

Aravali Biodiversity Park, Gurugram

2010 - 2020

MAKING OF A CITY FOREST

A Ten-Year Report by iamgurgaon





My heart beats with that new-born leaf
and through that slow awakening
I breathe again.
Reliving life, this time afresh
The city of steel that I am...

Contributing Authors

Abhishek Gulshan *Butterfly Diversity*

A keen naturalist and educator, he founded NINOX-Owl to promote nature awareness.

Misha Bansal *Monitoring Biodiversity*

A researcher and environmental educator, she is working with the Nature Science Initiative, Dehradun.

Dr. Robin Suyesh *Exploring Amphibians*

An Amphibian Biologist, he also teaches at Sri Venkateshwara College, Delhi University and conducts regular amphibian surveys in Delhi NCR and the Western Ghats.

Sourajit Ghosal *Birds of the Park*

An avid birder, Sourajit has authored a book on the common birds of the Aravali Biodiversity Park.

Vijay Dhasmana *Rewilding the Landscape, Forests of the Park*

A rewilder, Vijay is the curator of the Aravali Biodiversity Park.

iamgurgaon Team

• Latika Thukral • Swanzal Kak Kapoor • Gayatri Singh
• Priti Sanwalka • Anjali Khatri • Deep Kalra • Vasundhara Agarwal
• Nidhi Kankan • Namrita Chaudhri • Smita Ahuja

Credits

Book Design: **Tanushree Gandhi**, Neat Stuff

Cover Design: **Monika Khanna Gulati**, SkyBLUE Design

Cover, Back Cover & Inside Cover Photos: **Vijay Dhasmana**

Photo Contributors: **Abhishek Gulshan, Abhijit Singh, Aneel Stanley,**

Amit Sharma, Arvind Yadav, Atal Kapoor, Devraj Singh, Nitin Das,

Rajesh Shah, Dr. Robin Suyesh & Vijay Dhasmana

Compiled by **Vijay Dhasmana**

Printed in India at Archana Press Pvt. Ltd., New Delhi

Contact

For any query please mail: info@iamgurgaon.org

For the chapters on Rewilding of Aravali Biodiversity Park &

Forests of the Aravali Biodiversity Park, contact: vijay.dhasmana@gmail.com

Published by iamgurgaon in August 2020

Copyright for photographs remain with the respective contributors.

Aravali Biodiversity Park, Gurugram

2010 - 2020

MAKING OF A CITY FOREST

A Ten-Year Report by iamgurgaon





CONTENTS

Foreword	2
Introduction	4
Understanding the Land	10
Journey of Transformation	16
Vision of the Park	20
Rewilding the Landscape	24
Forests of the Park	28
Fauna of the Park	40
Birds of the Park	44
Exploring Amphibians	52
Butterfly Diversity	58
Monitoring Biodiversity	64
Significance of the Park	48
Future Endeavours	72
Doers & Believers	76

FOREWORD



It seldom happens that a city comes together to convert its mining site into a City Forest. This is what has happened in the last 10 years in Gurugram under Municipal Corporation of Gurugram's initiative. We have developed a 380-acre mining site as a City Forest known as Aravali Biodiversity Park.

In this venture, we have collaborated with iamgurgaon and provided them all the support to recreate forests of Aravali in this patch of land. I must say they have done a wonderful job of restoring this degraded land. We are also very thankful to Haryana Forest Development Corporation for coming forward initially green the place, and later, the Vision of a City Forest was furthered by iamgurgaon.

I would also like to thank the Corporates of Gurugram, who supported this venture in ecologically restoring this landscape. It is an excellent example of a partnership model for developing our degraded landscapes.

Today, I have been told that this place is home to more than 201 species of birds, more than 300 species of native plants in various forest types, several species of animals and insects. In a nutshell, I think, citizens of Gurugram would be proud of this place that not only serves the ecological and environmental functions, but also provides green lungs to the city.

I hope that a place like this in a city inspires its citizens, becomes a refuge for finding oneness with nature and also provides the city with an opportunity to be more ecologically conscious.

Best wishes,
Vinay Pratap Singh
Commissioner
Municipal Corporation of Gurugram
25 July, 2020



Photos: Vijay Dhasmana

INTRODUCTION

THE ARAVALI BIODIVERSITY PARK is 380 acres of wilderness carved out of a 40-year-old mining site in the millennium city of Gurugram. A joint venture between the Municipal Corporation of Gurugram (MCG) and Iamgurgaon (IAG), the Park is a perfect example of the citizens' initiative to make a difference to their city. Residents of the city from all walks of life have participated in very many ways to create this native Aravali forest.

The Park has become a small sanctuary harbouring endangered and rare plants of the Northern Aravali hills. Haryana is losing most of these plants rapidly to development and encroachments.

Over 300 species of native plants (trees, shrubs, herbs, climbers, grasses) have been added to the Park with a vision to showcase the forest flora. In the last ten years, the Park has become a favoured habitat for birds (over 201 species recorded) and wild animals (jungle cat, common palm civet, jackal, porcupine, neelgai and various kinds of reptiles) of Gurugram.

This report attempts to capture the journey of this transformation over the past 10 years. The journey from a dry, treacherous landscape of an abandoned mining site to a lush green City Forest – with a hope that it will inspire the rewilding of more scarred and denuded patches within the Aravali Range in Haryana.



Mangar Bani Forest and its diversity has played a big role in shaping the Aravali Biodiversity Park. Magnificent Salai overlooking the Bani.



Photos: Vijay Dhasmana

Grasses initiate the process of healing the landscape

Teetar Chowk

A chowk dedicated to the state bird of Haryana, the Black francolin (*Francolinus francolinus*), had a deserted look in the year 2011. Today, it is a hub of bird activity after some large trees have formed a closed canopy over it.

2011



2020



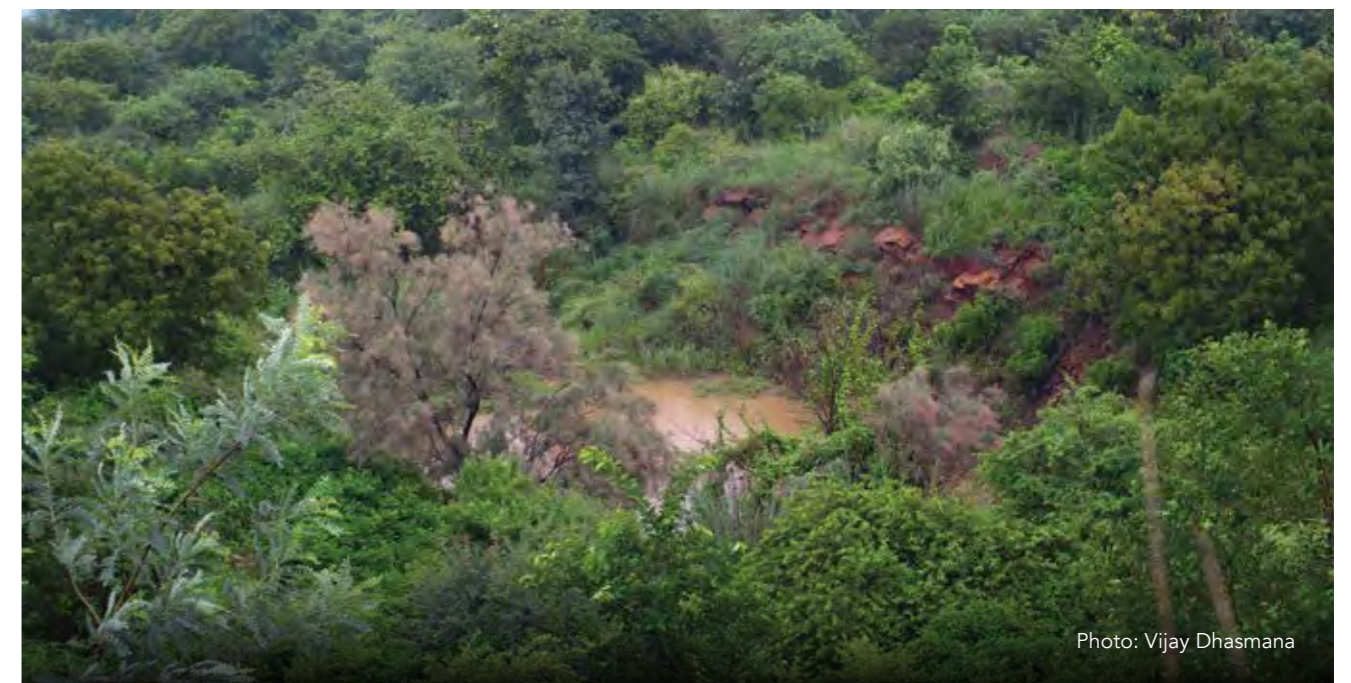
Seasonal Waterbodies

There were several seasonal waterbodies, but the surrounding landscape was infested with the alien invasive species Vilayati keekar (*Prosopis juliflora*). Today, this area has been restored with native vegetation, forming several tier forests of trees, shrubs, herbs and grasses.

2011



2020



Mined Valleys

The Park had several mining pits and large, barren valley like spaces. These valleys were restored with native plants that liked seasonal water accumulation, making them special micro-habitats within the larger Aravali landscape.

2011



2020



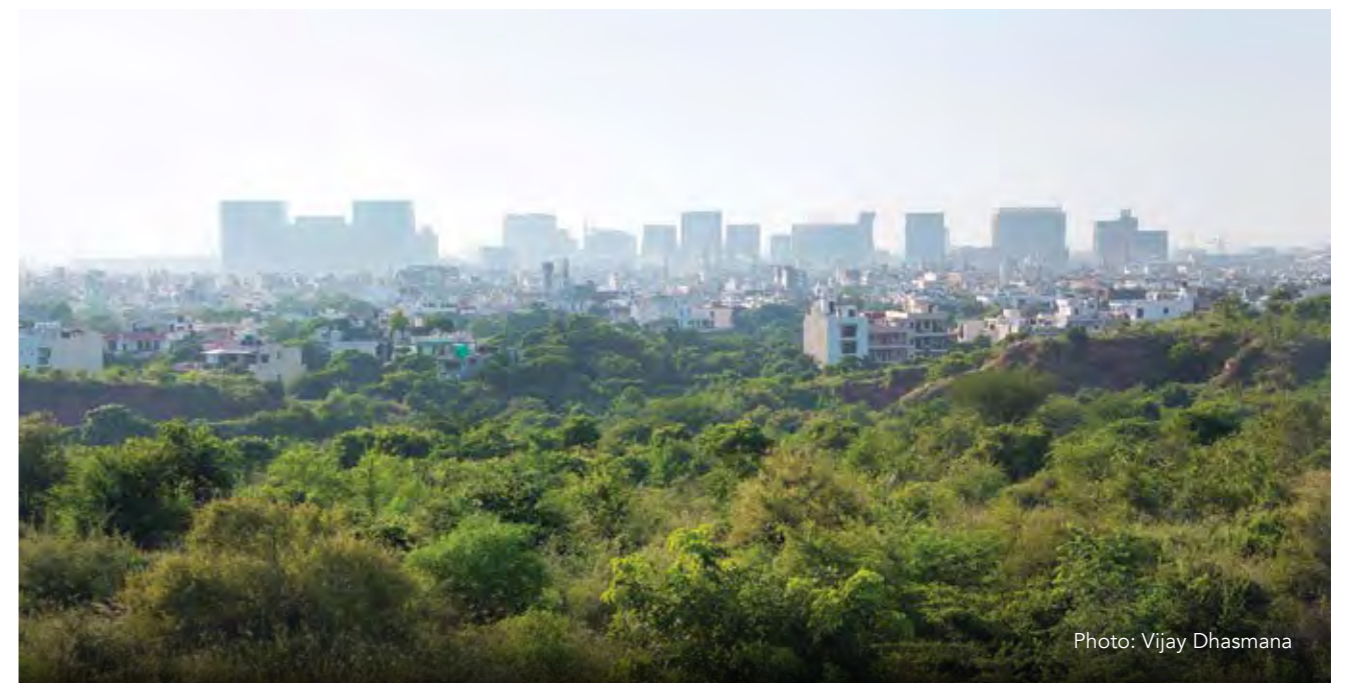
Park Landscape

Usually a mined landscape is colonized by invasive species or is encroached upon. With 8 years of restoration work, the area reflects the complete transformation into a lush, green Aravali forest.

