most of the forest areas of our country is October to January.

2. Methodology used as per 1999 Report of ISFR: Visual And Digital Interpretation:

a. Visual Interpretation

- For visual interpretation satellite data is procured on specified scale of 1:2,50,000 scale in this case in the form of hard copy called FCC.
- A base map is created in the tracing sheet Mylar using SOI top sheet of corresponding scale. Selected details are taken from the topo sheet. The base map depicts latitude and longitude, districts boundaries, state boundaries, drainages etc. The base map is set on the imagery of the corresponding area to check the important features are overlapping with the satellite imagery.
- The interpretation of the imagery is done using interpretation keys based on tone texture location association.
- Delineation of the forest patches is done on light-table with the help of magnifying glasses. It results in separation of areas in the categories of dense forest, open forest, mangrove, scrub, non-forest, etc. on a map.

DELHI'S FOREST AT A GLANCE, 2022

- The forest cover map is then compared with the cover map of the preceding assessment. The changes respect to preceding assessment are marked and a change map is prepared. These maps are used for ground verification to check the veracity of interpretations. Errors detected during ground verification are rectified and corrections incorporated. The area is calculated using transparent dot grid template, the forest cover is compiled by district and state.

b. Digital Interpretation.

- For digital interpretation, satellites data is procured in digital from NRSA. Using DIP software's.
- For classification of the data first the non-forest areas are masked out from the scene by delineating them. SOI topo sheet, vegetation map of preceding cycle, ground truth information of the past are used for masking non forest areas.
- After masking out the non-forest areas density classification of the forest cover is done by NDVI transformation of the masked image. Threshold values of different density classes are determined on the forest classes and the forest cover is classified accordingly.

3. Scale of Interpretation:

- The first assessment in 1987 was done visually on 1:1 million scale.
- Thereafter, since 1989 the assessment is being done on 1: 2,50,000 scale.
- To enrich the information on forest cover and to make out most useful information 1:50000 scale is desirable, visually the quantum of work is likely to be increased manifold as the country is covered by 5200 sheets on this scale. Here the application of DIP has significantly reduced the time taken for interpretation.
- DIP techniques offers a more objective assessment of forest cover at a larger scale and better cartographic presentation, thus overcoming the limitation of visual interpretation to a large extent.
- The scattered small patches of forest plantation not discernible at smaller scale are included in the assessment on larger scale thus adding to forest cover.

4. Limitation:

- There are certain cartographic and technological limitation in the assessment of forest cover.
- In visual interpretation the minimum size in the imagery that can be mapped is 2*2 mm which corresponds to 25 ha on the ground on 1:2,50,000 scale and 1 ha on 1: 50,000 scale. Since the resolution of LISS-II and LISS III are 36.25mts and 23.5 mts

DELHI'S FOREST AT A GLANCE, 2022

respectively the plantation along the road, canal and rail of a width less than the resolution are not recorded.

- Considerable details on ground may be obscured in areas having clouds and shadows. It is difficult to interpret such areas without the help of collateral data.
- The reflectance of the young plantation with small crown and low chlorophyll content is not recorded by satellite sensors.
- Gregarious occurrence of busy vegetation like lantana, tea and coffee poses problems in delineation of forest as their reflectance is similar to that of the forest.
- The processing of satellite data and its generation in the form of paper prints may also cause tonal variation in hue affecting interpretation.

➤ **Technological Advancement in Data Assessment of Forest Cover in 2001 as per ISFR 2001:**

- Taking advantage of advancements in remote sensing technology and wealth of data accumulated by Forest Survey of India, the ISFR 2001 provides much more comprehensive status of forest and tree cover in the country than the previous seven reports.
- FSI has taken several initiatives to accomplish this. These new features, introduced for the first time in ISFR 2001, are highlighted below:
- Assessment of forest cover for the entire country using digital method Forest cover of the entire country has been assessed by interpreting satellite data using digital image processing (DIP) technique.
- This is in contrast with the previous assessments where visual interpretation of satellite data had been the main mode of interpretation for most of the states. Although, in 1999 assessment, forest cover of this state was interpreted digitally at 1: 50,000 scale, the information was reprocessed at 1: 2,50,000 scale to compare it with the 1997 assessment. The forest cover data given in ISFR 1999 was based on visual interpretation at 1:250,000 scale. Digital interpretation at 1:50,000 scale has several advantages over visual interpretation done at 1: 2,50,000 scale.
- It minimizes subjectivity prevalent in visual interpretation. It also enables delineation of small areas, which cannot usually be delineated by visual methods due to cartographic limitations. As a result, all the areas down to 1 ha in extent and having forest cover have been included - irrespective of whether they are within or outside the recorded forest areas. Similarly, blanks in excess of 1 ha in the forest areas can be identified and excluded, thereby giving more accurate information on forest cover.
- Assessment of tree cover at the national level using field inventory data Field inventory data have been used to assess tree cover in the country. Substantial tree resources exist in the country in the form of linear plantations along roads, canals,

etc., scattered trees on farmlands, homesteads and urban areas and blocks of plantations and woodlots smaller than 1 ha that could not be captured by remote sensing data used in the assessment. For assessment of such tree cover, data collected from field inventory, based on appropriate stratification and sampling techniques, have been used.

- Estimation of accuracy of forest cover classification A classification is not complete until its accuracy is assessed. For the first time, an independent and systematic assessment of accuracy of satellite data interpretation by FSI has been made and the results.

➤ **Technological Advancement in Data Assessment of Forest Cover In 2003 as Per ISFR 2003:**

- Additional class of forest cover: In all the previous eight State of Forest Reports, forest cover was classified into two broad categories: Dense Forest and Open Forest. Dense Forest included all lands with a forest cover of trees with a canopy density over 40 percent while Open Forest showed all lands with a forest cover of trees with a canopy density between 10 and 40 percent. Many well-meaning readers felt that the class “Dense Forest” was too wide and it encompassed a large range of crop density. Even significant changes in canopy density within this class would thus go unreported. In the 2003 ISFR, the earlier category of “Dense Forest” has been subdivided into two classes: “Very Dense Forest” (where canopy density is above 70 percent) and “Moderately Dense Forest” (where canopy density lies between 40 and 70 percent). Now with maps showing three classes of forest cover (instead of only two till now), it will be possible to monitor changes in forest quality more closely.
- The assessment is based on digital interpretation of satellite data for the entire country. The satellite data was procured from the National Remote Sensing Agency (NRSA), Hyderabad in digital form. For the assessment, LISS-III sensor data of IRS-1D satellite with a resolution of 23.5 m has been used. Data for nearly all the states pertained to the period from October to December 2002. These are the months when cloud cover is low and the deciduous trees still have leaves to provide satisfactory reflectance for the satellite sensors.
- It may be mentioned here that one scene of LISS III covers an area of about 20,000 km² (140 km x 140 km). Due to considerable overlap of (15 to 20 percent) among adjacent scenes were used.

➤ **Technological Advancement in Data Assessment of Forest Cover in 2005 as Per ISFR 2005:**

- Scale of interpretation over the years, the gap between data period and assessment year has reduced with the introduction of digital image processing (DIP).

DELHI'S FOREST AT A GLANCE, 2022

- Though the digital image processing was introduced in 1993, a complete switchover to this technology took place in the year 2001. It has now become possible to have one time data for the whole country and thus making the assessment specific to a reference year. For example, most of the data in the assessment ('ISFR 2005') pertains to November-December 2004. For the limited areas of North-East region and for A&N Islands, data of January-February 2005 was used due to non-availability of cloud free scenes. Due to enhancement in the scale of interpretation (1:50,000), it has been possible to capture forest cover patches down to 1 ha. The increase in the forest cover in 2001 & 2003 assessments was partially due to the capture of such patches.
- Digital interpretation has also made it possible to add one more canopy density class in the mapping of forest cover. Against the two density classes (dense forest between 40- 100% and open forest between 10-40%) earlier, it is now possible to classify forest cover in three density classes (very dense between 70-100%, moderately dense 40-70% and open 10-40%) since 2003.
- After reviewing the technological inputs in the forest cover assessments of the other countries, it appears that the spatial resolution and scale of interpretation used in India at the national and at the State level is optimal. Brazil uses 25 m spatial resolution whereas 250 m spatial resolution has been used in the project level assessments in other countries. Necessary expansion in hardware and software infrastructure has taken place in FSI to make the switchover in technology possible.
- The experience gained and the technological advancement over the years has helped in improving the accuracy of interpretation, thus leading to revision of the previous assessments. A comparative account of the revised estimates on forest cover for the period starting from 1987 to 1995 after incorporating interpretational corrections was published in 'ISFR 1997'.
- With the adoption of new technology in 2001 when the assessment for the entire country was done digitally on 1:50,000 scale, a large number of additional forested patches were captured. Since these patches were outside the areas of the previous assessments, they needed detailed ground verification. But the same could not be done comprehensively due to paucity of time and lack of human resource. As a result, many patches were wrongly interpreted.
- It has been possible to rectify these errors with detailed ground truthing in subsequent assessments, i.e., of 2003 and 2005. In addition, some rectification of the errors was done on account of radiometric and geometric errors of satellite data. The quality of satellite data (IRS- P6, LISS III), which is available since 2003 is also found to be superior in terms of radiometry and shadow compared to that of IRS 1C/1D which FSI, was using until 2003.
- Refinement in Methodology of Forest Cover Assessment FSI has been following the raster-based approach in forest cover mapping, since the satellite imagery is in the

DELHI'S FOREST AT A GLANCE, 2022

form of pixels (raster) which makes the interpretation quick. The raster based maps are, however, not fully compatible for GIS analysis; as a result, interpretation of the satellite data in each cycle has to be done independently. This also makes the changes in forest cover prone to interpretational errors. FSI therefore proposes to switch over to a vector based approach in which forest cover would be mapped in polygons (vector) by defining clusters of pixels with boundaries. This will improve the cartographic presentation of the output, help map the changes more accurately and make the output available in GIS-ready format.

Table: Forest Cover Mapping over the Years as per ISFR

S. No.	State of Forest Report	Forest Cover (sq km)	Tree Cover (sq km)	Total (sq km)	Percentage of Geographic Area (%)	Image Resolution	Image Coverage Scale	Mode of Interpretation	Minimum Map able Area	Sensor Used
1.	1993	22	NA	22	1.48	36.25	1:250000	Visual	25	Landsat TM
2.	1995	26	NA	26	1.75	36.25	1:250000	Visual	25	IRSIB LISS II
3.	1997	26	NA	26	1.75	36.25	1:250000	Visual and Digital	25	IRSIB LISS II
4.	1999	88	NA	88	5.93	23.5	1:50000	Visual and Digital	25	IRSIC/ID LISS III
5.	2001	111	40	151	10.2	23.5	1:50000	Digital	1	IRSIC/ID LISS III
6	2003	170	98	268	18.07	23.5	1:50000	Digital	1	IRS-ID LISS III
7.	2005	176	107	283	19.09	23.5	1:50000	Digital	1	IRS-ID LISS III
8.	2009	176.58	123	299.58	20.20	23.5	1:50000	Digital	1	IRS-P6 LISS III
9.	2011	176.20	120	296.20	19.97	23.5	1:50000	Digital	1	IRS-P6 LISS III & IRS-P6 AWiFS
10.	2013	179.81	118	297.81	20.06	23.5	1:50000	Digital	1	IRS-P6 LISS III & IRS-Resourc esat-2&LISS III
11.	2015	188.77	111	299.77	20.22	23.5	1:50000	Digital	1	IRS-P6 LISS III & IRS-P6 LISS III & IRS-Resourc esat-

DELHI'S FOREST AT A GLANCE, 2022

S. No.	State of Forest Report	Forest Cover (sq km)	Tree Cover (sq km)	Total (sq km)	Percentage of Geographic Area (%)	Image Resolution	Image Coverage Scale	Mode of Interpretation	Minimum Map able Area	Sensor Used
										2&LISS III
12.	2017	192.41	113	305.41	20.58	23.5	1:50000	Digital	1	IRS-P6 LISS III & IRS-P6 LISS III & IRS-Resourc esat-2&LISS III
13.	2019	195.44	129	324.44	21.88	23.5	1:12500	Digital	1	LISS IV
14.	2021	195	147	342	23.06	23.5	1:12500	Digital	1	LISS IV

➤ Inference:

Due to the technological improvement in DIP processing and improved methodology introduced in each year by ISFR for the assessment of Forest has made significant jump in the forest cover over the past years. The limitation in each year has been addressed with newer methodology and DIP techniques as mentioned in the earlier lines which significantly shows the capability and technology and improvement in leaps and bounds in assessment of forest

Annexure 1.3
List of Projects Permitted Since 2019 by Delhi Forest Department

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantation	Felling	Total	
1.	2019	Central	Construction of cluster bus depot at Burari, New Delhi.	Transport Department	168	327	495	07.10.2019.
2.	2019	South	Site of 200 TPD Waste to Energy Plant at Tehkhand, adjoining existing SLF Okhla, New Delhi in 15 Acres (60702.8 SQM).	Tehkhand Waste to Electricity Project Limited	45	160	205	30.01.2019
3.	2019	South	Reconstruction of US Embassy Office and Utilities Building at Plot No. 1, Block E&F, Chanakyapuri, New Delhi in 13.75 hectare	M/s Roopak Kothari & Associates	35	170	205	20.06.2019
4.	2019	South	Redevelopment of GPRA Colony at Thyagraj Nagar, New Delhi.	Central Public Works Department	42	1	43	24.12.2019
5.	2019	West	Construction of DTC Bus DepotII at Ghumanhera, Delhi in 2.40 hectare (24051 SQM).	Delhi Transport Corporation	02	43	45	11.03.2019.
6.	2019	West	Construction of DTC Bus Depot at Mundela Kalan, Delhi in 1.934 hectare.	Delhi Transport Corporation	Nil	16	16	28.03.2019.
7.	2019	West	Dwarka Expressway from Shiv Murti, NH-8 to Road Under Bridge near Sector21, Dwarka (Km. 0.000 to 5.300)	National Highway Authority of India	4425	Nil	4425	31.12.2019

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantati on	Fellin g	Total	
			Package-I in the State of Delhi.					
8.	2019	West	DTC Bus DEPOT-I at Ghumenhera, Delhi.	Delhi Transport Corporation	Nil	74	74	23.12.2019
9.	2019	West	Redevelopment of General Pool Residential Colony at Mohammadpur, New Delhi.	Central Public Works Department	213	Nil	213	22.10.2019.
10.	2019	West	Rehabilitation and up-gradation of Rithala Phase-I, Waste Treatment Plant, Rithala, New Delhi.	Delhi Jal Board	88	Nil	88	22.10.2019.
11.	2019	West	Dwarka Expressway Package-II from Road under Bridge, Near Sector-21, Dwarka Delhi to DelhiHaryana Border.	National Highway Authority of India	3736	2624	6360	12.07.2019.
12.	2019	West	Construction of N.G. Pond of N.G. Pond Drain, Najafgarh, Delhi in 2.2841 hectare.	Irrigation & Flood Control Department	180	09	189	04.07.2019.
13.	2019	West	Construction of existing Hospital Blocks in Rao Tula Ram Memorial, Govt. Hospital at Jaffarpur, Delhi in 1.35 hectare	Public Works Department	23	Nil	23	21.06.2019.
14.	2019	West	Construction of Dwarka Expressway Package-II from rail under Bridge, Near Sector-21, Dwarka Delhi to Delhi-Haryana Border.	National Highway Authority of India	1981	694	2675	13.03.2019.

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantati on	Fellin g	Total	
15.	2019	West	Construction of two Cluster Bus Depots including Boundary wall at Sector-37, Rohini, Delhi110085 in 4.9 hectare.	Transport Department	06	16	22	02.04.2019.
16.	2020	Central	Kondli Phase I (45.5 MLD), Phase II (11.37 MLD) and Phase III (45.5 MLD) with effluent standards of BOD-10 mg/1, TSS-10mg/1 or better under YAP-III Package K3.	Delhi Jal Board	181	311	492	19.02.2020.
17.	2020	South	Constructions of proposed sanitary land fill at Tehkhand Okhla Industrial Area Phase-I, New Delhi.	South Delhi Municipal Corporation	660	76	736	03.01.2020.
18.	2020	South	South Asian University Campus, Maidan Garhi, New Delhi.	South Asian University	193	179	372	04.03.2020.
19.	2020	South	Redevelopment of Residential Colony at West Ansari Nagar Campus of AIIMS, New Delhi.	NBCC India Ltd.	69	02	71	13.05.2020.
20.	2020	South	Redevelopment of GPRA Colony at Sarojini Nagar in Phase-I, New Delhi.	NBCC India Ltd.	927	22	949	16.10.2020.
21.	2020	South	Redevelopment of Ayur Vigyan Nagar at August Kranti Marg, New Delhi.	NBCC India Ltd.	298	17	315	27.08.2020.
22.	2020	South	Proposed Grameen Vikas Bhawan, adjacent to Pandit	Central Public	38	14	52	15.09.2020.

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantation	Felling	Total	
			Ravi Shankar Shukla lane KG Marg, behind MEA Ambassadorial Suits, New Delhi.	Works Department				
23.	2020	South	Proposed Expansion and Restoration of Existing Parliament Building at Plot No. 118, New Delhi.	Central Public Works Department	404	Nil	404	16.09.2020.
24.	2020	West	Widening of road no. 320 (from RUB Shalimar Bagh towards Max Hospital), Shalimar Bagh, Delhi.	Public Works Department	58	18	76	07.09.2020
25.	2020	West	Construction of International Boys Hostel at IARI, Pusa, Delhi.	Indian Agricultural Research Institute	36	01	37	03.11.2020
26.	2021	Central	Construction of Maujpur to Majlis Park corridor of Delhi MRTS Project Phase-I, New Delhi	DMRC	961	507	1468	22.02.2021
27.	2021	Central	Implementation of Regional Rapid Transit System in DelhiGhaziabad-Meerut Corridor RRTS alignment.	NCRTC	327	891	1218	26.02.2021
28.	2021	Central	Construction of Loop in Loop out (LILO) of both circuit of 400 KV D/C Mandola-Bawana Transmission line at Maharani Bagh S/S (in front of Sarai Kale Khan ISBT), New Delhi.	Power Grid Corporation India Limited	100	299	399	30.07.2021
29.	2021	Central	Implementation of Regional Rapid	NCRTC	280	263	543	01.12.2021

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantation	Felling	Total	
			Transit System in Delhi NCR-Requirement in Delhi Ghaziabad-Meerut Corridor RRTS alignment, New Delhi					
30.	2021	North	Construction SemiPermanent/ Temporary ICU Hospital at Sultanpuri, New Delhi.	Public Works Department	22	05	27	29.12.2021
31.	2021	South	Construction of 564 MLD (124 MGD) WWTP with Effluent Standard of BOD-10 Mg/l, tss- 103 mg/l or better and Power Generation on DBO Basis at okhla under YAP-III	Delhi Jal Board	18	391	409	19.01.2021
32.	2021	South	Construction of GB Pant Integrated Technical Campus Situated on Kh. No. 400,401,1131/402, 1187/1130/402, 440, 444, 445, 446, 447, 448, 449, 450, 451, 453, 454, 1721/452, 455 of village Bahapur, at Okhla Industrial Estate Phase-III, New Delhi	Department of Training & Technical Education	115	160	275	19.01.2021
33.	2021	South	Gadaipur Bandh Road from Abhinav farm to police post near T-junction of	Public Works Department	0	146	146	28.01.2021

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantation	Felling	Total	
			Mandi Road in ward no-175, South Zone, New Delhi.					
34.	2021	South	Construction of Khanpur to Sangam Vihar section of Aerocity to Tughlakabad corridor of Delhi MRTS Project Phase-IV, New Delhi.	Delhi Metro Rail Corporation Ltd. (DMRC),	299	151	450	16.02.2021
35.	2021	South	Implementation of Delhi-GhaziabadMeerut Regiona Rapid Transit System (RRTS) Corridor (from Sarai Kale Khan to centre of River Yamuna)	Delhi National Capital Region Transport Corporation (NCRTC),	583	142	725	02.03.2021
36.	2021	South	Construction of Group Housing at Property No. B-319, Okhla Phase-I, New Delhi	Godrej Vestmark LLP	32	8	40	21.06.2021
37.	2021	South	Redevelopment of GPRA Colony at Netaji Nagar (Pkg.-II), New Delhi.	NBCC (India) Limited	1314	325	1639	21.06.2021
38.	2021	South	Redevelopment of General Pool Residential Colony (Phase-I) at Kasturba Nagar, New Delhi.	Central Public Works Department (CPWD)	632	32	664	06.10.2021
39.	2021	South	Redevelopment of Safdarjung Railway Station Jointly by IRCON & RLDA, Delhi.	Rail Land Development Authority	210	323	533	07.10.2021
40.	2021	South	Proposed Expansion and Restoration of Existing Parliament	Central Public Works	404	0	404	09.11.2021

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantation	Felling	Total	
			Building at Plot No. 118, New Delhi.	Department (CPWD),				
41.	2021	South	Development of Economic Corridors, Inter Corridors and Feeder Routes to improve the efficiency of freight movement in India under Bharatmala Pariyojna (Lot-4/ Package-I) NH-148 NA, New Delhi.	National Highway Authority of India (NHAI)	89	585	674	11.11.2021
42.	2021	South	Construction of 6 Lane access controlled Highway from DND Maharani Bagh to Junction with Jaitpur- Pushta Raod section of NH-148 NA (Design Ch.0.000 to 9.000) in the National Capital Territory of Delhi on Hybrid Annuity Mode under Bharatmala Pariyojana, New Delhi.	National Highway Authority of India (NHAI)	109	190	299	11.11.2021
43.	2021	South	Construction of RRTS Stabling Yard Alignment from Sarai Kale Khan at Chainage 950 to Chainage 1650 near Siddharth Extension and Sarai Kale Khan Station Yard at Chainage 0 to 200, New Delhi	National Capital Region Transport Corporation	120	24	144	03.12.2021
44.	2021	West	Rehabilitation and Upgradation of	Delhi Jal Board	905	5	910	20.01.2021

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantation	Felling	Total	
			Rithala Phase-II, Wastewater Treatment Plant, New Delhi.					
45.	2021	West	Construction of Wholesale Fruit and Vegetable Market at Village Tikri Khurd, Delhi	Delhi Agriculture and Marketing Board (DAMB)	96	39	135	22.01.2021
46.	2021	West	Construction of Line-8 Extension Metro corridor from Janakpuri West to Mukarba Chowk (Excluding 5.34 KM on Road No.-26 managed by PWD) and Mukarba Chowk to Deerawal Nagar (Excluding proposal for portion of cut and cover at Derawal Nagar) of Phase-IV of Delhi MRTS under DPTA, 1994	Delhi Metro Rail Corporation Ltd. (DMRC)	1963	977	2940	10.02.2021
47.	2021	West	Construction of Maujpur to Majlis Park corridor of Delhi MRTS Project Phase-I, New Delhi.	Delhi Metro Rail Corporation Ltd. (DMRC)	961	507	1468	22.02.2021
48.	2021	West	Construction of Loop in Loop out circuit of Bamnauli-Jhatikara 400 KV transmission line, Dwarka, Delhi.	Power Grid Corporation India Limited	53	139	192	30.07.2021
49.	2021	West	Construction of Urban Extension Road (UER)-II in five packages, Delhi.	National Highway Authority of India (NHAI)	4365	2314	6679	16.08.2021

DELHI'S FOREST AT A GLANCE, 2022

SN	Year	Jurisdiction	Project Name	Name of User Agency	No. of trees approved			Date of notification issued
					Transplantation	Felling	Total	
50.	2021	West	Construction of Urban Extension Road (UER)-II in five packages, Delhi.	National Highway Authority of India (NHAI)	4185	2223	6408	16.09.2021
51.	2021	West	Construction of 100 bedded Hospital at Rural Health Training Centre, Najafgarh, Delhi,	Ministry of Health & Family Welfare, Rural Health Training Center, Govt. of India, Najafgarh, Del	57	0	57	22.09.2021
52.	2021	Central	Construction of Semi-Permanent Temporary ICU Hospital at GTB Hospital Tahirpur Road, Dilshad Garden, Delhi.	Public Works Department	40	06	46	30.12.2021
53.	2022	West	Development/ Redevelopment of Vice President Enclave.	Central Public Works Department	396	-	396	14.01.2022
54	2022	Central	Redevelopment of New Delhi Railway Station, New Delhi.	Rail Land Development Authority	885	36	921	28.01.2022
55.	2022	North	Construction of semi-Permanent Temporary ICU Hospital at Raghbir Nagar, New Delhi.	Public Works Department	264	231	495	07.02.2022