2011



2018



UNDERSTANDING THE LAND



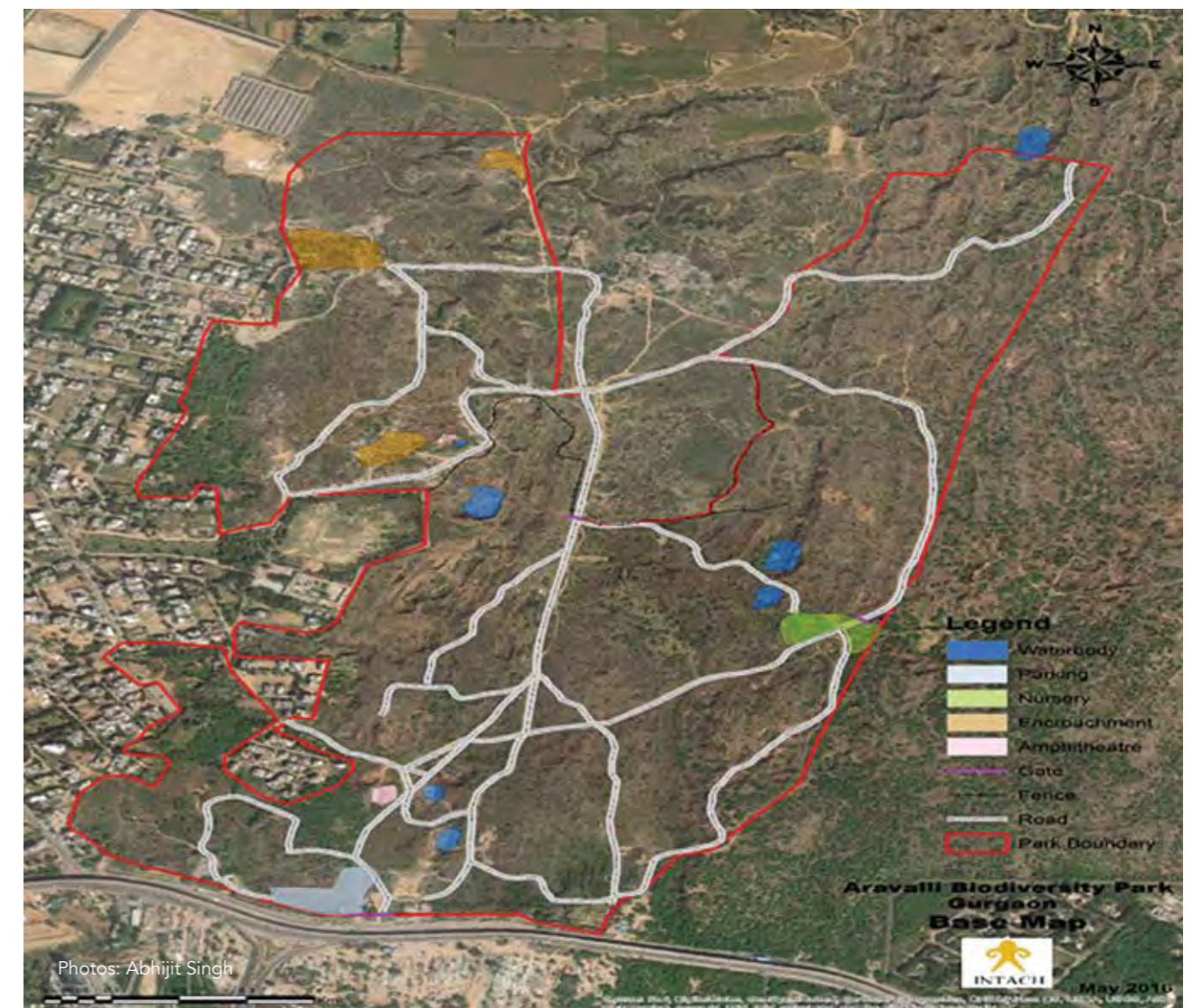
Exposed quartzite rock and few patches of invasive Vilayati keekar defined the landscape in 2011

THE LAND WE KNOW as Aravali Biodiversity Park was a part of the Nathupur Village of Gurugram. Located at the Delhi-Gurugram border on the Mehrauli-Gurugram Road, the Park covers an approximate area of 392 acres with the highest elevation of 277 meters and lowest 248 meters.

This area was extensively mined for over 4 decades for the quartzite stone and badarpur sand used for construction activities in Delhi-NCR. A large

number of small stone quarries were operational in this area. The operation of 8 stone crushers on the Park land along with illegal felling of trees, cattle grazing and waste dumping had caused serious environmental degradation.

The landscape of the Park is a part of the Aravali mountain range with undulating hills and comprises of several small ridges and valleys formed by seasonal streams and quarry pits.



Photos: Abhijit Singh

Source: IUCN Report 2016¹

What is the Aravali Range?

The hills in the southern districts of Gurugram and Faridabad are part of the oldest fold mountain range in the world called Aravali. They were formed around 3 billion years ago by colliding landmasses and volcanic eruptions. What you see of the range today is a result of cooking and weathering process of over 3 billion years.

The Aravalis run diagonally across Rajasthan extending from Champaner in Gujarat in the south west to near Delhi in the north east for a distance of about 690 km (Shetty and Singh, 1987)².

Most of the rocks seen in Haryana are quartzite – metamorphosed sandstone – resting on a very old base rock called Gneiss, which is part of the foundation stone of our subcontinent. The elevation of the Aravali range gradually rises in the south-west direction and so the vegetation pattern and plant composition changes due to the changes in the climatic and edaphic factors. Due to its geographical location, the range has a mix of Saharan, Ethiopian, peninsular, oriental and even Malayan elements of flora and fauna. However, very few studies have been carried out on the ecology of this mountain system (Singh, 2015)³.

The Ecological Significance

Combating Desertification

The Aravali with its lush forests used to act as a green barrier and an effective shield against desertification. It checked the spread of the Thar Desert towards eastern Rajasthan, into Gangetic plains, Haryana and Western UP. Today, the forests in the Aravali hills are no longer an effective green barrier. Perhaps the most degraded forests of India now, the Aravali range has lost most of its indigenous plant species. This range moderates the wind velocity and helps in checking transpiration and evaporation.

Important Drainage System

A water-divide between the Indus basin in the North West and Ganga basin in the East, it covers extensive areas of North India (Rathore 2009)⁴. Any obstruction and disturbance in the natural set up will lead to large-scale changes in the areas adjoining North Indian plains and will be devastating for the environment. It will also affect eastern Rajasthan, Haryana, Malwa region, western Uttar Pradesh and Delhi.



Photo: Vijay Dhasmana

A young forest of Salai (*Boswellia serrata*) taking shape over the amphitheatre rocks

Enhances Precipitation and Checks Drought

The occurrence of normal rainfall in north-west India depends on the preservation of the lush green forest cover and resultant normal evapotranspiration process over the Aravali hills. Trees and canopy cover preserve humidity in the atmosphere and helps regulate the rainfall patterns. However, an increase in deforestation and soil erosion has escalated the occurrence of drought in this area. The drought subsequently affects not only the people but also the much-threatened wildlife of the area.

Groundwater Recharge Zone

The highly fractured, jointed and weathered quality of the rocks allows water to percolate and recharge the groundwater. Calculations reveal an immense potential of about 2 million litre ground water recharge per hectare of the landscape. Water security of the surrounding towns of Faridabad, Gurugram and Sohna are dependent on this groundwater.

Rich Habitat for Biodiversity

The Aravali hills are a rich habitat to a wide spectrum of wildlife including avifauna comprising tiger, leopard, wolf, bear, blackbuck, chinkara,

sambhar, fox, desert fox, migratory common cranes, cuckoos, coots, pelicans etc., in its lush green forests. The wildlife is now limited to certain patches and protected areas owing to the biotic interference and deforestation.

Treasure of Resources

Aravalis with forest cover is integral to the surrounding ecosystem and provides numerous resources to its inhabitants including fuel, wood, fodder, fruits, vegetables and a range of economically viable mineral products.

Green Lungs for Delhi-NCR

The Aravali forests have been the protective green lungs by converting carbon dioxide to life-sustaining oxygen, playing an important role in trapping pollutants and regulating the temperature of the region.

However, due to excessive mining, the green cover has been systematically destroyed taking away this shield from its inhabitants.

In May 2004, after months of media and public protests, Hon'ble Supreme Court of India banned mining in Faridabad, Gurugram and Mewat districts in Haryana recognizing the ecological significance of the Aravali (<https://indiankanoon.org/doc/1896562/>).



Photo: Vijay Dhasmana

Perennial and seasonal waterbodies make life possible in these otherwise dry forests

“The Government of Haryana be directed to stop all mining activities and pumping of ground water in and from area up to 5 kms from Delhi-Haryana border in the Haryana side of the Ridge, inter alia, stating that in the larger interest of maintaining the ecological balance of the environment.”

Supreme Court of India M.C. Mehta vs Union of India & ORS on 18th March, 2004.

In 2004, due to this order, mining and stone crushing was stopped at the Park. What was left were some defunct stone crushers and many mining pits, bereft of any soil cover. As Gurugram was developing and becoming more densely populated, a lot of construction and demolition waste was dumped in the Park. Ecologically speaking, the only little vegetation that grew was small patches of *Prosopis juliflora* or vilayati keekar, a very invasive plant from Central America.



Photo: Atal Kapoor

There were 8 stone crushers operating at the Park until 2004

Notes

1. Aravali Biodiversity Park, Gurugram (ABPG) Biodiversity Assessment and Action Plan, April 2017, International Union for Conservation of Nature (IUCN).
2. Shetty, B.V and Singh, V., 1987, Flora of India Series 2 Flora of Rajasthan Volume 1. Botanical Survey of India, Calcutta.
3. Singh, R., Ecological changes in Central Aravali Hilly range: A case study of Tonk District, Rajasthan, India. International Journal of Research in Applied Natural and Social Sciences; Vol. 3, Issue 4, Apr. 2015, 17-28.
4. Rathore, N.S., 2009. The study of the environment and its impact in the Aravali Mountain Range in the study of the changing environment and its impact in the Aravali Mountain Range in the western region of India. Udaipur, Rajasthan.