DELHI'S FOREST AT A GLANCE, 2022

Annexure 2.1

Table-1: Assessment of Cost of Compensatory Plantation as Order on 02.03.2010

S. No.	Comments of Work	Unit of Work	Rate (Rs. per unit)	Amount per plant(In Rupees)	Remarks
1.	Fencing	Meter	4000	114.41 or say 120/-	45.76 running meter per acre for 640 plants to be planted per acre.
2.	Creation of plantation				
	Jungle clearance,leveling etc.	Hectare	5000	3.13	
	Uprooting of root stumps and site preparation	Hectare	5000	3.13	
	Digging of pits of the size 90 cm x 90 cm x 90 cm . In ordinary rocky soil	Per pit	126.66	126.66	
	Application of gypsum @ 5kg.per pit @ Re 1/- per Kg	Per pit	5000	5	
	Flooding the pit with water (lumpsum)	Per pit	4.5	4.5	
	Filling of pits with FYM (5 cft. per pit), good earth (5 cft. per pit), bone meal (5 Kg. per pit) and neem cake (5 Kg. per pit)(lumpsum)	Number	107.5	107.5	
	Cost of saplings (saplings of 6-7 ft height)	Number	50	50	
	Planting of saplings	Number	40	40	
	Irrigation during the month of planting	Number		28.3	
3.	Maintenance of saplings including watch and ward, watering at least thrice a week and casualty replacement for five years.	Per sapling per month	1938	1938	

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Comments of Work	Unit of Work	Rate (Rs. per unit)	Amount per plant(In Rupees)	Remarks
	Total estimated cost of creation and maintenance of 1(one) sapling including fencing.			2540	
4.	Number of saplings proposed to be planted in lie of removal of one tree	10			
5.	Number of saplings proposed to be planted by the applicant on private land	5			
6.	Number of saplings proposed to be planted by the Department at the cost of the applicant on Forest/government land	5			
7.	Cost of planting 5 saplings on forest/government land by Forest Department	Per sapling	2540/-	12700/-	
8.	Cost of planting 5 saplings on private land by Forest Department in case of failure on the part of the applicant to raise compensatory plantation (To be realized as part of refundable security deposit)	Per sapling	2540/-	12700/-	
9.	Administrative Expenses/Overheads@ 10% of the cost of activities undertaken by the Forest Department on raising compensatory plantation including fencing	Per tree felled		2540/-	
	Total amount to be realized from the applicant at the time of granting permission (inclusive of refundable and non-refundable amount)			27,940/- or say 28,000/-	

DELHI'S FOREST AT A GLANCE, 2022

Table-2: Assessment of Cost of Compensatory Plantation Applicable for Projects as Order on 02.07.2015

S. No.	Comments of Work	Unit of Work	Rate (Rs. per unit)	Amount in Rs. (For 1000 samplings/Ha)	Remarks
1.	Fencing	Meter	4000	10,000/-	-
2.	Removal of dead wood and dry bushes and malba etc. and leveling	Hectare	25,000	25,000/-	-
3.	Uprooting of root stumps, weed etc. and site preparation with good earth.	Hectare	6000	23,000/-	Site leveling for better soil moisture regime
4.	Mechanical digging of pits	Per pit	240	2,40,000/-	Procurement and good earth to the site
5.	Application of Cholorpyrphos and Gypsum for termite/laterite treatment	Hectare	7500	7500/-	Improvement of pH as alkalinity of soil is more than 8
6.	Flooding the pit with water	Per pit	25	25,000/-	To assess the kankar pan formation below top soil.
7.	Treatment of pits with FYM (5 cft. Per pit), bone meal (5 kg per pit) and neem cake (5 kg per pit)	Per pit	25	25,000/-	
8.	Cost of saplings	Number	80	80,000/-	
9.	Transportation cost of saplings from nursery to the site		10	10,000/-	

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Comments of Work	Unit of Work	Rate (Rs. per unit)	Amount in Rs. (For 1000 samplings/Ha)	Remarks
10.	Irrigation during month of planting and remaining months of the seven years of creation of plantation		25	21,00,000/-	
11.	FYM/neem cake, bone meal and insecticide for 7 years		15	12,60,000/-	
12.	Casualty replacement in 2 nd and 3 rd year for 20% of the plantation			36,000/-	Due to weather extremes, diurnal variation, poor establishment of saplings, pest infections etc.
13.	Watch and ward duty including monitoring and evaluation	Per sapling	12	10,08,000/-	
14.	Total estimated cost of creation and maintenance including fencing			49,49,500/-	49,50,000/- or say 50 lakh
15.	(a) Overheads/ administrative expenses @ 10% of the total cost of plantation. (b) Contingency @ 5%			49,94,950/- 2,47,475/-	4,95,000/- 2,47,500/-
16.	Total amount to be realized from the Project Authority at the time of granting permission			56,91,925/- or say 57 lakh	56,92,500/-

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Comments of Work	Unit of Work	Rate (Rs. per unit)	Amount in Rs. (For 1000 samplings/Ha)	Remarks
17.	Amount to be realized for removal of 1 tree from Project Authority	For planting and maintenance of 10 saplings for 7 years			57,000/-

Research Permissions Issued by the Department of Forest and Wildlife, Govt. of NCT of Delhi

S.No.	Name of Researcher/Supervisor	Title/Topic	Institute/University	Date of issuance of permission letter
1	Sh. Gaurav Barhodiya	Seeking approval for Herpetofaunal survey for baseline assessment of urban biodiversity and conservation	Department of Environmental Studies, University of Delhi	21.02.2022
2	Ms. Sonali Chauhan	Vegetation Ecology, Plant Invasions and Governance of Delhi Ridge Forests in Delhi	School of Human Ecology, Ambedkar University	24.11.2021
3	Ms. Monalisa Sen	Request for permission to undertake a short assignment on trees in Delhi	ICLEI - Local Governments for Sustainability, South Asia	24.11.2021
4	Sh. Ajay Immanuel Gonji	Ecology and urban adaptations of the Golden Jackal (Canis aureus) in Delhi Ridge.	School of Human Ecology, Ambedkar University	24.11.2021
5	Dr. Y.S.C. Khuman, Sh. Bhuvan Chopra	Evaluation of Ecosystem Services of Delhi Ridge Forest	Indira Gandhi National Open University	16.07.2021
6	Ms. Monica Kaushik	Testing the impacts of anthropogenic sounds in rural and urban soundscapes across India's cities	School of Human Ecology, Ambedkar University	07.07.2021

DELHI'S FOREST AT A GLANCE, 2022

S.No.	Name of Researcher/Supervisor	Title/Topic	Institute/University	Date of issuance of permission letter
7	Ms. Tanya Gill	Influence of personality traits in the tolerance behaviour of urban dwelling Rhesus macaques (Macaca mulatta)	Department of Anthropology, University of Delhi	07.06.2021
8	Ms. Tanu Prakash	Assessment of soil organic carbon stock in different land use and land cover in Delhi	Guru Gobind Indraprastha University, Delhi	07.04.2021
9	Ms. Khusboo Randhawa	Plant community structure and regenerating potential of native tree species of Delhi for effective management of urban forest in NCT of Delhi	Guru Gobind Indraprastha University, Delhi	18.03.2021
10	Dr. Y.S.C. Khuman, Sh. Bhuvan Chopra	Evaluation of Ecosystem Services of Delhi Ridge Forest	Indira Gandhi National Open University	07.02.2020
11	Sh. Chetan Agarwal	"Faunal Survey" in Asola-Bhatti Wildlife Sanctuary	Centre for Ecology Development and Research (CEDAR)	02.12.2019
12	Dr. Krishan Kumar, Sh. Akash Kumar Jaiswal	Study on singing activity of birds under different ecological conditions and its association with bird diversity	School of Environmental Sciences, Jawaharlal Nehru University	28.06.2019
13	Dr. Tuisem Shimrah, Ms. Khusboo Randhawa	Plant community structure and regenerating potential of native tree species of Delhi	Guru Gobind Indraprastha University, Delhi	03.07.2019

DELHI'S FOREST AT A GLANCE, 2022

S.No.	Name of Researcher/Supervisor	Title/Topic	Institute/University	Date of issuance of permission letter
		for effective management of urban forest in NCT of Delhi		
14	Dr. Sanjay Keshari Das, Sh. Mayankit Singh	"Reptilian Species" in Asola-Bhatti Wildlife Sanctuary	Guru Gobind Indraprastha University, Delhi	06.05.2019
15	Dr. Suresh Babu, Ms. Anukriti Bajpai	Population estimates and habitat associations of the Nilgai (<i>Boselaphus tragocamelus</i>) in Central Ridge, Delhi	Ambedkar University	30.05.2018
16	Dr. Krishan Kumar, Sh. Akash Kumar Jaiswal	Study on singing activity of birds under different ecological conditions and its association with bird diversity	School of Environmental Sciences, Jawaharlal Nehru University	15.02.2018
17	Ms. Rajlakshmi Mishra	Request for permission to carry out research on bats in Lutyen's area, New Delhi.	Guru Gobind Indraprastha University, Delhi	11.02.2016
18	Ms. Ishita Ganguly	Ecology of relocated Rhesus macaques (<i>Macaca mulatta</i>) and management of its conflict with humans in and around ABWLS, Delhi-NCR	Amity Institute of Wildlife Sciences, Amity University	11.02.2016
19	Prof. Krishan Kumar, Sh. Manoj Singh	A study of avian acoustics adaptation in habitats	School of Environmental Sciences, Jawaharlal Nehru University	30.10.2014

DELHI'S FOREST AT A GLANCE, 2022

S.No.	Name of Researcher/Supervisor	Title/Topic	Institute/University	Date of issuance of permission letter
		characterized by different background noise levels		
20	Dr. Sumit Dookia	Request for permission to carry out research on bats in the NCT of Delhi.	Guru Gobind Indraprastha University, Delhi	30.09.2014
21	Dr. Rahul Baishya	Vegetation analysis of selected forest areas, studying seasonal variation in Nitrogen, Phosphorus and Potassium, to estimate soil carbon sink and study soil carbon sequestration potential, etc.	Department of Botany, University of Delhi	25.03.2014
22	Sh. P.K. Mathur	Study on resource selection by Black Kites (Milvus migrans)	Wildlife Institute of India, Uttarakhand	10.03.2014
23	Sh. V.B. Mathur	A study on resource selection by Black Kites (Milvus migrans) in the urban landscape of NCT, India.	Wildlife Institute of India, Uttarakhand	06.12.2012

DELHI'S FOREST AT A GLANCE, 2022

Annexure 3.1

Table:: Vide Notification No. F. No. F.SCO.32(C)Noti. 80-81, dated 10.04.1980 the specific areas below are declared as Protected Forest:

S. No.	Name of Work	Zone Ownership	Distt.	Tehsil	Village	Area (Acres)	Boundary
1.	Distt. Park i/c Hauze Khas Picnic hut Lake, Rose Garden etc.	E-4 DDA	Delhi	Mehrauli	Huaz Khas Humayon PurJeya Serai	400	North: 80' wide Rd(Harsukh 3d) DDA Residential SchemeSafderjang Block B. South: Outer Ring Road. East: Safderjang Residential Scheme C- Block & Green Park. West: M-Avenue extension linking RingRoad & outer Ring Rd.
2.	Jahan Panch City Forest	F-9, DDA	Delhi	Mehraulli	Tughlakabad Khirkihirag Delhi, MadanGir.	800	North: Group HousingScheme E.P.D.P. ColonyGreater Kailash – II Hasjid Moth Phase – III Residential Scheme Chirag Delhi & Kalkaji. South: HamdardInstitutional East: Road No.14 Linking Kalkaji, Mehrauli 150' wide, Badarpur Rd. West: Road Linking outer Ring Rd.& Badarpur Mehrauli Rd
3.	Basant Nagar Moradabad Pahari area.	F-12 DDA Land except Monument	Delhi	Mehrauli	Basant Nagar, Kasum purMoradabad Pahari area	200	North: Guru Harkishan Singh School & DTC Depot. South: Indian Airlines staff quarters & boundaryof acquired land in villageKasumpur. East: 100' wide Rd.passing on the west ofNehru University.
4.	Vasant Vihar Distt. Park	F-12 DDA L&DO Land	Delhi	Mehrauli	Mohd. PurMunirka	20	North: Guru Harikishan Singh School & DTC Depot. South: Indian Airlines staff quarters & boundary of acquired land in village Kasumpur. East: 100' wide Rd,passing on the west ofNehru University. West: Vasant Vihar Colony.
5.	Dhaura Kuan Complex	F-6 Defence Land	Delhi	Mehraulli	Cantt. Area	200	North: Ring Road, University Complex. South: Subrato Park Colony. East: Cantt. Boundary along with University complex. West: Gurgaon Palam Road.
6.	Southern Ridge Area	G-5 D-10L&DO Land	Delhi	Delhi	Nazul Estate	2022	North: Link Rd. Pusa Road. South: Patel Marg uptoDhaura Kuan Round about. East: Road between Talkatora and Presidentestate.