JOURNEY OF TRANSFORMATION



IN 2009, THE SEVERALY degraded panchayat land with encroachments and dumped waste of Nathupur village was transferred to the Municipal Corporation of Gurugram. This barren site of a former quarry on the border of Delhi and Gurugram caught the attention of iamgurgaon, which went ahead to propose its development as the Aravali Biodiversity Park to the MCG. The then MCG Commissioner, Rajesh Khuller, a man with immense foresight, took to the idea immediately and asked IAG to initiate drawings and develop this concept further.

Noted architect Atal Kapoor designed the Park's infrastructure. Boundary wall, parking lot, pathways and an amphitheatre were designed with his team and soon enough, MCG started the civil works under Atal's watchful guidance and supervision. The Park slowly started taking shape. MCG, IAG and Haryana Forest Development Corporation (HFDC) came forward to start the plantation work in this denuded landscape, bereft of any soil cover and infested with *Prosopis juliflora*.

The first few avenues inside the Park were prepared by HFDC in 2010. It planted 6,000 saplings of local species like *Aegle marmelos*, *Acacias senegal*, *Acacia leucopholea*, *Bauhinia racemosa*, *Tamarindus indicus*, *Aegle marmelos*, *Cassia fistula*, *Albizia procera*, *Acacia nilotica*, *Cordia dichotoma*, *Anogeissus pendula*, *Ficus religiosa* and *Ficus benjamina* in the mining pits and flowering trees along walking trails, such as Jacaranda, Gulmohar, Bottle-brush, etc. This work of planting and maintenance of 6,000 saplings continued for 2 years. (IUCN report: 2017)¹

The Park was inaugurated by the Haryana Chief Minister Bhupinder Singh Hooda on June 5th 2010, on the World Environment Day. Shortly after, MCG ratified the goal of making the Park into a City Forest. IAG was formally assigned the tasks of carrying out conservation work, setting up a nursery of native plants, and doing whatever research and surveying was necessary for 8 years to implement these tasks, from 2012 to 2020.



Photos: Vijay Dhasmana

Restored Saccharum savannah

With native planting in mind, IAG's vision led them to Pradip Krishen who authored the book, *Trees of Delhi*. He lent his support in greening the Park and recommended that Vijay Dhasmana, eco-restoration practitioner, be brought on board to take the project to its next level of development.

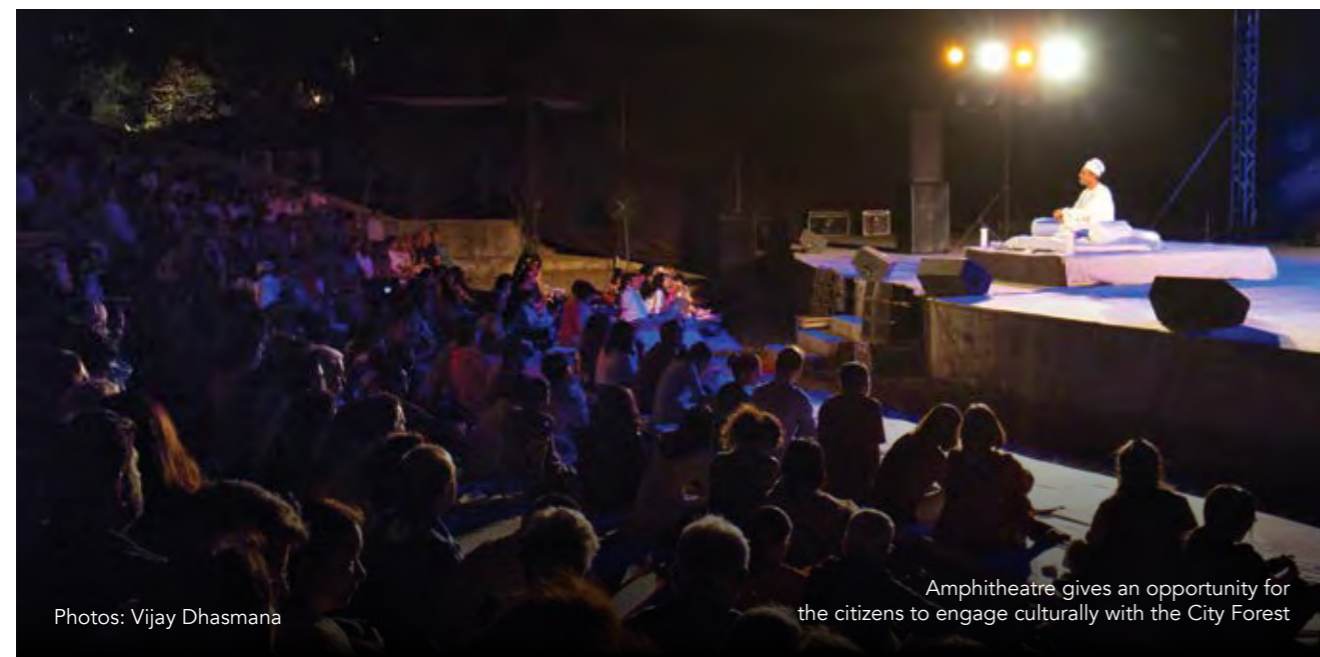
With Vijay, the team drew up a long-term vision to showcase the forest habitats of the Aravali Range, most of which were being lost rapidly in Haryana to mining, encroachments, urbanization and alien invasive species of plants. This would be the culmination of IAG's landmark effort to showcase natural habitats, endemic plants, and sensitize the city dwellers of Gurugram about the inherent richness in their immediate vicinity.

But what does it mean to create a City Forest?

The Park, nestled within the Aravali mountain range, and representative forests of the northern Aravali, such as those of Salai (*Boswellia serrata*), Dhau (*Anogeissus pendula*), Kaim (*Mitragyna parvifolia*), and many others were to be developed within the Park. The idea was not to make it into a dense woodland but to create diverse habitats, including grasslands that would support varied forms of life, typical of the Northern Aravali.

In 2011, the new MCG Commissioner Sudhir Rajpal suggested that Gurugram's corporates be invited to support the planting and upkeep of the Park. Latika Thukral took the lead in coordinating this effort with the MCG and began involving many corporates across the city, while Swanzal Kak Kapoor, Priti Sanwalka, Gayatri Singh, Nidhi Kankan and Vansundhara Agarwal steered the planting and volunteering activities. Anjali Khatri and Namrita Choudhary facilitated the participation of schools and school children to ensure that the young were not left out in the making of the forest. With this generous engagement, in the last 9 years – 68 corporates, more than 50 schools, thousands of children and citizens from all walks of life, have come to plant about 1,45,000 plants of over 200 species in the Park. This laid the foundation for the transformation.

Today, the Park showcases more than 300 species of plants, many of them reintroductions to Haryana. The diverse microhabitats have become a haven for 201 species of birds, making it one of the richest birding habitats in Delhi's NCR. Animals such as the Nilgai, Jackal, Indian Small Civet, Indian Hare, various snakes, lizards and skinks have found a happy home in the Park. This is even truer of many species of butterflies, moths, beetles, bugs, aphids, ants and spiders.



Photos: Vijay Dhasmana

Amphitheatre gives an opportunity for the citizens to engage culturally with the City Forest



Over 15,000 children of Haryana have come in the last 8 years to plant at the Park

Programmes to engage the city with this wilderness have been taking shape. Nature walks have become popular and are widely attended. A programme to involve school children with nature awareness is usually packed with enthusiastic learners! Corporates find enough space in the Park for team-building and volunteering activities. You can often spot business teams unwinding while clearing up garbage, composting leaves or planting saplings in the nursery.

Though a relatively young forest, the Park is well on its way to becoming an ecological heritage site in Gurugram. It is one of the rare stories of eco-restoration in our country where an NGO, citizens, corporates and the local administration have converged their efforts to bring a natural forest landscape back into the heart of the city for people of all walks of life to enjoy. The transformation that began 10 years ago unfolds beautifully in every breath that the city forest takes today.



The Park nursery added more than 200 species of native plants

VISION OF THE PARK



The Municipal Corporation of Gurugram ratified the vision of the Park as a City Forest showcasing native forest flora of the Northern Aravali. The ecological restoration work undertaken was guided by this vision and helped integrate ecology, urban environment and human aspirations in the city.

City Forest

Showcase the forests of the Northern Aravali, such as forests of Salai (*Boswellia serrata*), Dhau (*Anogeissus pendula*), Kaim (*Mitragyna parvifolia*), Dhak and many others. With the rewilding work, it is to become a rich habitat for birds and animals and a repository of endangered and rare flora of the Aravali range.

Water Recharge Zone

Groundwater is becoming further scarce in Gurugram and surrounding areas due to rapid urbanization and over-extraction. The groundwater table is receding at the rate of four feet per year, and these finite reserves are perilously close to being completely exhausted. The Park is to work as a large groundwater recharge zone.



Photos: Vijay Dhasmana

Mining pits are now seasonal waterbodies helping in recharging the groundwater

Educational Space

The Park will serve an important role in educating the citizens, especially children on the significance of the Aravalis — its flora, fauna, avi-fauna, ecological restoration and water conservation. The Park will sport an interpretation center and

in-situ interpretation panels for raising awareness on the above-mentioned subjects. Educational and appreciation walks and workshops will be conducted regularly in the Park to disseminate deeper information on these subjects.



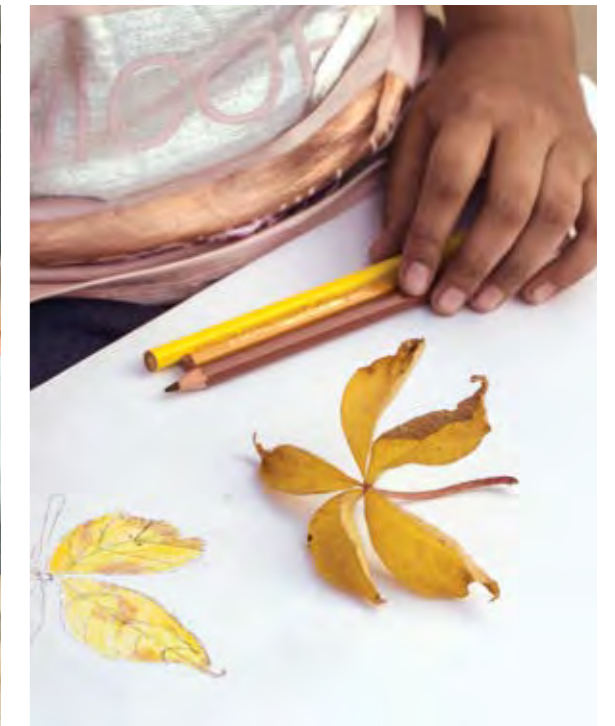
Recreational Space

The Park will play an important role in engaging with the citizens and provide them with a recreational space set in natural surroundings. There will be nature trails, walking, jogging and bicycling tracks to give them an opportunity to exercise in the midst of nature. There will be an amphitheatre to host events in the park.



Research Station

Once restored, the Park has the potential to be a vast carbon sink and a rich resource to conduct various studies. It will offer opportunities to study carbon sequestering and how climate change impacts our forests in the semi-arid Aravalis. Additionally, the Park with its different forest communities should be studied for a) ecological succession b) inter-species dynamics and c) interactions of plants with animals and birds.