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Name of Work	Zone Ownership	Distt.	Tehsil	Village	Area (Acres)	Boundary
							West: Military area starts from D. Kuan round about to Rajendra Nagar, New & Old.
7.	Nehru University Afforestation	F-12 DDA Land	Delhi	Mehrauli	Katwaria Sarai Ber Sarai Masood Pur	200	North: Road connecting outer Ring Rd. & Mehrauli Rd. going via Ber Sarai, Katwaria Sarai & Qutab Hotel. South: Mehrauli city & Qutub Minar area. East: Mehrauli Rd. & Boundary of Quila Rai Pithora. West: Nehru University complex.
8.	R. Block Rajender Nagar	B-7 DDA Land	Delhi	Delhi	Nazul Estate	205	North: Ridge Rd. Linking upper Ridge Rd. to Pusa Rd. & R. Block New Rajender Nagar. South: Todapur & Dashare. East: Military area & Residential area. West: Dr. Krishna Menon Rd. (Inderpuri Rd.) from Pusa gate to Das Ghara
9.	Bhuli Bhatyari area	B-3 DDA Land	Delhi	Delhi	Nazul Estate	40	North: Link Rd. from Pachkuian Rd. to Pusa Rd. crossing. South: Rabindra Rangshalla. East: Reading Road NDMC Quarters. West: Upper Ridge Rd. going to Rabindra Rangshalla from Link Rd. & Bhooli Bhatyari Water Reservoir.
10.	Distt. Park Gokul Puri.	E-14 E-15 E-16 DDA Land	Delhi	Delhi	Gokul Puri & NE	7.5	North: Boundary of acquired land of village Gokulpuri. South: Wazirabad Rd. from Jamuna River to Nand Nagri. East: Boundary of U.P. & Delhi Estate. West: Eastern Jamuna Canal.
11.	Distt. Park Jhilmil Tabarpur	Z-6 DDA Land	Delhi	Delhi	Jhilmil Tabarpur	20	North: Road No.69 from G.T. Road to Tabar Puri. South: G.T. Road East: Seemapuri Road, West: Linking to Rd. No.
12.	Zonal Green Area Kalyan Puri, Trilokpuri, Khichripuri, Rd. No.56, Dilshad Garden.	E-16 DDA land	Delhi	Delhi	Kotla Patpar Ganj, Khichripur Gazipuri, Mandoli Fazalpur.	373	North: National Highway Mother Dairy Village Mandooli. South: Village Kotla. East: Hindon cut. West: Village Patpar Ganj.
13.	Northern Ridge Area.	C-11 DDA Land	Delhi	Delhi	Civil Station	400	North: Alipur Rd., office of the development commissioner & Vishwa Vidyalaya Marg. South: Rd. going to ISBT from

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Name of Work	Zone Ownership	Distt.	Tehsil	Village	Area (Acres)	Boundary
							old Sabji Mandi. East: Rajpura Road. West: Malka Ganj, Kabir Basti.
14.	<NE> between Sadhora Kalan, Nemri, Gulabi Bagh& Darbar Khan Nursery and other areas.	H-3 DDA Land	Delhi	Delhi	Sadhorakalan Neemeri, Sadhara Khurd.	100	North: Sadhora Kalan & Road in Chowki No.2 to Ashok Vihar. South: W.J. Canal, Kalidas Marg. East: Gulabi Bagh colony. West: Shastri Nagar, N.G. Drain.
15.	Area between Hill Road & Ludlo Castle Road.	C-11 L&DO Land	Delhi	Delhi	Civil Station	17	North: Under Hill Road. South: Ludlo Castle Road. East: Private Bungalows. West: Private Bungalows.
16.	Orchard in Wazirpur near Bharat	H-3 DDA Land	Delhi	Delhi	Sadhora Kalan Wazirpur, Neemri	120	North: Wazirpur Residential Scheme Phase – III.
17.	Maya Puri Green Belt.	G-8 DDA Land	Delhi	Mehrauli	Naraina Tehar	5	North: G-8, Rajouri Garden, G-14 Society, Subash Nagar. South: Rewari Line, Industrial Area Phase – J& III along Road connecting Ring Road & Jail Road. East: Ring Road. West: Jail Road
18.	Hastal Afforestation	G-16 DDA Land	Delhi	Mehrauli	Poshangirpur Hastal Budhela	40	North: Najafgarh Drain. South: Najafgarh Road. East: Vikaspuri. West: Uttam Nagar, JJC.
19.	Area between Inderpura Naraina JJ Colony	G-5 DDA Land	Delhi	Mehrauli	Naraina	32	North: Pusa Institute. South: Naraina Cantt. Board. East: Todapur & Old Nazul land. West: Ring Road.
20.	Afforestation M.P. Green area Tagore Garden.	G-9 DDA Land	Delhi	Mehrauli	Talarpur	55.26	North: N.G. Drain, Mukherjee Cly. South: N.G. Road. East: Tagore Garden West: Shyam Nagar.
21.	Orchard Nangloi Sayed.	G-17 DDA land	Delhi	Mehrauli	Nangloi Sayed.	257.56	North: Nangloi Drain. South: N.G. Drain East: Nangloi Sayed, Paschimpuri Residential. West: U. Nilothi & Nangloi Drain.
22.	District Park, Rohtak Road, Cooperative Society.	G-17 DDA Land	Delhi	Mehrauli	Jawala Heri.	35	North: Pashimpuri Residential area. South: Outer Ring Road. East: Najafgarh Drain. West: Co-operative Society.
23.	Afforestation M.P. Green G-8.	G-18 DDA Land	Delhi	Mehrauli	Tihar	65	North: Tihar Village. South: Janta Quarters Jail Road. East: Hari Nagar Residential. West: Tilak Nagar Najafgarh Drain.
24.	Afforestation M.P.	G-17 DDA Land except	Delhi	Mehrauli	Basai Darapur Khiala Keshopur	54.58	North: Cultivation land of Hastal.

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Name of Work	Zone Ownership	Distt.	Tehsil	Village	Area (Acres)	Boundary
	Gree narea. Najafgarh Drain.	Vill.Khyala			Chowkhandi Buddela Nangloi Sayed Jaawala Hori <NE>.		South: Ring Road. East: Punjabi Bagh, Paschimpur, Co-operative Society land. West: J.J. land of Raghubir Nagar <NE> Village sewerage plant, Vikas Puri
25.	District Park in between Pitam Pura Co- operative Housing Society.	H-4 DDA land	Delhi	Mehrauli	Sultan Pur Mazea Madipur Shakurpur, Peer Garhi.	185	North: Saraswati Vihar. South: Rani Bagh, Shakur Pur Railway line to Rohtak. East: Road No.41 connecting Ring Road to outer Ring Road. West: Outer Ring Road from Mangol Puri leading to Railway line.

Plantation Sites of Department of Forest and Wildlife, Govt. of NCT of Delhi**List of Plantation Sites****I. Central Division**

S. No.	Site Location	Approx. Area (in Ha)	Scheme	Year
1.	Shahdara Link Drain near Samachar Apartment	Appx. 3 km	State Scheme/ Departmental	1998-99
2.	Anand Vihar Trunk Drain No.2	Appx. 2 km	State Scheme/ Departmental	1998-99
3.	Sonia Vihar	60	State Scheme/ Departmental	1999-2000
4.	Chauhan Patti	27	State Scheme/ Departmental	1998-99 2012-13
5.	Hindon Cut	15.88	DPTA	2006-07 2007-08
6.	Garhi Mandu	297.6	DPTA/Departmental/Gap Filling	2000-2021
7.	ITO Chungi	12.83	DPTA/Departmental	2010-11 2011-12 2014-15 2017-18 2021-22
8.	Saleem Garh	10.69	DPTA/Departmental	2011-12 2012-13
9.	Millenium Bus Depot Back Side Front Side	1.45	State Scheme/ Departmental	2012-13
10.	Chat Pooja Ghat	3.2	State Scheme/ Departmental	2012-13
11.	Kondli STP Premises	5.576	DPTA	2014-15
12.	Ghazipur Drain NGT Order	1 Km	DPTA	2015-16
13.	I&FCD Drains LG Order Plantation		State Scheme/ Departmental	2017-18
14.	Ghazipur Drain	1 Km appx	State Scheme/ Departmental	2021-22

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Site Location	Approx. Area (in Ha)	Scheme	Year
15.	Shastri Park (near Shastri Park metro station)	8.354	FCA (CAMP A Fund)	2015-16
16.	Near Shastri Park metro station	2.44	FCA (CAMP A Fund)	2021-22
17.	Shastri Park metro station adjoining Yudhister on Eastern Bank	4.85	FCA (CAMP A Fund)	2021-22
18.	Shastri Park metro station adjoining Yudhister on Eastern Bank	4.3	FCA (CAMP A Fund)	2021-22
19.	Shastri Park (near Shastri Park metro station)	8.354	FCA (CAMP A Fund)	2015-16
20.	Near Shastri Park metro station	2.44	FCA (CAMP A Fund)	2021-22
21.	Shastri Park metro station adjoining Yudhister on Eastern Bank	4.85	FCA (CAMP A Fund)	2021-22
22.	Shastri Park metro station adjoining Yudhister on Eastern Bank	4.3	FCA (CAMP A Fund)	2021-22
23.	Shastri Park (near Bela Farm)	19.9	FCA (CAMP A Fund)	2016-17
24.	Yamuna Flood Plains, between Yamuna Bank Station and Railway Line adjacent to CWG village	1.81	FCA (CAMP A Fund)	2019-20
25.	Yamuna Flood Plain area in between Yamuna Bank Metro Station & Railway line adjacent to CWG village	35.73	FCA (CAMP A Fund)	2020-21
26.	Near Sarai Kale Khan Yamuna Bridge, Behind PWD office, NH-24	10	FCA (CAMP A Fund)	2020-21
27.	NH 24 near PWD office	6.13	FCA (CAMP A Fund)	2021-22
28.	Garhimandu near Usmanpur village	5.3	FCA (CAMP A Fund)	2021-22
29.	Area in Usmanpur, Khasra No. 16, Chiragah- North, Usmanpur, Civil lines	0.124	FCA (CAMP A Fund)	2021-22
30.	Shastri Park (near Metro Station)	6.6	DPTA	2015-16
31.	Shastri Park (near colony)	5.6	DPTA	2015-16

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Site Location	Approx. Area (in Ha)	Scheme	Year
32.	Taj Enclave near Geeta Colony	1.17	DPTA	2015-16
33.	Shastri Park (Bela Farm)	9.15	DPTA	2016-17
34.	NetajiSubhash Chandra Bose Marg	2.17	DPTA	2017-18
35.	GarhiMandu Yamuna Flood Plains near III Pushta	14.65	DPTA	2018-19
36.	GarhiMandu Yamuna Flood Plains near III Pushta	14.45	DPTA	2018-19
37.	GarhiMandu Yamuna Flood Plains near III Pushta	7	DPTA	2019-20
38.	Garhimandu near Usmanpur village	20	DPTA	2018-19
39.	Shastri Park near Old Iron Bridge	21.52	DPTA	2018-19
40.	GarhiMandu near Signature Bridge	17.13	DPTA	2019-20
41.	GarhiMandu Yamuna Flood Plains near II Pushta	19.52	DPTA	2019-20
42.	Land Adjoining NH-24 on Eastern Bank PGCIL (Yamuna Flood Plains)	2.41	DPTA	2020-21
43.	Land Adjoining NH-24 on Eastern Bank PGCIL (Yamuna Flood Plains)	5	DPTA	2020-21