REWILDING THE LANDSCAPE

- Vijay Dhasmana



Photo: Vijay Dhasmana

Hasibul with his team gearing up to plant large Kullu (*Sterculia urens*) saplings on the rocky outcrop, 2013

THE MOVEMENT FROM planting a million trees in a day to creating an Aravali forestscape came with a huge churn for us in iamgurgaon (IAG). This was, perhaps, the biggest shift in the vision of the project. It took several visits to Mangar Bani, Sariska and other lovely forests of the Aravalis to change the attitude and strategy within IAG. These visits inspired the team to accept the new vision to create a native Aravali rocky forestscape with its full panoply of plants – resplendent with trees like Dhau, Salai, Kumath, Doodhi and Dhak, lots of shrubs, grasses and the full range of ephemerals that spring up in the rains.

We took the then MCG Commissioner Sudhir Rajpal to see Mangar Bani, so he could also see what we meant when we spoke about native wilderness. He was supportive, enthusiastic and ratified the goal of making the Park into a City Forest. IAG was formally assigned the tasks of carrying out conservation work in the Park, setting up a nursery of native plants, and doing whatever research and surveying was necessary. We were given eight years – from 2012 to 2020 –

to implement these tasks. The barren land of the Aravali Biodiversity Park was to be rewilded. The questions that came to our mind were what are the forests that we should be bringing and why?

According to Champion and Seth's system (1968)¹, the NCR Aravali forests belong to Major Group II Dry Tropical Forest. Two types of forests of this major group are present in the NCR Aravalis, namely Group 5 – Tropical Dry Deciduous Forests, and Group 6 – Tropical Thorn Forests.

Within Group 5, the NCR Aravalis are categorised as Northern Tropical Dry Deciduous Forests (5B). The rocky terrain, steep slopes, thin soil, low nutrients and moisture regime have produced a peculiar kind of vegetation where the upper canopy of deciduous trees in such forests is light and a continuous canopy can only be seen in the best examples. Stunting is common and trees rarely grow over 15m high. In summer, these forests become leafless, bone-dry, and the soil is exposed. In May or June, these forests begin to leaf



Photo: Atal Kapoor

Mined landscape was bereft of any soil and was colonised by invasive plants

again and luxuriant greenery appears everywhere with the onset of the monsoon. The forest patches of Salai (*Boswellia serrata*), Dhau (*Anogeissus pendula*) and Dhak (*Butea monosperma*) are a delight to visit.

The forests of the Project Tiger area in Sariska (Alwar), Ferozpur Jhirka's Jhir forest in Mewat (Haryana), Mangar Bani's sacred grove in Faridabad district, close to Delhi, are some of the finest forests of the Northern Aravalis in NCR. On the other hand, large tracts of the Aravalis have been denuded, degraded and cleared due to anthropogenic pressures. As a result, the predominant forest cover in the Aravalis today has the nature of an open scrubland. These are other group of forests Tropical Thorn Forests (6) which occurs in the NCR Aravalis, and its sub-group Northern Tropical Thorn Forests. Various species of *Acacia*, *Ziziphus*, *Capparis*, *Prosopis*, *Calotropis* and *Euphorbia* are found in these forests. Tree growth is poor and they hardly grow to 10m in height, with only a single-storeyed canopy, and are very prone to fires.

We came up with an initial list of about 200 forest species native to the rocky Northern Aravalis. Some of them had disappeared from view but there was enough evidence to know that they were once present in our region. Now we had to get hold of the seeds of all these species, and take complete charge of rewilding the Park landscape. When the next fruiting season came around, we mounted a massive collection drive for seeds and vegetative cuttings by visiting wild and semi-wild areas near and far.

My special task was to try and understand where each kind of plant would be most 'at home'. It may not seem obvious, but even a place like the Biodiversity Park is made up of a mosaic of tiny micro-habitats. Some plants are 'generalists' but most plants – more so in arid or stressed environments – specialise in where they are best adapted to live and do well, in different kinds of sites such as the foot of a hill or a hollow where there is sandy soil or on a well-drained slope.

This is what I tried to observe and learn about in all my travelling and seed collecting. Our scientific 'Floras' are not very good at teaching you about what sort of conditions plants require. Individual species have their preferences – the dry rocky slopes are partial to stands of Salai (*Boswellia serrata*), Dhau (*Anogeissus pendula*) can withstand thin soils and rapid runoff, while the valleys support Kaim (*Mitragyna parvifolia*) that can withstand both waterlogging and a certain extent of drought, and Babool (*Acacia nilotica*) only where the soil is deep and of good quality, with water close to the surface. On the other hand, sand dunes that have come to rest at the feet of the Aravalis have a xeric or desert vegetation that is typically found much further west in the Thar Desert. The idea was not to make this Park into a dense woodland but to create diverse habitats, including grasslands, that would support varied forms of life, typical of the Northern Aravali.



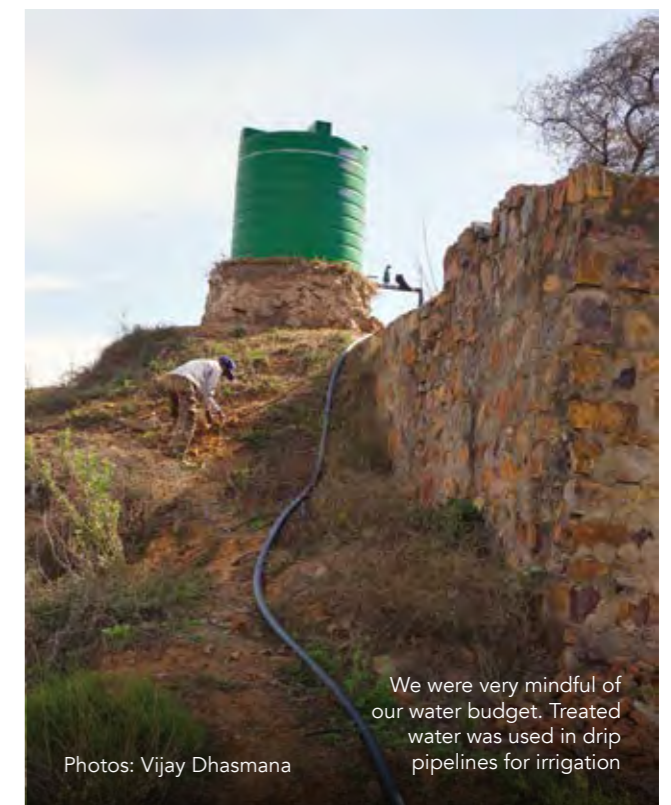
Anil supervising the state of seeds



The nursery has become an arboretum of native trees

Once our nursery was up, from germinating 35 species in the first year we were able to add more than 200 species to the Park in the last 10 years. Thousands of citizens and children came to plant up the dry rocky slopes of the Park. More than 50 school children, 68 corporate volunteers and thousands of individuals came to plant about 1,45,000 plants in the Park in the last 10 years. We set up a drip irrigation network in some of the areas, where irrigation by our gardeners was not so easy. Plants were monitored very regularly and irrigation was provided only when there was water stress noticed, not more than 8 times in a year and only up to three years. This water for irrigation came from the Sewage Treatment Plants of DLF and Hotel Le Meridien. Things are slow in dry, rocky places. The growing season is restricted to a precious few weeks in the year and we knew we had to somehow hold out for a few more years before we could offer clear evidence that our approach and method was paying off.

Today the Park showcases more than 300 species of plants, many of them reintroductions to Haryana. With its diverse microhabitats, the Park has become a haven for birds, animals and insects.



We were very mindful of our water budget. Treated water was used in drip pipelines for irrigation

Photos: Vijay Dhasmana

Notes

1. Champion HG & Seth SK, 1968, A Revised Survey of the Forest Types of India.

Vijay Dhasmana is a rewilder and curator of the Aravali Biodiversity Park, iamgurgaon

FORESTS OF THE PARK

- Vijay Dhasmana



Photo: Nitin Das

Ecological restoration has led to rewilding of the fissured land

IN THE YEAR 2010, the Park was mostly barren and whatever little vegetation we saw was mainly young vilayati keekar (*Prosopis juliflora*), an invasive alien species that was colonizing the Park. One also noticed some seasonal herbs and grasses that came up during the monsoon and winter months.

At the start of the restoration work, rootstocks of native plants were identified and given protection. We saw a resurgence of babool (*Acacia nilotica*), ronjh (*Acacia leucopholea*), hingot (*Balanites roxburghii*), kair (*Capparis decidua*), ghatbor (*Fleuggea leucopyrus*) and jungli karonda (*Carissa spinarum*) from these rootstocks. While we protected these native species, we eradicated alien invasives, such as *Prosopis juliflora*, *Lantana camara*, *Xanthium*

stumarium, *Parthenium hestrophorus* and many others. The Park was a large canvas for us to paint with the diverse forests of the Northern Aravalis.

Today these forest communities are established and many are recruiting individuals giving us hope that the Park is becoming a self-sustaining forest ecosystem. The forest community in the Park varies as per the terrain. The steep rocky outcrops are home to salai and dhau forests, gentle outcrops house kumath and khair forests. Dhak forest on gentle slopes and dry valleys, and distinct forests of kaim in the seasonal drainage channels. Then the patches where the soil is deep, you find babool and jhand forests, and seasonal wetlands have khajoor and saccharum grasslands.