II. North Division

S.No.	Site Location	Approx. Area (in Ha)	Scheme	Year
1	Sawda	15	Department/DPTA	2020-21

DELHI'S FOREST AT A GLANCE, 2022

S.No.	Site Location	Approx. Area (in Ha)	Scheme	Year
2	Mukhmelpur	11	Department/DPTA	2021-22
3	Mamurpur	1	Department/DPTA	2021-22
4	Qutubgarh	10	Department/DPTA	2019-20

III. West Division

S.No.	Site Location	Approx. Area (in Ha)	Scheme	Year
1.	Ujwa	57.72	Department/DPTA	2006-07
2.	Surhera	4.49	Department/DPTA	2020-21
3.	RewlaKhanpur	33.59	Department/DPTA	2007-08; 2008-09.
4.	Kharkhari Jatmal	53.08	Department/DPTA	2006-07; 2008-09; 2009-10; 2014-15.
5.	Malikpur	13.94	Department/DPTA	2019-20; 2021-22
6.	Jafarpur	3.11	Department/DPTA	2009-10.
7.	Shikarpur	26.62	Department/DPTA	2008-09; 2009-10.
8.	Gummanhera	9.89	Department/DPTA	2009-10; 2014-15; 2020-21.
9.	Issapur	64.28	Department/DPTA	2000-01; 2001-02; 2019-20; 2020-21.
10.	Daurala	28.36	Department/DPTA	2021-22
11.	PandwalaKhurd	4.84	Department/DPTA	2009-10

IV. South Division

DELHI'S FOREST AT A GLANCE, 2022

S.No.	Site Location	Approx. Area (in ha)	Scheme	Year
1.	Degraded forest land, Asola BhattiSanctuary	100	FCA (CAMP Fund)	2011-12
2.	Ayanagar	20	DPTA	2021-22
3.	Ayanagar	24	DPTA	2021-22
4.	Ayanagar	12.5	DPTA	2018-19
5.	Ayanagar	4	Gap Plantation	2018-19
6.	Neb Sarai	4.2	DPTA	2021-22
7.	Neb Sarai	5	Department	2018-19
8.	DeraMandi (Pocket A, B, C)	13	DPTA	2018-19
9.	DeraMandi	19	Department	2020-21
10.	DeraMandi	3	Gap Plantation	2018-19
11.	Jounapur	8	DPTA	2021-22
12.	Jounapur	7	Department	2018-19
13.	Jounapur	5.8	Department	2019-20
14.	Jounapur	11	Department	2020-21
15.	Maidan Garhi	12	DPTA	2021-22
16.	Shahoorpur Part-I	30	Department	2019-20
17.	Shahoorpur Part-II	20	Department	2019-20
18.	Tughlakabad Pocket-A	32.5	Department	2018-19
19.	Bhatti Mines RadhaSwamy	7.2	Department	2018-19
20.	Asola	17	Department	2020-21
21.	Satbari	5	Department	2020-21

Annexure 3.3

SPECIES SUITABLE FOR PLANTATION IN DIFFERENT AREAS OF DELHI

Species Suitable for Plantation in Ridge Area

S. No.	Common Name of the Species	Botanical Name
1.	Amaltas	<i>Cassia fistula</i>
2.	Anar	<i>Punica granatum</i>
3.	Anjan	<i>Hardwickia binata</i>
4.	Kikar	<i>Acacia nilotica</i>
5.	Bakain	<i>Melia azederach</i>
6.	Bargad	<i>Ficus benghalensis</i>
7.	Ber	<i>Zizyphus mauritiana</i>
8.	Bistendu	<i>Diospyros monatana</i>
9.	Danda Thaur	<i>Euphorbia neriifolia</i>
10.	Dhak	<i>Butea monosperma</i>
11.	Dhauk / Dhonk	<i>Anogeissus pendula</i>
12.	Gular	<i>Ficus racemosa</i>
13.	Gondi Lasora	<i>Cordia gharaf</i>
14.	Imli	<i>Tamarindus indica</i>
15.	Khejri, khehra, Jand, Thand	<i>Prosopis cineraria</i>
16.	Jhinjheri	<i>Bauhinia racemosa</i>
17.	Jungle Jalebi	<i>Pithecellobium ducle</i>

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Common Name of the Species	Botanical Name
18.	Kadi Patta	<i>Bergera koenigii</i>
19.	Karonda	<i>Carissa carandus</i>
20.	Kassod	<i>Senna siamea</i>
21.	Kher	<i>Acacia catechu</i>
22.	Khair	<i>Acacia senegal</i>
23.	Khajur	<i>Phoenix sylvestris</i>
24.	Lasora	<i>Cordia dichotoma</i>
25.	Mahua	<i>Madhuca longifolia</i> var. <i>latifolia</i>
26.	Makkhan Katori	<i>Ficus benghalensis</i> var. <i>Krishna</i>
27.	Mango	<i>Mangifera indica</i>
28.	Neem	<i>Azadirachta indica</i>
29.	Bistendu	<i>Diospyros montana</i>
30.	Peepal	<i>Ficus religiosa</i>
31.	Pilkhan	<i>Ficus virens</i>
32.	Putranjiva	<i>Drypetes roxburghii</i>
33.	Ronjh	<i>Acacia leucocephala</i>
34.	Shahtoot	<i>Morus alba</i>
35.	Senjana	<i>Moringa oleifera</i>

Species Suitable for Plantation in Yamuna Flood Plains

S. No.	Common Name of the Species	Botanical Name
1.	Amla	<i>Phyllanthus emblica</i>

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Common Name of the Species	Botanical Name
2.	Arjun	<i>Terminalia arjuna</i>
3.	Amrood/ Guava	<i>Psidium guajava</i>
4.	Babool	<i>Acacia nilotica</i>
5.	Bael Patra	<i>Aegle marmelos</i>
6.	Baheda	<i>Terminalia bellirica</i>
7.	Bargad	<i>Ficus benghalensis</i>
8.	Ber	<i>Zizyphus mauritiana</i>
9.	Gular	<i>Ficus racemosa</i>
10.	Harad	<i>Terminalia chebula</i>
11.	Harsingar	<i>Nyctanthes arbor-tristis</i>
12.	Imli	<i>Tamarindus indica</i>
13.	Jamun	<i>Syzigium cumini</i>
14.	Jarul	<i>Lagerstroemia speciosa</i>
15.	Jhar Fanoos/ Balam Kheera	<i>Kigelia africana</i>
16.	Jhinjheri	<i>Bauhinia racemosa</i>
17.	Jungle Jalebi	<i>Pithecellobium ducle</i>
18.	Kachnar	<i>Bauhinia variegata</i>
19.	Kadam	<i>Neolamarckia cadamba</i>
20.	Kadi Patta	<i>Bergera koenigii</i>
21.	Kanak Champa	<i>Pterospermum acerifolium</i>
22.	Kachnar	<i>Bauhinia purpurea</i>
23.	Karonda	<i>Carissa carandus</i>
24.	Kher	<i>Acacia catechu</i>

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Common Name of the Species	Botanical Name
25.	Khair	<i>Acacia senegal</i>
26.	Lasora	<i>Cordia dichotoma</i>
27.	Maharukh	<i>Ailanthus excelsa</i>
28.	Mango	<i>Mangifera indica</i>
29.	Maulsari	<i>Mimusops elengi</i>
30.	Neeli Gulmohar	<i>Jacaranda mimosifolia</i>
31.	Neem	<i>Azadirachta indica</i>
32.	Pahadi Papri/ Chilbil	<i>Holoptelia integrefolia</i>
33.	Peepal	<i>Ficus religiosa</i>
34.	Phalsa	<i>Grewia asiatica</i>
35.	Pilkhan	<i>Ficus virens</i>
36.	Putranjiva	<i>Drypetes roxburghii</i>
37.	Rohida/ Rugtrora, Rohitaka	<i>Tecomella undulata</i>
38.	Semal	<i>Bombax ceiba</i>
39.	Shahtoot	<i>Morus alba</i>
40.	Sharifa	<i>Annona squamosa</i>
41.	Shisham	<i>Dalbergia sissoo</i>
42.	Siris	<i>Albizia lebbeck</i>
43.	Senjana	<i>Moringa oleifera</i>

Species Suitable for Plantation in Areas other than Ridge and Yamuna Flood Plains

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Common Name of the Species	Botanical Name
1.	Amaltas	<i>Cassia fistula</i>
2.	Amla	<i>Phyllanthus emblica</i>
3.	Anar	<i>Punica granatum</i>
4.	Anjan	<i>Hardwickia binata</i>
5.	Arjun	<i>Terminalia arjuna</i>
6.	Nakli Ashok	<i>Polyalthia longifolia</i>
7.	Ashok	<i>Polyalthia pendula</i>
8.	Amrood/ Guava	<i>Psidium guajava</i>
9.	Bael Patra	<i>Aegle marmelos</i>
10.	Baheda	<i>Terminalia bellirica</i>
11.	Bakain	<i>Melia azederach</i>
12.	Balam Kheera	<i>Kigelia pinnata</i>
13.	Bargad	<i>Ficus benghalensis</i>
14.	Ber	<i>Zizyphus mauritiana</i>
15.	Bistendu	<i>Diospyros monatana</i>
16.	Champa	<i>Plumeria obtusa</i>
17.	Desi Papdi / Chamror	<i>Ehretia laevis</i>
18.	Dhak	<i>Butea monosperma</i>
19.	Gular	<i>Ficus racemosa</i>
20.	Harad	<i>Terminalia chebula</i>
21.	Harsingar	<i>Nyctanthes arbor-tristis</i>
22.	Imli	<i>Tamarindus indica</i>

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Common Name of the Species	Botanical Name
23.	Indian Coral Tree	<i>Erythrina variegata</i>
24.	Jamun	<i>Syzigium cumini</i>
25.	Jangli Arandi	<i>Jatropha curcas</i>
26.	Jhar Fanoos/ Balam Kheera	<i>Kigelia africana</i>
27.	Jand/khejri	<i>Prosopis cineraria</i>
28.	Jhinjheri	<i>Bauhinia racemosa</i>
29.	Jungle Jalebi	<i>Pithecellobium dulce</i>
30.	Jarul	<i>Lagerstroemia speciosa</i>
31.	Kikar	<i>Acacia nilotica</i>
32.	Kachnar	<i>Bauhinia variegata</i>
33.	Kadam	<i>Neolamarckia cadamba</i>
34.	Kadi Patta	<i>Bergera koenigii</i>
35.	Kanak Champa	<i>Pterospermum acerifolium</i>
36.	Kachnar	<i>Bauhinia purpurea</i>
37.	Karonda	<i>Carissa carandus</i>
38.	Kassod	<i>Senna siamea</i>
39.	Khair	<i>Acacia senegal</i>
40.	Khirni	<i>Manilkara hexandra</i>
41.	Lasora	<i>Cordia dichotoma</i>
42.	Maharukh	<i>Ailanthus excelsa</i>
43.	Mahua	<i>Madhuca longifolia</i> var. <i>latifolia</i>

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Common Name of the Species	Botanical Name
44.	Mango	<i>Mangifera indica</i>
45.	Maulsari	<i>Mimusops elengi</i>
46.	Neeli Gulmohar	<i>Jacaranda mimosifolia</i>
47.	Neem	<i>Azadirachta indica</i>
48.	Pahadi Papri /Chilbil	<i>Holoptelia integrefolia</i>
49.	Bistendu	<i>Diospyros montana</i>
50.	Peepal	<i>Ficus religiosa</i>
51.	Phalsa	<i>Grewia asiatica</i>
52.	Pilkhan	<i>Ficus virens</i>
53.	Putranjiva	<i>Drypetes roxburghii</i>
54.	Rohida	<i>Tecomella undulata</i>
55.	Ronjh	<i>Acacia leucocephala</i>
56.	Sagwan	<i>Tectona grandis</i>
57.	Shahtoot	<i>Morus alba</i>
58.	Sharifa	<i>Annona squamosa</i>
59.	Shisham	<i>Dalbergia sissoo</i>
60.	Siris	<i>Albizia lebbeck</i>
61.	Sohanjna	<i>Moringa oleifera</i>
62.	Saptarni	<i>Alstonia scholaris</i>
63.	Toon	<i>Toona ciliata</i>
64.	Mitoshika	<i>Millettia peguensis</i>

Annexure 3.4**List of Species Available at Aravalli Forest Nursery**

S. No.	Species	Common Name	Type
Trees			
1.	<i>Aegle marmelos</i>	Bael, Bel Patra	Tree
2.	<i>Albizia lebbeck</i>	Siris	Tree
3.	<i>Anogeissus pendula</i>	Dhau	Tree
4.	<i>Azadirachta indica</i>	Neem	Tree
5.	<i>Cassia fistula</i>	Amaltas	Tree
6.	<i>Ehreti alaevis</i>	Chamrod	Tree
7.	<i>Ficus benghalensis</i>	Banyan	Tree
8.	<i>Ficus racemosa</i>	Goolar	Tree
9.	<i>Ficus religiosa</i>	Peepal	Tree
10.	<i>Ficus virens</i>	Pilkhan	Tree
11.	<i>Moringa oleifera</i>	Drumstick tree	Tree
12.	<i>Morus alba</i>	Toot	Tree
13.	<i>Phoenix sylvestris</i>	Khajur, Date Palm	Tree
14.	<i>Phyllanthusemblica</i>	Amla	Tree
15.	<i>Prosopis cineraria</i>	Khejdi	Tree
16.	<i>Psidium guajava</i>	Amrood	Tree
17.	<i>Punica granatum</i>	Anar	Tree
18.	<i>Saraca asoca</i>	Ashoka	Tree
19.	<i>Senegalia catechu</i>	Khair	Tree
20.	<i>Syzygiumcumini</i>	Jamun	Tree
21.	<i>Vachellia nilotica</i>	Desibabool	Tree
22.	<i>Stercularia urens</i>	Kulu	Tree
23.	<i>Ziziphus mauritiana</i>	Ber	Tree
24.	<i>Diospyros montana</i>	Bistendu	Tree
25.	<i>Dichrostachys cinerea</i>	Goya khair	Tree
26.	<i>Vachellia leucophloea</i>	Ronjh	Tree
27.	<i>Wrightia tinctoria</i>	Doodhi	Tree
28.	<i>Murraya koenigii</i>	Curry patta	Tree
29.	<i>Tecomella undulata</i>	Rohida	Tree

DELHI'S FOREST AT A GLANCE, 2022

S. No.	Species	Common Name	Type
30.	<i>Holoptelea integrifolia</i>	Kanju	Tree
31.	<i>Terminalia elliptica</i>	Saja	Tree
32.	<i>Senegalia senegal</i>	Kumthha, Gum arabic	Tree
Shrubs			
33.	<i>Bambusa vulgaris</i>	Golden bamboo	Shrub
34.	<i>Barleria prionitis</i>	Vajradanti	Shrub
35.	<i>Calotropis gigantea</i>	Aak, milkweed	Shrub
36.	<i>Capparis decidua</i>	Kareel	Shrub
37.	<i>Capparis sepiaria</i>	Heens, Wild Caper	Shrub
38.	<i>Carissa congesta</i>	Karonda	Shrub
39.	<i>Flueggea luecocyprus</i>	Ghatbor	Shrub
40.	<i>Grewia tenax</i>	Gangeti, phalsa	Shrub
41.	<i>Holarrhena pubescens</i>	Indrajav	Shrub
42.	<i>Justicia adhatoda</i>	Adusa, malabar nut	Shrub
43.	<i>Lawsonia inermis</i>	Mehendi	Shrub
44.	<i>Mimosa pudica</i>	Touch-me-not	Sub-shrub
45.	<i>Senna alata</i>	Candle bush	Shrub
46.	<i>Withania somnifera</i>	Ashwagandha	Shrub
47.	<i>Ziziphus nummularia</i>	Jharber	Shrub
48.	<i>Ziziphus oenopolia</i>	Makora, jackal jujube	Shrub
Herbs			
49.	<i>Aerva lanata</i>	Gorakhbooti grass	Herb
50.	<i>Aloe vera</i>	Gwarpatha	Herb
51.	<i>Asparagus racemosus</i>	Shatawari	Herb
52.	<i>Catharanthus roseus</i>	Sadabahar	Herb
53.	<i>Clitoria ternatea</i>	Butterfly pea, aparajita	Herb
54.	<i>Cyanodon dactylon</i>	Grass	Herb
55.	<i>Desmostachya bipinnata</i>	Halfa grass, daabh	Herb
56.	<i>Epipremnum aureum</i>	Money plant	Herb
57.	<i>Indigofera astragalina</i>	Silky indigo	Herb
58.	<i>Ipomoea batatas</i>	Sweet potato	Herb
59.	<i>Kalanchoe pinnata</i>	Bryophyllum, miracle plant, parchatta	Herb
60.	<i>Ocimum tenuiflorum</i>	Basil	Herb
61.	<i>Solanum nigrum</i>	LaalMakoi	Herb
62.	<i>Tinospora cordifolia</i>	Giloy	Herb

DELHI'S FOREST AT A GLANCE, 2022

Annexure 5.1

Details of Encroachment in Southern Ridge

SL. No.	Village	Total Area as Reserve Forest		Total encroachment identified as on 05.04.2019		Encroachment removed in 2019-2020		Encroachment removed in 2020-21		Encroachment removed in 2021-22		Encroachment left for removal	Range/Beat
		Bigh-Biswa	Hectares	Bigh-Biswa	Hectares	Bigh-Biswa	Hectares	Bigh-Biswa	Hectares	Bigh-Biswa	Hectares	Hectares	
1	Aaya Nagar	4028-9	337.05	172-00	14.39	2 -00	0.16	4 - 00	0.33	0	0	13.9	Mehrauli
2	Chhattarpur	594-4	49.71	253-08	21.20	0	0	0	0	0	0	21.20	South
3	Nebsarai	590-01	49.36	264 -09	22.12	0	0	1 -10	0.12	0	0	22	South
4	Sahoorpur	3306-15	276.66	238 -03	19.92	53 -19	4.51	0	0	0	0	15.41	AB
5	Devli	5631-03	471.14	452 -14	37.87	0	0	0-1	0.004	0	0	37.86	AB
6	Asola	9268-13	775.48	675 -00	56.47	13 -13	1.14	48 - 12	4.06	83-16	7.01	44.26	AB
7	Bhatti	12845-12	1,074.76	477 -14	39.96	0	0	0	0	3-0	0.25	39.71	AB
8	Maidangarhi	5055-16	423.00	79 -03	6.62	28 -08	2.37	2 -00	0.16	0	0	4.09	AB
9	Saidulajab	302-06	25.29	109 - 04	9.13	03 -00	0.25	2 -00	0.16	0	0	8.72	South
10	Satbari	1625-03	135.97	181 - 17	15.21	60 - 00	5.02	0	0	0	0	10.19	AB
11	Jaunapur	3855-18	322.61	287 - 05	24.03	113 - 13	9.50	2 -15	0.23	4-0	0.33	13.97	Mehrauli
12	Deramandi	10821-18	905.44	399- 8.5	33.41	127 - 09	10.66	32- 00	2.67	8-12	0.71	19.37	Mehrauli
13	Tughlakabad	6491-16	543.15	403- 02	33.72	0	0	20- 17	1.74	4-8	0.36	31.62	AB
14	Pulpehladpur	680-18	56.96	246- 03	20.59	1 - 7	0.11	1- 7	0.11	2-8	0.2	20.17	AB
15	Rangpuri	1793-17	---	246-01	20.58	54 -00	4.51	0	0	0	0	16.07	---
16	Rajokri	3318-15	---	214-02	17.91	37-02	3.10	0	0	0	0	14.81	---
17	Mahipalpur	732-14	---	17-04	1.43	16-10	1.38	0	0	0	0	0.05	---
Total		70,943-18	----	4716 - 17.5	394.56	511-1	42.71	115-02	9.5	106-04	8.86	333.53	

DELHI'S FOREST AT A GLANCE, 2022

Area Notified in Various Notifications

S. No.	Notification	Bigha Biswa 1 Bigha=20 Biswa		Sq. Yard (1 Bigha=1008 Sq. Yard)	Acre (1 Acre=4840 Sq. Yard)	Hectare (1 Hectare= 2.471 Acre)	Sq. Km
		Bigha	Biswa				
1.	1980(Protected Forest Area)	28098	14	28,332,876	5853.9	2369.041	23.69041
2.	1994(Reserved Forest Area)	92241	9	9,30,10,120.28	19,216.967	7777	77.77
3.	Nanakpura South Central	83	1	83,717.48	17.297	7	0.07
3.	1996(Recorded Forest Area)*	50501	16	50905088.64	10517.73	4275.81	42.7581
4.	1986(Asola)*	12860	12	12962880	2678.405	1083.936	10.83936
5.	1991(Bhatti)*	10398	3	10484795.2	2166.28	876.681	8.76681

(*These are part of area notified in 1994 Serial. No.2)

Conversion Methods

- 1 Bigha = 20 Biswa =1008 Sq. yard
- 1 Acre = 4 Bigha 16 Biswa (4.8 Bigha)
- 1 Hectare = 2.471 Acre
- 1 Hectare = 10,000 Sq. Metre
- 1 Hectare = 0.01 Sq. KM
- 1 Acre = 4840 Sq. Yard

Annexure 6.1

1. Nilgai Rescue Protocol

Nilgai (*Boselaphus tragocamelus*) is the State animal of NCT of Delhi. There are large numbers of Nilgai distributed all over the State, inhabiting diverse range of habitats. Nilgai are very shy and sensitive animal. Due of biotic interferences and shortage of foods in their natural habitats, they quite often venture out in human habitations. During such occasion the animals sustain injuries whiles crossing roads etc. and sometimes get trapped.

The Department usually receives calls from public as well as different organizations for rescue of such injured/trapped Nilgai. Initially due to lack of proper infrastructural facilities in the form of trained animal handlers, equipments and vehicles, the Department used to face real difficulties in the field. Gradually, with time, the Department have developed certain infrastructure and made it possible to handle the rescue operation of Nilgai.

The following protocol has been prepared by the Delhi Forest Department that has to be maintained for successful rescue operation:

- As the Nilgais are very shy and sensitive, proper care is to be taken to ensure avoid both physical and psychological injuries to the animal.
- The animal handler need to be trained and dedicated for the purpose equipped with accessor like net stick rope, stretchers, head lamp (for Night operator) etc.
- Animal ambulance fitted with first aid equipments and or compounder to ensure stress free transportation.
- Availability of veterinary doctor and compounder.
- Rescue, rehabilitation and treatment center with provisions to medicines, surgical instruments and after accessories should be ready for operation.
- Provisions for food and water.
- In rare occasions when it is required to ensure safety of both human and animal lives, application of chemical process by way of tranquilization may be recommended by seeking approval of the Chief Wildlife Warden.
- Rescued Nilgai are to be released as early as possible in their natural habitat as per the advice of veterinarian.
- Manpower recruitment for ease of action.

□ Protocol for Hand-rearing and Release of Nilgai Calf to Wild

Protocols for hand-rearing are essential elements of animal management programs. Hand rearing those neonates that are maternally neglected or medically compromised reduces neonate mortality.

Milk replacer formulation and selection can be the most important and difficult decisions of the hand-rearing process. The use of nurse dams is the best option, if not available then it

DELHI'S FOREST AT A GLANCE, 2022

becomes necessary to utilize a variety of commercially available milks (i.e., cows and goats) and milk replacers.

☐ **Feeding Protocol**

The calves should be fed 5 times during a 12 hour period (in every 3 hr), until 21 days of age. Then, it should be fed 4 times per 12 Hour (every 4 hr) for an additional 20 days, at the age of 1.5 month feeding should be reduced to 3 times/day (every 5 hr). The volume of formula fed remained stable from day 48 to day 61 to aid in the transition from liquid to solid diet. Solid foods should be introduced on day 7 and fed ad libitum.

☐ **Evaluation**

Regular examination of stool should be done because loose stools can be a symptom of formula indigestibility or incompatibility during the first 3 weeks. neonates should be observe for behavioral abnormalities and overall body condition, such as coat texture and signs of abdominal distension or bloat

Consistency of the stools	Diarrhea, foamy stools
	Extremely soft, badly formed/amorphous stools
	Cylindrical-shaped stools, tacky to touch, leaves mark when picked up
	Well-formed, cylindrical-shaped and pelleted stools, dry but not crumbly, easily picked up and leaves no mark

Weight gain is another important parameter for evaluating formula fitness. Weights should be recorded every week, In addition, the neonates should be observe for behavioral abnormalities and overall body condition, such as coat texture and signs of abdominal distension or bloat.