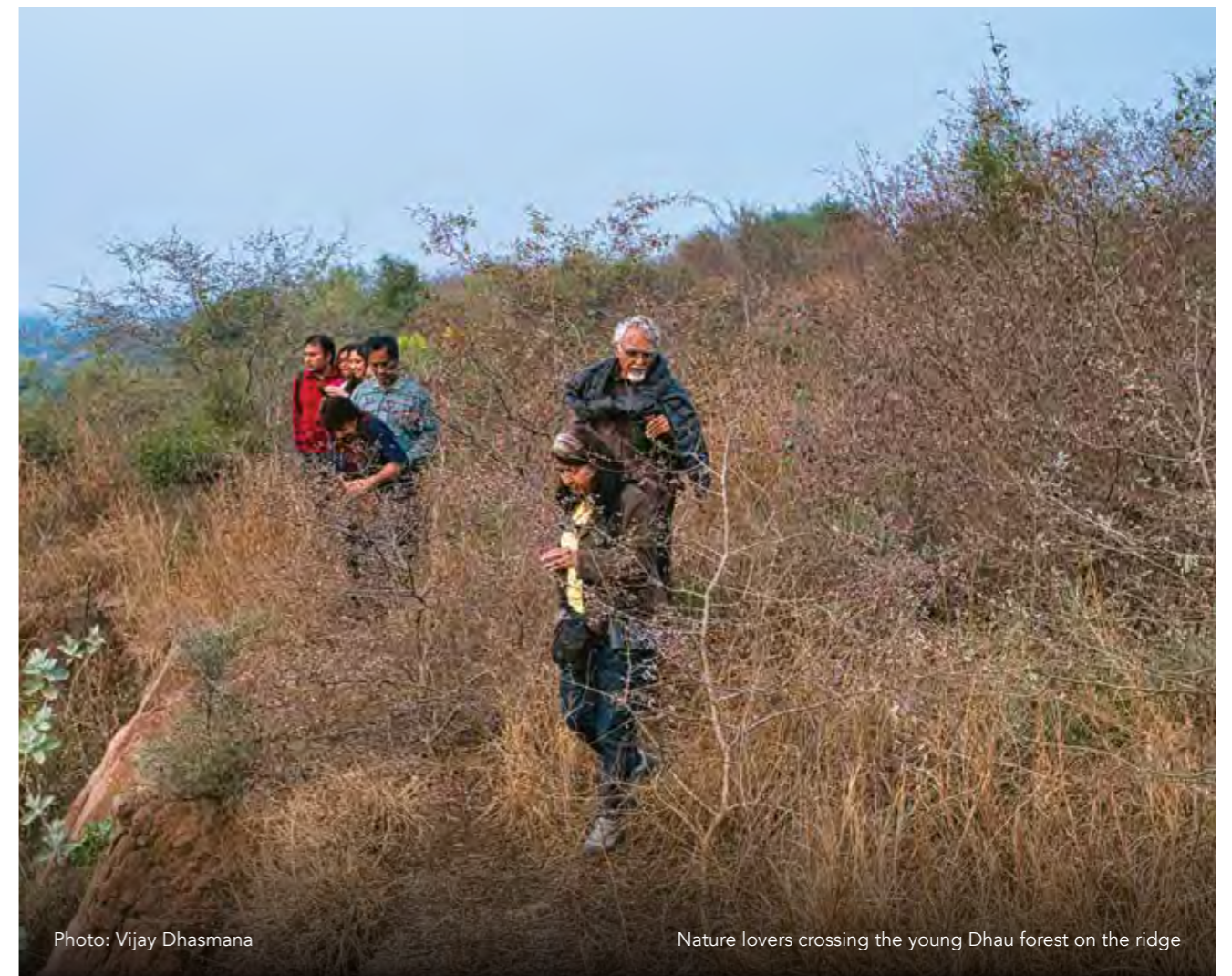


Photo: Vijay Dhasmana

Nature lovers crossing the young Dhau forest on the ridge

Hilltops and Rocky Outcrops

Forest of *Boswellia serrata*, salai: On hilltops, ridges and spurs where soil is usually bouldery, pebbly, shallow and dry. Companion species are: *Sterculia urens*, kullu; *Lannea coromendalica*, gurjan; *Anogeissus pendula*, dhau; *Gmelina arborea*, gamhar; *Crateva adansonii*, barna; *Wrightia tinctoria*, doodhi; *Ehretia laevis*, chamrod; *Flaucourtia indica*, kakai; *Bauhinia racemosa*, jinjheri; and an understory of *Holarhena pubscens*, kuda; *Helicteres isora*, marodphali; and *Grewia flavescens*, pisangna.

Forest of *Anogeissus pendula*, dhau: This forest exists on the ridges and slopes almost as a pure forest of dhau (about 90-95%). Often ridge tops are populated by salai and slopes with dhau. Companion species are: *Acacia leucophloea*, ronjh; *Acacia senegal*, kumath; *Crateva adansonii*, barna; *Flaucourtia indica*, kakai; *Wrightia tinctoria*, doodhi; *Bauhinia racemosa*, jinjheri.

Forest of *Acacia catechu*, khair: Found on the gentler ridges and slopes of hills. Companion species are: *Anogeissus pendula*, dhau; *Acacia leucophloea*, ronjh; *Acacia senegal*, kumath; *Crateva adansonii*, barna; *Wrightia tinctoria*, doodhi; *Ehretia laevis*, chamrod; *Bauhinia racemosa*, jinjheri; *Flueggea leucopyrus*, ghatbor; *Dichrostachys cinerea*, goya khair.

Forest of *Acacia senegal*, kumath: These forests are often a sign of degraded forest in the Aravali. Companion species are: *Anogeissus pendula*, dhau; *Acacia leucophloea*, ronjh; *Wrightia tinctoria*, doodhi; *Cordia gharaf*, goondi; *Ehretia laevis*, chamrod; *Flueggea leucopyrus*, ghatbor; *Dichrostachys cinerea*, goya khair.



A few hilltops have salai forest on the edges. Slowly they are recruiting seedlings to the landscape.



Photos: Vijay Dhasmana

Kaim forests in the valleys are now gaining height

Forests in the Valleys

Forest of *Mitragyna parvifolia*, kaim: These are often found in valleys of the salai or dhau forests where seasonal streams flow. Companion species are: *Butea monosperma*, dhak; *Albizia odoratissima*, basa; *Diospyros cordifolia*, bistendu; *Bauhinia racemosa*, jinjheri; *Crateva adansonii*, barna; *Ficus religiosa*, peepal; *Ficus benghalensis*, badh; *Ficus racemosa*, goolar.

Forests of *Butea monosperma*, dhak: These are often found in the drier valleys or planes of the Aravalis. Companion species are: *Acacia leucophloea*, ronjh; *Holoptelea integrifolia*, chudail; *Bauhinia racemosa*, jinjheri; *Flaucourtia indica*,

kakai; *Cordia gharaf*, goondi; *Holarhena pubscens*, kuda; *Helicteres isora*, marodphali; *Adhatoda vasica*, adulsa; *Diospyros cordifolia*, bistendu; *Capparis sepiaria*, hins; *Flueggea leucopyrus*, ghatbor; *Dichrostachys cinerea*, goya khair.

Forest of *Acacia nilotica*, babool: Valley forests with deep soil deposits, often waterlogged during monsoon. Companion species are: *Capparis decidua*, kair; *Capparis sepiaria*, hins; *Salvadora persica*, jaal; *Salvadora oleoides*, methi jaal; *Ziziphus mauritiana*, ber.



Babool is a very fast growing species that makes forests of its own. We call them Babool rakh at the Park.



Some of the grasses are pioneers, such as *Chrysopogon fulvus* on the rocky outcrops. Here you can see how they aid in restoration of degraded landscapes.

Grasslands

Savanna of *Phoenix sylvestris* and *Saccharum*: These occur in the wetlands and seasonal wetlands of the Aravalis. Companion species are: *Ehretia laevis*, chamrod; *Salvadora persica*, jaal; *Acacia*

nilotica, babool; *Tamarix dioica*, farash; and the dominant grasses are *Saccharum spontaneum*; *Saccharum benghalensis* and *Desmostachya bipinnata*.



Photos: Vijay Dhasmana

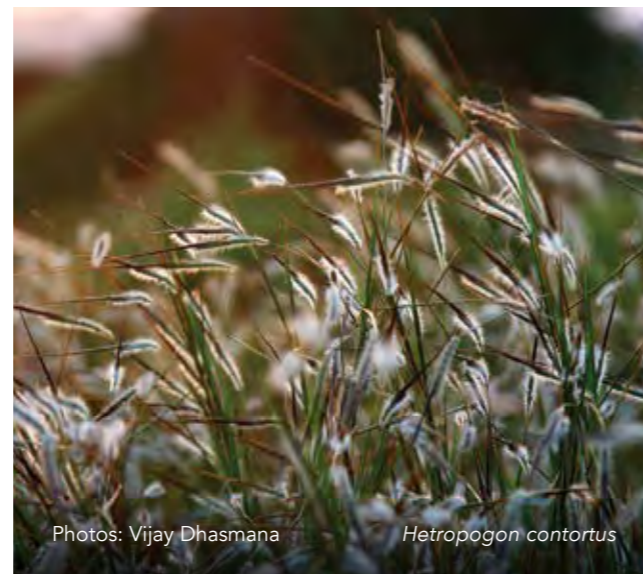
Mining pits have become happy *Saccharum* grasslands

References

- Bamber CJ, 1916, Plants of the Punjab.
 Brandis D, 1874, The Forest Flora of North-West and Central India.
 Champion HG & Seth SK, 1968, A Revised Survey of the Forest Types of India.

Vijay Dhasmana is a rewilder and curator of the Aravali Biodiversity Park, iamgurgaon

A Checklist of Plants Aravali Biodiversity Park, Gurugram*



Trees			
1	<i>Acacia catechu</i> (khair)	32	<i>Cordia gharaf</i> (goondi)
2	<i>Acacia leucophloea</i> (ronjh)	33	<i>Cordia obliqua</i> (choti goondi)
3	<i>Acacia modesta</i> (phulai)	34	<i>Crateva adansonii</i> (barna)
4	<i>Acacia nilotica subso indica</i> (babool)		<i>Dalbergia paniculata subsp.</i>
5	<i>Acacia nilotica subsp</i>	35	<i>lanceolaria</i> (takoli)
	<i>tomentosa</i> (babool)		<i>Dalbergia paniculata subsp.</i>
6	<i>Acacia senegal</i> (kumtha)	36	<i>paniculata</i> (dhoban)
7	<i>Adina cordifolia</i> (haldu)	37	<i>Desmodium oojeinense</i> (tinsa, sandan)
8	<i>Aegle marmelos</i> (bel)		<i>Dichrostachys cinerea</i>
9	<i>Ailanthus exelsa</i> (arlu)	38	(bilatri, goya khair)
10	<i>Alangium salvifolium</i> (akol)	39	<i>Diospyros cordifolia</i> (bistendu)
11	<i>Albizia amara</i> (krishna siras)	40	<i>Diospyros melonoxylon</i> (tendu)
12	<i>Albizia odoratissima</i> (basa)	41	<i>Dolicondron falcata</i> (medsingh)
13	<i>Anogeissus latifolia</i> (dhawda)	42	<i>Drypetes roxburghii</i> (putranjeeva)
14	<i>Anogeissus pendula</i> (dhau, dhok)	43	<i>Ehretia laevis</i> (chamror, desi papdi)
15	<i>Anogeissus sericia subsp</i>	44	<i>Erythrina stricta</i> (gadha palash)
	<i>nummularia</i> (indrok)	45	<i>Erythrina suberosa</i> (Hadua)
16	<i>Azadirachta indica</i> (neem)	46	<i>Euphorbia cuducifolia</i> (thor)
17	<i>Balanites roxburghii</i> (hingot)	47	<i>Euphorbia nivulia</i> (thor)
18	<i>Bauhinia malabarica</i> (apta)	48	<i>Ficus arnottiana</i> (peepli)
19	<i>Bauhinia purpurea</i> (kachnar)	49	<i>Ficus benghalensis</i> (baddh)
20	<i>Bauhinia racemosa</i> (jhinjheri)	50	<i>Ficus hispida</i> (katambar)
21	<i>Bombax ceiba</i> (semal)	51	<i>Ficus mollis</i> (son pakhad)
22	<i>Boswellia serrata</i> (salai)	52	<i>Ficus palmata</i> (jangli anjeer)
23	<i>Bridelia retusa</i> (kasai)	53	<i>Ficus racemosa</i> (goolar)
24	<i>Butea monosperma</i> (palas, dhaak)	54	<i>Ficus religiosa</i> (peepal)
25	<i>Capparis decidua</i> (kareel, kair)	55	<i>Ficus tinctoria</i> (gacchi)
26	<i>Casearia graveolens</i> (mujaal)	56	<i>Ficus virens</i> (pilkhan)
27	<i>Cassia fistula</i> (amaltas, kirwara, ali)	57	<i>Firmiana colorata</i> (pinj)
28	<i>Catunaregam spinosa</i> (mainhar)	58	<i>Flacourtia indica</i> (kakai)
29	<i>Chloroxylon sweitenia</i> (bhirra)	59	<i>Gardenia latifolia</i> (papda)
30	<i>Commiphora wightii</i> (gugal)	60	<i>Gmelina arborea</i> (gamhar)
31	<i>Cordia dichotoma</i> (lasoda)	61	<i>Grewia tiliaefolia</i> (dhaman)