☐ **Releasing of Animal Back to Wild**

- Capacity of wildlife habitat at the release sight to accommodate and support the released animals and their progeny on a sustained basis, without adversely impacting the population of other species inhabiting the area.
- Capacity of the animals that are being released to adopt itself in the wild and fend itself successfully.
- Release of the animals not posing/ having a potential to pose any physical or health hazard to the local human population and their live- stock.
- Acceptability of release of the animal to the local population.
- Availability of trained and dedicated man power to execute the preparatory phase, carrying out planned and successful release and conducting post release monitoring of the released animals.
- The execution of the release should be carried out under the supervision of an expert.

DELHI'S FOREST AT A GLANCE, 2022

- Long term and short term indicators for quantifying the success of the release should be identified.
- Necessary vaccinations against local endemic and epidemic diseases should be given to all the Nilgai that is likely to share the habitat with the existing animals.

❑ **Protocols for Rescue Rehabilitation and Release of Rhesus macaque (Monkey)**

There are large numbers of Monkeys (Rhesus macaque) distributed all over the National Capital Territory of Delhi in varying habitats. The population of monkeys are increasing at an alarming rate. As a result of which these monkeys come out of their natural habitats due to scarcity of foods and invade in human habitations. During such occasions, many of them sustain injuries by way of electrocution and road accidents. These monkeys often take shelter in terrace of buildings, schools and offices causing menace for the inmates. The Department of Forest and Wildlife, Govt. of NCT of Delhi receives several complaints regarding injured, sick, trapped and strayed monkeys everyday and called for their rescue and rehabilitation.

While dealing with the rescue, treatment and release of the monkeys certain protocols are to be followed to ensure safe and successful rescue and rehabilitation of the animals.

❑ **Steps to be followed during Rescue**

- As the monkeys are very active, agile, aggressive and stays in a herd of 50 to 100, therefore proper safety measures should be taken to avoid injury both to the animal and rescuer.
- The rescue team should be equipped with necessary rescue equipments and protective gears. A first aid kit should always be there in the rescue ambulance.
- Before commencing rescue operation, proper survey of the area and the physical condition of the monkey have to be assessed.
- A history should be collected for each animal while capturing monkey. In case of stray monkey, history should be collected from local people around and if monkey is kept as a pet then from the owner of the monkey. The information includes the following:
 - (i) reason for the monkey is needed to be rescued
 - (ii) the circumstances and location where it is found
 - (iii) its approximate age
 - (iv) if a pet, how long it was kept for and what was its feeding habit.

These information can help to determine the kind of initial care needed and whether or not the individual is likely to be suitable for release. For example, an orphan that has been cared for by an inexperienced person may be malnourished and/or dehydrated; while an adult that has been kept as a pet for an extended period of

time will be habituated to humans and is unlikely to be suitable for release into the wild.

- Rehabilitation involves the treatment of medical or physical disabilities, active teaching of animals to develop latent or lost skills necessary for independent survival in the wild (for example, foraging, rearing behavior and anti-predator behavior) and weaning from human contact.

☐ **Initial Steps when Monkey Arrives at the Center**

- The monkey should be quarantined and undergo medical assessment and treatment. This ensures that each monkey is healthy and helps to avoid transmission of any diseases to other animals at the center.
- Monkeys are susceptible to human diseases, should be examined by a veterinarian. Some infectious diseases known to affect monkeys include foamy viruses, tick-bite fever and chikungunya virus.
- The new arrival should also undergo a behavioral assessment. Many confiscated pets may have been socially isolated at their young age, and this can have profound effects on their behavior and their ability to be socially integrated.

☐ **Methods use to Reduce Risks of Disease Transmission**

The following methods are used to reduce risk of disease transmission:

- (i) Quarantine,
- (ii) Clinical examination by a veterinarian,
- (iii) Fecal examination for parasite eggs and larvae,
- (iv) Hematology and serum biochemistry profiles to aid disease detection based on comparison with normal blood values for the species,
- (v) Serological testing to detect infectious diseases,
- (vi) Microbial culture to isolate and identify the cause of the disease, and
- (vii) Vaccination for some common diseases where there is a specific risk.
- (viii) Animals that die in captivity should undergo a full post-mortem examination to determine the cause of death. Wherever possible, this should also be done for animals that die post-release so as to identify any problems with the health of rehabilitated animals.

☐ **Pre-release Assessment**

Human contact should be minimized for the animal to be released and screening for common diseases should be done before releasing of the animal as it is vital that animals for release be healthy.

DELHI'S FOREST AT A GLANCE, 2022

Behavioral assessment should be carried out to confirm suitability for release. Direct comparisons of the behavior of wild and captive animals can help to determine which animals are ready to be released. Individuals that show significant deviation from wild behavioral patterns are less likely to survive post-release.

☐ **Release Site Selection**

One of the most important steps in a release project is the selection and assessment of the release site. Factors that should be assessed for any primate release have been outlined in the IUCN guidelines for non-human primate re-introductions. These include availability of food and water and their seasonality, protection of the site, etc. A release site should provide appropriate habitat and ideally be free from human disturbance (for example, hunting, introduction of feral or domestic animals). Habitats should be chosen to minimize edge effects and should not have an unusually high concentration of predators.

It is important for the density of species to be lower than the carrying capacity of the habitat. Often the presence of the species in an area is used as a definitive criterion for the suitability of a release site. This simplified view fails to recognize that introducing more monkey groups to an area may lead to increased competition, aggression and disease transmission. Monkeys can be highly territorial and this can result in inter-group aggression, sometimes resulting injury of released monkeys.

☐ **Release**

A transport plan should be in place, with emphasis on minimizing stress and risk of injury. All monkeys should be transported in well-ventilated, secure transport cages. The warm hours of the day should be avoided; transporting is viable either in the early morning or late afternoon. Larger monkeys, such as adult males should be placed in individual boxes to avoid injury to smaller individuals. Vulnerable individuals such as mothers with infants should also be isolated. Whenever possible, monkeys that have been known to frequently direct aggression toward each other, should not be transported in the same box. If transporting to a long distance, regular stops should be made to check the monkeys and to provide food and water. The group should be accompanied by experienced personnel from the rehabilitation center.

☐ **Post-release Assessment**

Post-release monitoring is vital, and the data collected during this time allow the success of the project to be assessed and lessons to be learned for future release efforts. The released groups should be monitored for a minimum of one year to encompass at least one breeding season and all climatic conditions of the release site.

2. Protocol for Translocation of *Rusa unicolor* (Sambar Deer)

The Department of Forest and Wildlife, Govt. of NCT of Delhi has started the process of rescuing Sambar deer from the Delhi Sambar area, where excessive numbers of poaching incidences were recorded. For translocation of Sambar from present location of the Deer to Asola Bhatti Wildlife Sanctuary, following protocol is being followed:

DELHI'S FOREST AT A GLANCE, 2022

☐ **Data Collection**

Survey has to be done to collect the information prior to the translocation of the deers with the following objective:

- (i) Habitat mapping using aerial photographs.
- (ii) Population size and density of Sambar Deer in their present location.
- (iii) List has to prepare separately for Stags, Does, and Fawns with expected age.
- (iv) Feeding habit of Sambar deer and vegetation available in their present location.
- (v) Identifying the sites for feeding and resting of deer.

☐ **Technique for Survey**

- **Interviews with local workers from Sambar:** Information from locals should be considered as the primary data about the existing wildlife in the Sambar which will in turn able the officials to identify the potential area and site selection for survey.
- **Point Counts:** Observation points have to be established along feeding points or water bodies, at a higher place or at any other location suitable for viewing the habitat. For a period of 60 minutes at each observation point, the observer records all sightings of the Deer at that site.
- **Camera Trapping:** Camera traps will be placed at representative locations in the study area and the infrared sensor of the camera would be triggered by passing of any warm-blooded animals. The animals could then be identified from the photos taken.
- **Drone Survey:** Drones can be use for mapping, monitoring the movement of deer and for collecing aerial photographs of their habitat.

☐ **Equipments and Field Kit**

Following equipments and field kits will be required for observing the deers and estimating its populations at their present location:

- (i) Drone cameras
- (ii) Binoculars
- (iii) Trap cameras
- (iv) Digital camera to record photographic evidences of the Sambar deer
- (v) GPS to record the coordinates
- (vi) Measuring tape to record the size of foot prints and fecal droppings
- (vii) Maps of the study area and note book for recording field notes

☐ **Selection of Animals**

The selected animal should be in good health:

DELHI'S FOREST AT A GLANCE, 2022

- Only adults and sub-adults should be transported. Pregnant, geriatric, lactating, suckling, sick, weak, injured or deformed animals and stags in velvet should be avoided to transport.
- If young ones unable to fend for themselves, should be transported along with their mothers.
- Marking of selected individuals: Microchips or ear tags or tattoo markings with permanent dye may be used for identification.

☐ **Weather and Climate Considerations**

- A complete record of the weather and climatic conditions should be maintained prior to initiating transport. Extreme climatic conditions, viz. the peak summer and monsoon, should be avoided while transportation.
- In case transportation is planned during the summer, it should be carried out strictly during the cooler hours of the day, preferably the early morning or late evening.
- Abrupt changes in weather conditions should be anticipated and provided for transportation logistics and be carefully planned. A backup and support vehicle always needs to be available on call.

☐ **Transport Cage Considerations**

- Animals have to be confined in transport cages for easy handling and to minimize the chances of injury to the animals.
- The crate should be well ventilated, and it should be ensured that the extremities of the animals do not project out.
- Crates should be disinfected properly prior to transport.
- Do not use lead paints for painting crates. As far as possible crates should not be painted inside, but the surface should be smooth.
- Padding with gunny bags filled with paddy straw foam/ cotton cushions should be provided in crates used for transportation. Nails, wooden splinters, protrusions, sharp edges and sharp objects should be removed from the inner surfaces of the container.
- Antler tips may be taped with padding/cushioning to prevent injuries and breakage during transport.
- The maximum number of animals that may be transported at a time is four or five.
- Transport only one animal in a crate.
- Dimensions of crates as provided by Central Zoo Authority (CZA) for Sambar deer: Length: 180 cm, Width: 68 cm, Height: 150 cm (Figure 1).

Frame	All around solid wooden or metallic battens of 4 mm thickness
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DELHI'S FOREST AT A GLANCE, 2022

Sides	12 mm thick waterproof plywood
Floor	19 mm thick waterproof ply
Roof	12 mm thick waterproof plywood
Door	sliding doors on both sides with bolts and chains; 12 mm thick waterproof ply



Figure 1: Crates for Transportation of Sambar Deer

☐ **Veterinary Considerations**

- The identified animals should be subjected to health screening so as to ensure their fitness for transportation and to avoid transmission of diseases to other animals.
- Animals may be vaccinated and dewormed well in advance to transportation, at least 3 weeks before the action.
- Body weight and morpho metric features should be estimated by a biologist.

☐ **Nature of Capture**

The decision to use physical or chemical restraint will be depending on the safety of the handlers and the animal, along with the factors like behavior, tolerable degree of stress, size of the animals etc.

➤ **Physical Methods**

If physical methods of capture are to be used, it should be ensured that the animals are subjected to minimal stress and that there are skilled and experienced personnel

available in the team. Snares, traps, crates, ropes, nets should be carried along with the team.

The deers can be habituated to its crate well in advance by placing the crate in the enclosure and feeding the animal every day in it. This will slowly make the animal comfortable with the crate, thereby reducing the stress during the transportation (Figure 2).



Figure 2: Crate in Enclosure for Habituation of the Animal

➤ Chemical Immobilization

- (i) If chemical immobilization and restraint procedures are to be used permission has to be taken from CWLW, Govt. of NCT of Delhi.
- (ii) Adequate stocks of immobilizing drugs, reversal agents and antidotes should be procured and stored appropriately.
- (iii) The drug dosage may be decided based on the size of the animal and other considerations such as the age, sex, weight, weather, physiological and temperamental needs and excitement level.
- (iv) The animal should not be given food for 24 hours and deprived of water for 12-16 hours. The animal may have to be covered with wet cloths in case it develops a high temperature, and the eye may need to be covered as a precaution.
- (v) Projected darts have proved to be effective and safe option for delevering. Light weight plastic darts of 3-5 ml capacity should be used for remote injection using air powered/CO2 tel-injection projector. Needle length is critical factor while darting. The outside diameter of the needle should be 1.5 mm and length of 35 mm.