*It excludes plants not native to our region

Herbs & Grasses

29	<i>Cymbopogon martinii</i> (grass)	63	<i>Panicum antidotale</i> (grass)
30	<i>Cynotis cristata</i>	64	<i>Pavonia arabica</i>
31	<i>Cyperus</i> (various spp)	65	<i>Pedaliium murex</i>
32	<i>Dactyloctenium aegyptium</i> (grass)	66	<i>Pergularia daemia</i>
33	<i>Desmostachya bipinnata</i> (grass)	67	<i>Peristrophe bicalyculata</i>
34	<i>Dicanthium annulatum</i> (grass)	68	<i>Perotis indica</i> (grass)
35	<i>Digera alternifolia</i>	69	<i>Phyllanthus amara</i>
36	<i>Digitaria adscensionis</i> (grass)	70	<i>Pluchea lanceolata</i>
37	<i>Digitaria setigera</i> (grass)	71	<i>Polycarpaea corymbosa</i>
38	<i>Dipteracanthus patulus</i>	72	<i>Portulaca oleracea</i>
39	<i>Echinops echinatus</i>	73	<i>Portulaca pilosa</i>
40	<i>Eleusine compressa</i> (grass)	74	<i>Rhyncosia minima</i>
41	<i>Elytraria acaulis</i>	75	<i>Saccharum benghalensis</i>
42	<i>Eragrostris poaeodes</i> (grass)	76	<i>Saccharum spontaneum</i>
43	<i>Euphorbia hirta</i>	77	<i>Senna occidentalis</i>
44	<i>Evolvulus alsinioides</i>	78	<i>Senna tora</i>
45	<i>Fagonia cretica</i>	79	<i>Sesamum indicum</i>
46	<i>Heliotropium</i> (various)	80	<i>Setaria verticillata</i> (grass)
47	<i>Hetropogon contortis</i> (grass)	81	<i>Sida</i> (various spp)
48	<i>Hibiscus micranthus</i>	82	<i>Solanum albicaule</i>
49	<i>Hibiscus ovalifolius</i>	83	<i>Solanum nigrum</i>
50	<i>Indigofera cordifolia</i>	84	<i>Solanum surattense</i>
51	<i>Indigofera linifolia</i>	85	<i>Sonchus arvensis</i>
52	<i>Indigofera tinctoria</i>	86	<i>Sonchus oleraceus</i>
53	<i>Justicia diffusa</i>	87	<i>Sporobulus diander</i> (grass)
54	<i>Lepidagathis cristata</i>	88	<i>Tephrosia purpurea</i>
55	<i>Leptadenia pyrotechnica</i>	89	<i>Tephrosia villosa</i>
56	<i>Lindenbergia indica</i>	90	<i>Tragus biflorus</i> (grass)
57	<i>Melanocenchris jacquemontii</i> (grass)	91	<i>Tranthena portulacastrum</i>
58	<i>Melilotus indicus</i>	92	<i>Tribulus terrestris</i>
59	<i>Merremia aegyptiaca</i>	93	<i>Trichodesma amplexicaule</i>
60	<i>Mukia maderaspatana</i>	94	<i>Triumfetta rhomboidea</i>
61	<i>Ocimum americanum</i>	95	<i>Urginea indica</i>
62	<i>Oropetium thomaeum</i> (grass)	96	<i>Vernonia cinerescens</i>



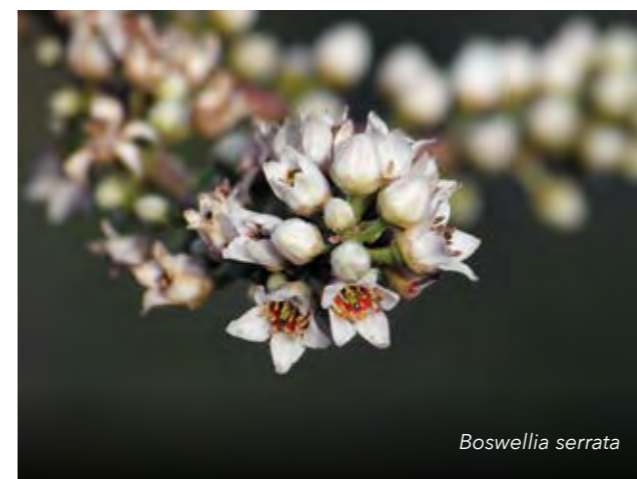
Capparis decidua



Mitragyna parvifolia



Melilotus indica



Boswellia serrata



Cenchrus ciliaris



Dichrostachys cinerea



Photos: Vijay Dhasmana

Maerua arenaria

FAUNA OF THE PARK

- Vijay Dhasmana



Photo: Amit Sharma

Indian Jackal is a common sighting at the Aravali Biodiversity Park.

MINING AND STONE CRUSHING at the Aravali Biodiversity Park had led to a huge loss of animal (faunal) diversity. With the ecological restoration work, there is a gradual revival of faunal diversity. Once our biodiversity surveys are complete, we shall come up with an updated lists of mammals, reptiles, amphibians and invertebrates (worms, bugs and insects).

A recent study conducted to map the wildlife of the Aravali districts in South Haryana in 2017 revealed the “presence of 10 mammalian species namely Common Leopard, Striped Hyena, Golden Jackal, Grey Wolf, Indian Fox, Jungle Cat, Grey Mongoose, Small Indian Civet, Indian Crested Porcupine, Indian Hare, Wild Pig, Rhesus Macaque, Blue-bull (Nilgai) and Indian Gazelle (Chinkara).” (Habib et al., 2017)¹

Of the 10 species mentioned in the survey, you can spot 6 at the Aravali Biodiversity Park: Golden Jackal, Jungle Cat, Grey Mongoose, Small Indian Civet, Indian Hare and Blue-bull (Nilgai). You can also spot other mammalian species, such as Striped Palm Squirrel, House Shrew, Indian Bush Rat, Flying Fox and a few species of bats.



Photo: Amit Sharma

Indian Hare



Photo: Rajesh Shah

Jungle Cat



Photo: Arvind Yadav

Indian Monitor Lizard

Apart from mammals, you can also see reptiles, amphibians and invertebrates (backbone less animals). The reptiles commonly observed are; monitor lizard, snakes (common cobras, saw scaled viper, russell's viper, common krait, rat snake, common wolf snake, sand boa, etc.), skinks, geckos and lizards.

There is a huge surge in the invertebrate diversity and populations in the Park. They play a crucial role in our ecosystem. The majority of animal species (in the world) are invertebrates; one estimate puts the figure at 97% (May, Robert M. 1988)².

Some invertebrates are pollinators, such as bees, wasps, butterflies, moths and flies, some are herbivores, such as aphids, grasshoppers, crickets, cicadas, katydids and some predators, such as ants, spiders, scorpions, centipedes, praying mantis, etc. There are others who work on the soil and make nutrients available to the plants, such as earthworms and termites. Most of these invertebrates become food for birds, reptiles and mammals and play an important role in nurturing the forests.

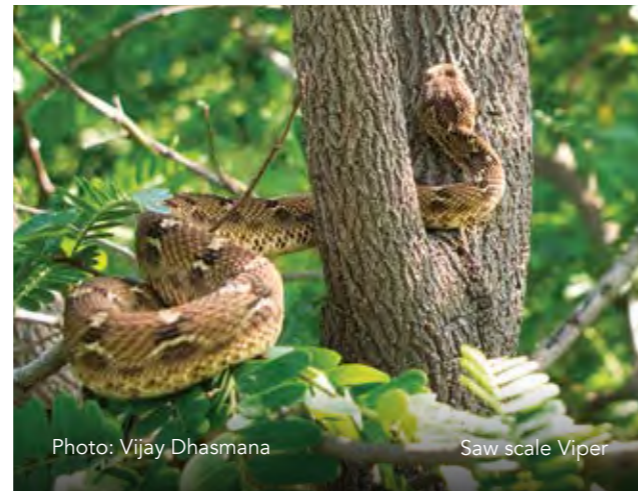


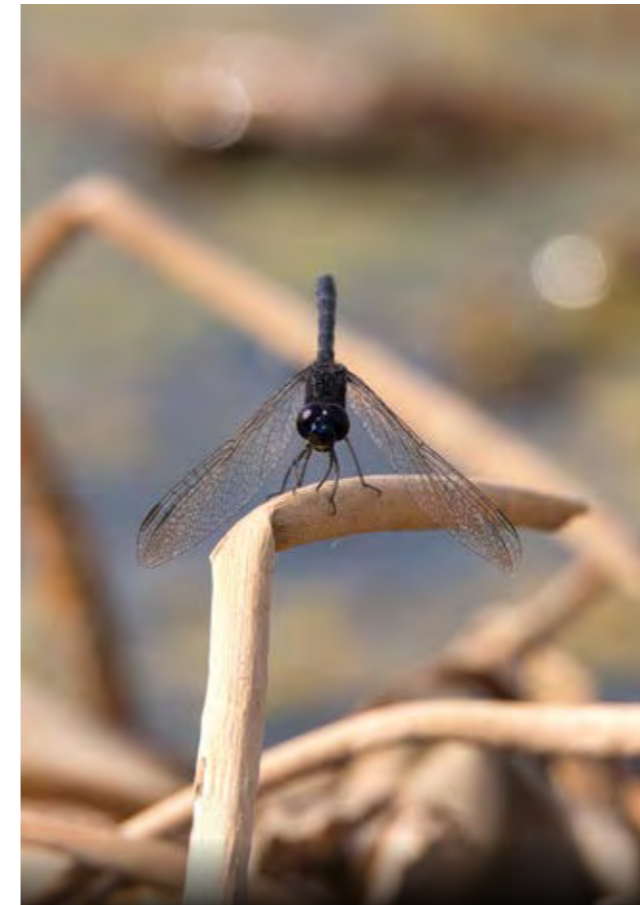
Photo: Vijay Dhasmana

Saw scale Viper

Notes

1. Habib, B., Talukdar G., Jain, P. and Bhasin A. (2017): Mapping landuse/landcover patterns in Aravallis Haryana with special reference to key wildlife species. Project Completion Report. Wildlife Institute of India, Dehradun and Haryana Forest Department. Pp97.
2. May, Robert M. (16 September 1988). "How Many Species Are There on Earth?". *Science*. 241 (4872): 1441–1449, 2014.

Vijay Dhasmana is a rewilder and curator of the Aravali Biodiversity Park, iamgurgaon



Photos: Vijay Dhasmana



Photo: Devraj Singh

Nilgai

BIRDS OF THE PARK

- Sourajit Ghosal



Photo: Vijay Dhasmana

The rocky cliffs of the Park are home to the Indian Eagle-owl

AS OF JUNE 2020, the total number of bird species sighted at the Aravali Biodiversity Park, Gurugram, is 201. This is as per the sighting records submitted over 6 years by birdwatchers on eBird — world's largest citizen science initiative maintained by the Cornell Lab of Ornithology.

To put this in context, 330 bird species have so far been reported on eBird from Sultanpur National Park — a landscape protected since 1971.



This is an interesting observation because, as recently as year 2004, the site where Aravali Biodiversity Park, Gurugram, is located today, was an active stone crushing zone strewn with rubble, covered in dust.

This patch of the Aravali mountain range at the intersection of Gurugram and Delhi had been ravaged by years of ruthless mining and neglect, turning into a degraded landscape devoid of the flora native to this habitat. Today, anyone taking a leisurely stroll along any of the pathways in the Park can observe the rich birdlife with absolute ease. Ubiquitous bulbuls, pigeons, mynas and peafowls share space with habitat specialists like prinias, babblers and shrikes. Careful observation of the scrub vegetation can reveal francolins, buttonquails and thicknees, while parakeets, drongos, treepies and barbets call for attention from the canopies.

The munias and weavers go about their business on the reeds, the house sparrows keep a studied distance from the walkers and the black-shouldered kites perform aerial acrobatics while keeping a watch from high above. While these commoners reveal themselves without a fuss, the beautiful Sirkeer Malkoha and the magnificent Indian Eagle-owl are two elusive residents of this Park that reveal themselves to the luckiest few. But it's not only the resident birds that have found a refuge in this Park, a significant

number of migratory birds arrive here coinciding with the change of seasons. Golden Oriole, Indian Paradise Flycatcher, Black-headed Cuckooshrike, Savanna Nightjar and Common Cuckoo are the summer migrants sighted on successive years in the Park. The beautiful Jacobin Cuckoos (known as Chataka in our mythological texts) have been arriving in ever greater numbers each year and spending entire summers in the Park.

Aravali Biodiversity Park, Gurugram is the wintering grounds for many migratory birds as well, arriving from their breeding habitats in the Western Himalayas, Central Asia and beyond. Eurasian Wryneck, Common Kestrel, Black Redstart, Common Stonechat, Variable Wheatear, Red-breasted and Taiga Flycatchers, 5 species of Wagtails and Pipits and at least 10 species of Warblers are sighted in the Park during the winter months.

As if the arrival of the summer & winter migrants was not enough, the Park has hosted many birds on passage, that are not common to the region — Himalayan Griffon Vulture (November 2019), Hair-crested Drongo (November 2019), Rufous-tailed Scrub-Robin (August 2018), Spotted Flycatcher (May 2016). These sightings have ensured continued interest of the birdwatching community in the Park and detailed documentation of its birdlife.

Birds have always been considered as important markers of the health of an ecosystem. The

species diversity of birds and their abundance in a habitat indicates appropriate micro-habitats, healthy prey base, nesting opportunities and consequently serves as a measure of success of an eco-restoration effort. Aravali Biodiversity Park, Gurgaon, has risen from the rubbles and in time will evolve into a beautiful forest of the Aravalis – you can ask a bird.

Sourjit Ghosal is an avid birder and has authored a book on the common birds of the Aravali Biodiversity Park.

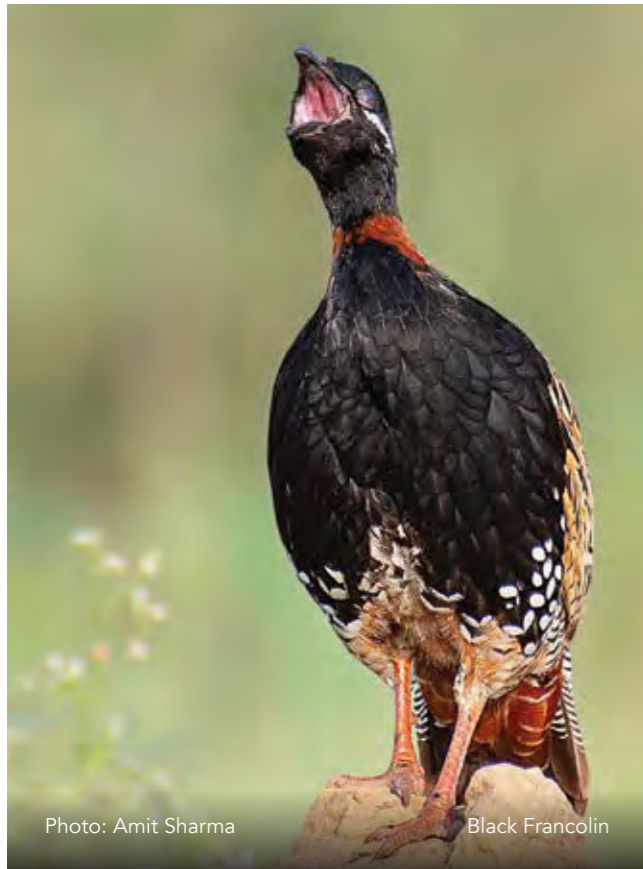


Photo: Amit Sharma Black Francolin



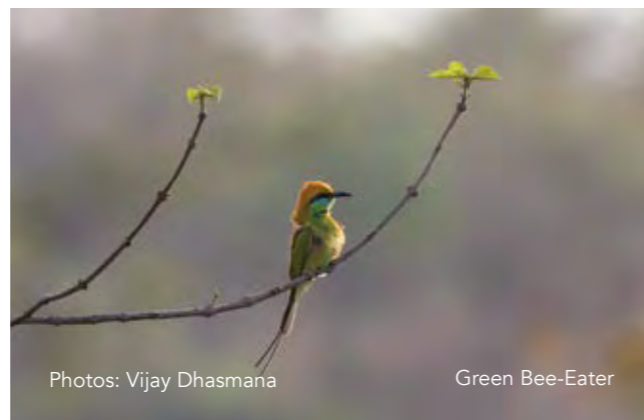
Indian Silverbill



Black Drongo



Red-Vented Bulbul



Photos: Vijay Dhasmana Green Bee-Eater



Photos: Amit Sharma Eurasian Wryneck



White Throated Kingfisher



Rufus-tailed Scrub-Robin



Photo: Aneel Stanley Golden Oriole

A Checklist of Birds Aravali Biodiversity Park, Gurugram*

1	Lesser Whistling-Duck	31	Grey Francolin
2	Greylag Goose	32	Greater Flamingo
3	Ruddy Shelduck (Brahminy Duck)	33	Little Grebe
4	Indian Spot-billed Duck	34	Rock Pigeon (Blue Rock Pigeon)
5	Green-winged Teal (Common Teal)	35	Oriental Turtle-Dove
6	Ruff	36	Eurasian Collared-Dove
7	Common Sandpiper	37	Red Collared-Dove (Red Turtle-Dove)
8	Green Sandpiper	38	Spotted Dove
9	Common Greenshank	39	Laughing Dove (Little Brown Dove)
10	Wood Sandpiper	40	Yellow-footed Green-Pigeon
11	Eurasian Moorhen	41	Chestnut-bellied Sandgrouse
12	White-breasted Waterhen	42	Painted Sandgrouse
13	Asian Openbill	43	Greater Coucal
14	Painted Stork	44	Sirkeer Malkoha
15	Little Cormorant	45	Asian Koel
16	Great Cormorant	46	Pied Cuckoo (Jacobin Cuckoo)
17	Indian Cormorant (Indian Shag)	47	Grey-bellied Cuckoo
18	Grey Heron	48	Common Hawk-Cuckoo
19	Purple Heron	49	Common Cuckoo
20	Indian Pond-Heron	50	Savanna Nightjar
21	Great Egret	51	Little Swift (Indian House Swift)
22	Intermediate Egret	52	Indian Thick-knee (Indian Stone-curlew)
23	Little Egret	53	Black-winged Stilt
24	Cattle Egret	54	Yellow-wattled Lapwing
25	Black-crowned Night-Heron	55	Red-wattled Lapwing
26	Glossy Ibis	56	Barred Buttonquail
27	Black-headed Ibis	57	Himalayan Griffon (Himalayan Vulture)
28	Red-naped Ibis (Indian Black Ibis)	58	Egyptian Vulture
29	Indian Peafowl	59	Crested Serpent-Eagle
30	Black Francolin		

*As reported in Ebird.

A Checklist of Birds Aravali Biodiversity Park, Gurugram

60	Short-toed Snake-Eagle	89	Yellow-crowned Woodpecker
61	Indian Spotted Eagle	90	Black-rumped Flameback (Lesser Goldenbacked Woodpecker)
62	Greater Spotted Eagle	91	Eurasian Kestrel (Common Kestrel)
63	Booted Eagle	92	Eurasian Hobby
64	Steppe Eagle	93	Peregrine Falcon
65	Imperial Eagle	94	Alexandrine Parakeet
66	Bonelli's Eagle	95	Rose-ringed Parakeet
67	Long-legged Buzzard	96	Plum-headed Parakeet
68	White-eyed Buzzard	97	Black-headed Cuckooshrike
69	Oriental Honey-buzzard (Crested Honey Buzzard)	98	Indian Golden Oriole
70	Black Kite	99	Common Woodshrike
71	Black-winged Kite (Black-shouldered Kite)	100	Black Drongo
72	Pallid Harrier	101	Ashy Drongo
73	Shikra	102	Hair-crested Drongo (Spangled Drongo)
74	Eurasian Sparrowhawk	103	Isabelline Shrike
75	Indian Eagle-owl	104	Brown Shrike
76	Indian Scops-Owl (Collared Scops-Owl)	105	Bay-backed Shrike
77	Spotted Owlet	106	Long-tailed Shrike
78	Eurasian Hoopoe	107	Great Grey Shrike
79	Indian Grey Hornbill	108	Rufous Treepie
80	White-throated Kingfisher	109	House Crow
81	Green Bee-eater	110	Large-billed Crow
82	Blue-cheeked Bee-eater	111	Cinereous Tit (Great Tit)
83	Blue-tailed Bee-eater	112	Ashy-crowned Sparrow-Lark (Ashy-crowned Finch-Lark)
84	European Roller	113	Bengal Bushlark
85	Indian Roller	114	Indian Bushlark (Red-winged Bushlark)
86	Coppersmith Barbet	115	Oriental Skylark
87	Brown-headed Barbet (Large Green Barbet)	116	Crested Lark
88	Eurasian Wryneck		

A Checklist of Birds Aravali Biodiversity Park, Gurugram

117	Common Tailorbird	147	Red-vented Bulbul
118	Rufous-fronted Prinia	148	Red-whiskered Bulbul
119	Grey-breasted Prinia	149	White-eared Bulbul
120	Graceful Prinia	150	Yellow-eyed Babbler
121	Jungle Prinia	151	Indian White-eye (Oriental White-eye)
122	Yellow-bellied Prinia	152	Common Babbler
123	Ashy Prinia	153	Striated Babbler
124	Plain Prinia	154	Large Grey Babbler
125	Zitting Cisticola	155	Jungle Babbler
126	Booted Warbler	156	European Starling (Common Starling)
127	Sykes's Warbler	157	Rosy Starling
128	Paddyfield Warbler	158	Asian Pied Starling (Pied Myna)
129	Blyth's Reed Warbler	159	Brahminy Starling
130	Clamorous Reed Warbler (Indian Great Reed Warbler)	160	Common Myna
131	Common Grasshopper-Warbler	161	Bank Myna
132	Common Chiffchaff	162	Orange-headed Thrush
133	Hume's Warbler	163	Blue Rock-Thrush
134	Brooks's Leaf Warbler	164	Rufous-tailed Scrub-Robin
135	Sulphur-bellied Warbler	165	Indian Robin
136	Greenish Warbler	166	Oriental Magpie-Robin
137	Western Crowned Warbler	167	Bluethroat
138	Eastern Orphean Warbler	168	Indian Paradise-Flycatcher
139	Lesser Whitethroat	169	Spotted Flycatcher
140	Grey-throated Martin (Plain Martin)	170	Verditer Flycatcher
141	Pale Sand Martin (Pale Martin)	171	Ultramarine Flycatcher
142	Dusky Crag-Martin	172	Taiga Flycatcher (Red-throated Flycatcher)
143	Barn Swallow	173	Red-breasted Flycatcher
144	Wire-tailed Swallow	174	Black Redstart
145	Red-rumped Swallow	175	Siberian Stonechat
146	Streak-throated Swallow		(Common Stonechat)

A Checklist of Birds Aravali Biodiversity Park, Gurugram

176	White-tailed Stonechat
177	Pied Bushchat
178	Brown Rock Chat (Indian Chat)
179	Variable Wheatear
180	Purple Sunbird
181	Streaked Weaver
182	Baya Weaver
183	Black-breasted Weaver (Bengal Weaver)
184	Red Avadavat
185	Indian Silverbill (White-throated Munia)
186	Scaly-breasted Munia (Spotted Munia)
187	House Sparrow
188	Yellow-throated Sparrow (Chestnut-shouldered Petronia)
189	Grey Wagtail
190	Western Yellow Wagtail
191	Citrine Wagtail
192	White-browed Wagtail (Large Pied Wagtail)
193	White Wagtail
194	Paddyfield Pipit
195	Long-billed Pipit
196	Tawny Pipit
197	Tree Pipit
198	Olive-backed Pipit
199	Common Rosefinch
200	Red-headed Bunting
201	White-capped Bunting (Chestnut-breasted Bunting)



EXPLORING AMPHIBIANS

- Dr. Robin Suyesh



Robin and his team exploring amphibians in the Park

ARAVALI BIODIVERSITY PARK has a suitable combination of required aquatic and terrestrial habitats to support amphibians. It has characteristic mining pits that have become seasonal water-bodies and get filled up during monsoon season.