Table 6.1 depicts the recommended drug/dosage for immobilization of *Rusa unicolor*.

- (vi) Yohimbine at the dose of 0.15 – 0.30 mg/kg body weight shall be applied as a reversal of anesthesia.

Table 6.1: Recommended drug/dosage for immobilization of Sambar Deer (*Rusa unicolor*)

Generic Name	Total Content(mg)	Total Volume (ml)	Reference
Etorphine + Xylazine	5- 8 500	5- 8 5	Seal 1976
Ketamine + Xylazine (male)	210 262	2.1 2.6	WII Manual
Ketamine + Xylazine (female)	80-160 100- 200	0.8-1.6 1.0-2.0	Kotwal 1985

- **Problems and hazards of chemical restraint in wild animals:** There is always an undesirable side effect of the drug such as,
- (i) Complications like cardiac arrest, pulmonary edema, hemorrhage, hypoglycemia, bloat, capture myopathy, shock may be notice after minutes to hours/days after chemical immobilization.
 - (ii) As the health status of the animal is unknown in most of the cases it is very risky to use drugs for restraining of the animals.
 - (iii) Pregnant animals may abort if exposed to drugs for tranquilization.
 - (iv) Dart may miss the target and can puncture the wind pipe or hit the eye of the animal.
 - (v) Procurement of drugs may be problematic and expensive.

☐ **Handling and Care of the Immobilized Animal**

Animal should be approached quietly and following steps should be followed:

- (i) Removal of dart,
- (ii) Blind folding the animal,
- (iii) Ensure proper positioning (Sternal, lateral recumbency) to maintain patient airway and ensure normal breathing and circulation,
- (iv) Assessment of depth of the anesthesia,
- (v) Shifting of the animal to a stretcher and placed in lateral or strenal recumbency,
- (vi) Animal should then be shifted to a transport container.

☐ **Animal Transport Considerations**

- The animal's health and well being should be the highest priority during transport.

DELHI'S FOREST AT A GLANCE, 2022

- The cage should be kept in the vehicle in such a way that the animal always faces the direction in which the vehicle is moving.
- Human contact with the animals should be minimized to avoid cross infection.
- The animals should be monitored throughout the transportation, and if needed, appropriate treatment/management should be administered.
- An official with the requisite financial powers to cover any exigencies en-route should accompany the animal.
- Ensure that the vehicle is fit for the journey. The vehicle should be serviced, and a thorough check-up should be carried out prior to the transport. Additionally, information on the fuel level, tyre pressure and the tool kit and essential spares should be obtained. An animal transport vehicle on a long journey should be accompanied by two drivers.
- The mobile numbers and contact details of the drivers, owners, cleaners, etc. should be given to the coordinators of both the donor and recipient.
- The transport vehicle should be insured. All the vehicle-related documents should be valid (R.C., insurance papers, driver's licence, etc.) and should be checked.
- The vehicle should be disinfected properly prior to transport.
- Identification of the animals to be transported should be done prior to loading.
- The shortest route among the usable ones should be selected.
- Staff undertaking transportation of animals should not consume alcohol during or before the transportation.
- Before transportation, factors such as the weather forecast and possible disturbances (blockades, processions, festivals, public functions etc.) during the proposed transportation period should be taken into account and the planning to be carried out accordingly.
- The travel plan should be communicated to the Officers so that they can provide assistance, if required.
- The pilot vehicle should have a representative of the competent authority and a veterinarian. It should have drugs, equipment for physical immobilization and communication facilities.
- The personnel should be wearing in uniform with proper dress code. The vehicle should have the necessary papers/certificates.
- The team in the pilot vehicle should inform toll gates/check posts in advance so that unnecessary delays are avoided.
- The transport vehicle and pilot vehicle should carry emergency lights, torches with sufficient batteries, drinking water, IV fluids, medical kits, etc.

☐ **Facility at Recipient (Asola Bhatti Wildlife Sanctuary)**

DELHI'S FOREST AT A GLANCE, 2022

A quarantine and health check-up should be carried out after reception of the animal to the Asola Bhatti Wildlife Sanctuary. A new enclosure should be constructed well before the arrival of the animals for quarantine of the animals before releasing into wild. Additional man power for the care of the new animals may be recruited as per the requirement.

❑ **Post Release Monitoring**

Post releasing of the animals monitoring should be undertaken for 3 broad categories, such as, Survival, Behavior and Reproductive Success. The movement and activity pattern of the animals will be monitored using drones.

Camera trap and spotlighting: Remote sensor camera trap and driven spotlight survey will be done for better understanding of distribution of the animal in the sanctuary.

3. Protocols to be followed while Releasing Rescued Snakes

It is required to attend several complaints regarding rescue of Snakes from different parts of NCT of Delhi. For safe rescue of the snakes, trained snake handlers with suitable equipments are required. At the same time, it is needed to ensure safe release of the rescued snakes in its suitable natural habitats. During last few years, the rescued snakes were being released in Asola Bhatti Wildlife Sanctuary only, it is afraid that, if such large numbers of snakes are continued to be released in same location, it would exceed the bearing capacity of the habitat. Therefore, three natural habitats have been earmarked, viz. (i) Asola-Bhatti Wildlife Sanctuary, (ii) Jounapur Plantation sites (Mandi Valley Beat) and (iii) Area under Forest in Yamuna Flood Plan.

➤ **Categories of Snake found in Delhi**

Categories of Snakes	Suitable habitat for release
Venomous: (<i>Cobras, Kraits and Vipers etc.</i>)	Snakes live in almost every corner of the world, they are found in Forests, Deserts, swamps, and grass lands. Many prefer underground burrows or space under Rocks. Snakes feed upon rodents, rabbits, forges, eggs, other Reptiles, fishes, earthworms etc. so it should be ensured that the site of release of snakes have abundance of pray. This category of snakes should be released in the habitats mentioned at (i) & (ii) on rotational basis as per the instruction of Wildlife Warden with a gap of at least one month.
Non-venomous: (<i>Sand boas, Rat snakes, Wolf snakes etc.</i>)	Snakes live in almost every corner of the world they are found in Forests, Deserts, swamps, and grass lands. Many prefer underground burrows or space under Rocks.

Categories of Snakes	Suitable habitat for release
	Snakes feed upon rodents, rabbits, forges, eggs, other reptiles, fishes, earthworms etc. so it should ensured that the site of release of snakes should have abundance of pray. This category of snakes should be released in neighboring forest areas nearest to the site of rescue.
Large: (<i>Pythons</i>)	Preferred natural habituated are dense as well as open forest, arid scrub jungles, marshy land. They may live in abandons mammal burrows, hollow trees, dense water reeds etc. python will feed on wild animals such as lizard, caiman, Monkeys and antelopes etc. This category of snakes may be released in all the three habitats mentioned above on rotational basis as per the direction of Wildlife

➤ **For the purpose of safe release of the rescued snakes following protocols have to be followed:**

- (i) If the snake is fit for release then do it without delay, within 24 hours of rescue, under the guidance and supervision of the Forest Department.
- (ii) Keep records of the rescue and release in a prescribed format. (Include the photographs of the snake either before rescue or after rescue for location/habitat identification.
- (iii) In case of non-venomous snakes, try to release it as close to the rescue site as possible, a little away from human habitation.
- (iv) In case of venomous snakes, the local forest department and the snake rescuer should identify and designate a release site within the local geography. These sites should be changed periodically, with a break of at least 30 days between releases at the same site. Wildlife Warden will be responsible to identify sites where rotation will be done for release of snakes.
- (v) All releases should be made as per the reported activity time of the particular snake. For example, nocturnal snakes should be released at night and snakes that are active during the day should be released in the daytime. Very high temperatures and harsh sunlight should be avoided during release. Rescued snakes should be released in nature immediately.
- (vi) Rescuer/snacks handler should not attend any release under the influence of drugs or alcohol.

DELHI'S FOREST AT A GLANCE, 2022

- (vii) Rescuer/snacks handler should not keep live snakes in captivity, except for medical treatment. If medical treatment is required, it should be administered under the supervision of the local forest department.
- (viii) Rescuer/snacks handler should not indulge in live snake shows. Any such action will be booked under the relevant clauses of the Wild Life (Protection) Act 1972.
- (ix) Rescuer/snacks handler should not unnecessarily handle the rescued snakes. Handling puts snakes under more stress and can lead to diseases and in extreme cases death of the reptile.

☐ **First aid for snakebites: if suspected of a snake bite:-**

- (i) Immediately move away from the area where the bite occurred. If the snake is still attached use a stick or tool to make it get go. Sea snake victims need to be moved to dry land to avoid drowning.
- (ii) Remove anything tight from around the bitten part of the body (e.g: rings, anklets, bracelets) as these can cause harm if swelling occurs.
- (iii) Reassure the victim. Many snake bites are caused by non-venomous snakes. And even after most venomous snake bites the risk of death is not immediate.
- (iv) Immobilize the person completely. Splint the limb to keep it still. Use a makeshift stretcher to carry the person to a place.
- (v) Applying pressure at the bite site with a pressure pad may be suitable in some cases.
- (vi) Avoid traditional first aid methods, herbal medicines and other unproven or unsafe forms of first aid.
- (vii) Transport the person to a health facility as soon as possible
- (viii) Paracetamol may be given for local pain (which can be severe)
- (ix) Vomiting may occur, so place the person on their left side in the recovery position.
- (x) Closely monitor airway and breathing and be ready to resuscitate, if necessary.

☐ **Do's and Don'ts:-**

Do's	Don'ts
Stay calm and call emergency numbers	Don't apply ice on the snake bite as the ice may block blood circulation
Let the victim of a snake bite lie in a semi-reclined position with the bite wound below the level of the heart. This prevents the venom from spreading to other parts of the body until medical help arrives	Don't suck the blood out with your mouth (germs in the mouth may cause infection in the bite wound) and you may be also exposing yourself to the venom.
Immobilize the bitten limb:- Tie a bandage 2 to 4 inches above the bite wound to slow the spread of	Don't attempt to cut the wound.

DELHI'S FOREST AT A GLANCE, 2022

Do's	Don'ts
venom in the body. if the bite area turns cold or numb, the bandage is too tight	
Clean the wound:- if there is bleeding, stop it first by applying pressure on the bite wound. When the bleeding stops, clean the wound with soap and water to prevent infection. Dress up the wound. Do not wash the wound under running water	Don't attempt to guess whether the snake was venomous or not, based on its physical characteristics. "Even emergency physicians are not always able to definitely identify a venomous snake.
Get medical Help early:- The snake bite is usually not venomous if there is no swelling or discoloration within five minutes of being bitten. However, for some snake bites these signs may only appear after several hours	
As snake bites can potentially be fatal, always treat a snake bite as a medical emergency. call for the help early and bring the victim to the nearest Hospitals & Contact details are mentioned below: Emergency anti venomous treatment Hospitals and Contact No:- Safdarjung Hospital: 011-26194690, 26161960 AIIMS Hospital: 011-26594405 Ram Manohar Lohiya (RML) Hospital: 011-23365525, 23404212 Max Hospital Saket 1800-266 4242, 011-26515050 Fortis Hospital Okhla: 011-26825002/3, 105010	

Annexure 7.1**Strength of the Department of Forest and Wildlife, Govt. of NCT of Delhi****Forestry Staff**

S. No.	Designation	Sanctioned Strength	Filled
1.	ACF	4	0
2.	Forest Ranger	6	6
3.	Wildlife Inspector	9	1
4.	DRO	22	15
5.	Forester	66	---
6.	Forest Guard	276	275
7.	Wildlife Guard	11	11
8.	Labourer/ Mali	---	314

Ministerial Staff

S. No.	Designation	Sanctioned Strength	Filled
1.	Sr. AO	1	1
2.	AAO	2	1
3.	SO	4	3
4.	ASO	3	1
5.	Sr. Asst.	11	8
6.	Jr. Asst.	15	8
7.	PPS	1	1
8.	PS	1	1
9.	PA	2	2
10.	Steno Grade-III	4	3
11.	Driver	7	5
12.	Non-Peon	1	1

1800-11-8600



**Indian Forest Act,
1927**



**Forest Conservation
Act, 1980**



**Delhi Preservation of
Trees Act, 1994**



**Wildlife Protection
Act, 1972**

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