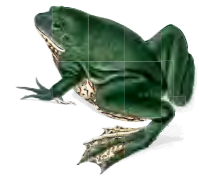
Amphibians lay their eggs in water and the larvae (tadpoles) develop there. Outside the breeding season, adults and sub-adults spend much of their time on land where, generally, they need moist conditions to prevent loss of water, although some species can tolerate more water loss than others. Delhi-NCR region has very limited habitat that can support amphibians and Aravali Biodiversity Park, Gurugram is one of the best among them.

Basic requirements to sustain amphibian is found in the Park as they provide:

- Relatively clean permanent and temporary water bodies for egg laying and development of larvae (tadpoles).

- Vegetation providing shelter from excessive heat dryness & predators.
- Foraging areas & sufficiently good populations of prey species (mostly insects).
- Suitable hibernation sites for amphibians.

Amphibians are an important part of an ecosystem as they are considered to be environmental indicators. Their semi-permeable skin makes them highly susceptible to pollution and their presence indicates a relatively healthy ecosystem. They also play a very important role in the food chain as they consume insects, control their population and are also a source of food for higher carnivores like reptiles and birds.



Photos: Vijay Dhasmana

Amphibians thrive in the seasonal fresh water pools of the Park

The amphibian survey conducted in Aravali Biodiversity Park during the monsoon season of 2018 shows the presence of eight sympatric amphibians and no other habitat in Delhi-Gurugram currently shows such high diversity of amphibians.

Amphibians in urban areas are currently facing a major crisis of habitat loss and fragmentation. Aravali Biodiversity Park, Gurugram is currently an important habitat, critical for survival for these city dwelling amphibians, made possible with over 8 years of habitat restoration. Conservation efforts for

amphibians with complex life cycles must protect the full range of habitats required by all life history stages. Thus, the water bodies and the adjoining terrestrial habitat in the Aravali Biodiversity Park, Gurugram needs to be protected to prevent amphibians from becoming locally extinct.

The Eight Species of Amphibians in the Park



Hoplobatrachus Tigerinus, Bull Frog:
Largest Frog Of India

They are mostly solitary and nocturnal in nature. They inhabit crevices and bushes near permanent water sources. The bullfrog does not stay in water for a long time and it prefers spending most of its time hiding and feeding in surrounding vegetation.



Euphlyctis Cyanophlyctis, Indian Skipper Frog

They are associated with the permanent water body at the Aravali Biodiversity Park. They are often seen at the edge of bodies of water with their eyes above the water. They are rarely seen outside water.



Microhyla Nilphameriensis, Narrow Mouthed Frog

This diminutive narrow-mouthed frog lives semi-buried in leaf litter on the forest floor. It is mainly nocturnal but it is also active during the day during the peak monsoon season. It breeds in ponds and temporary pools that form during the rainy season at the Aravali Biodiversity Park.



Minervarya Pierrej, Pierrei's Wart Frog

They breed in any kind of stagnant water body. It occupies both terrestrial and freshwater habitat. They breed during the peak monsoon season.



Duttaphrynus Melanostictus, Indian Toad

Asian common toads at the Aravali Biodiversity Park breeds in still temporary and permanent ponds and pools. Adults are predominantly terrestrial and may be found under ground cover such as rocks, fallen leaves and logs.

Photos: Dr. Robin Suyesh



Duttaphrynus Stomasticus

Their habit is similar to that of common Asian toad. It is nocturnal and hides in moist and shaded closed places. Breeding season lasts from June to October.



Minervarya Nepalensis

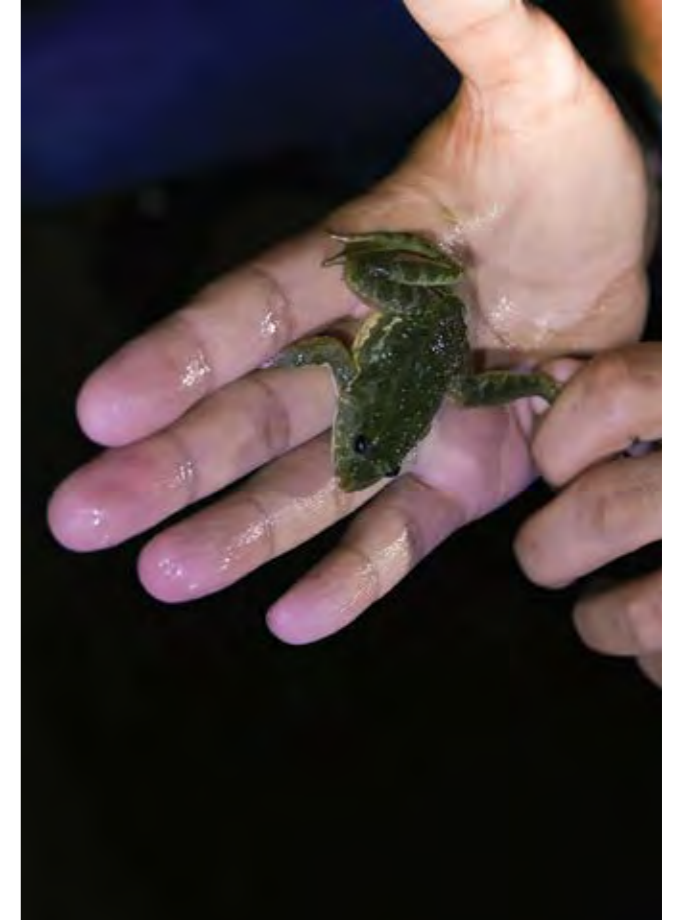
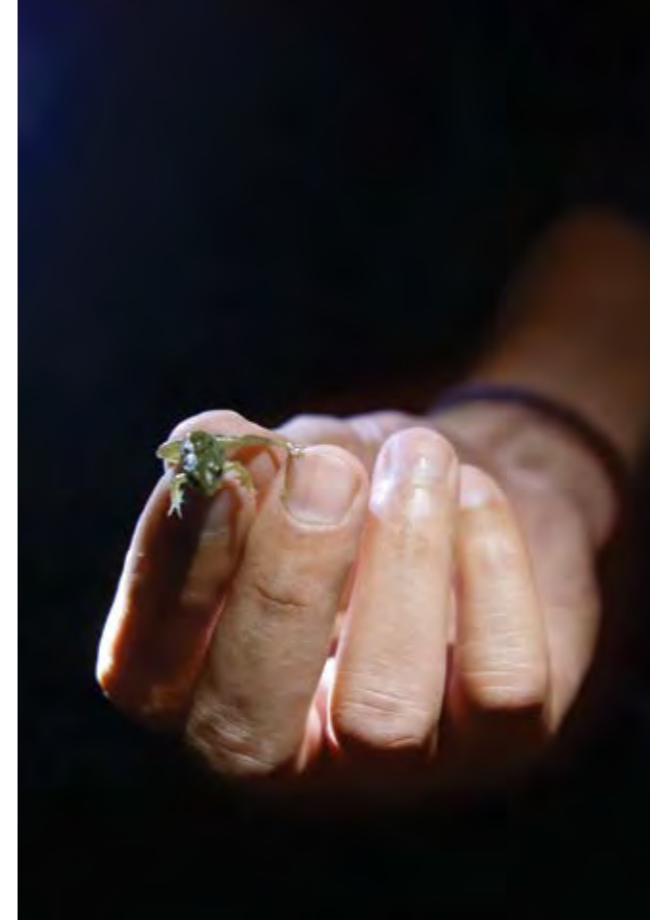
Their breeding takes place in temporary and permanent pools of the Aravali Biodiversity Park. Males call from the water edges. Lay eggs in permanent or ephemeral pool of water.



Photos: Dr. Robin Suyesh

Sphaerotheca Breviceps

Extremely elusive animals and can only be seen for a few days at the Park. The microhabitat in which this frog is found includes leaf litter or under rocks, in crevices or in open spaces in moist areas with vegetation cover.



Photos: Vijay Dhasmana

Dr. Robin Suyesh is an Amphibian Biologist who teaches at Sri Venkateshwara College, Delhi University and conducts regular amphibian surveys in Delhi NCR and Western Ghats.

BUTTERFLY DIVERSITY

- Abhishek Gulshan



With wide scale fragmentation and massive deterioration in habitat, the need for environment consciousness has never been greater. Butterflies have been recognised as indicators of biodiversity worldwide. Their fragility makes them more receptive to change in environment, hence their struggle to survive is a serious warning to us. With massive habitat degradation, climate and weather shift patterns due to pollution and other signification reasons is not only effecting these species adversely but it would inevitably impact our lives as well.

Being the quality of life indicators, a few reasons why butterflies are important:

1. Butterflies are an important component of rich biodiversity and flagship species for conservation in general. They are indicators of a healthy environment and ecosystem.
2. They are an extremely important group that has been studied for several years to fuel biological research in areas like evolution, mimicry, climate change, habitat loss and fragmentation and biodiversity conservation etc.
3. Areas rich in butterflies are generally rich in other invertebrates as well. These collectively provide a wide range of selfless environmental benefits such as pollination and natural pest control.
4. Butterflies and other insects play a pivotal role in the sustenance of the food chain, where they are a prime prey base for several other animals like birds, bats and other insectivores.
5. Their fascinating life-cycles are taught in educational institutions to teach children about the natural world and gives them a peek into the wonders of nature.
6. The wing patterns, colours and migration in insects also opens vital educational channels.
7. They have been a part of our natural heritage and have been studied for years.
8. Butterflies are often portrayed as representing freedom, beauty and peace.
9. In general, the popularity and mystery around butterflies amongst children and other people helps sensitise them towards the environment.
10. As per research, seeing all these incredible creatures also contributes towards both mental and physical health of a being.



Photo: Abhishek Gulshan

Lime Swallowtail

A Checklist of Butterflies Aravali Biodiversity Park, Gurugram

1	Yellow Pansy	26	Forget-me-not
2	Lemon Pansy	27	Danaid Eggfly
3	Blue Pansy	28	Great Eggfly
4	Peacock Pansy	29	Great Eggfly
5	Lime Swallowtail	30	Common Jay
6	Plain Tiger	31	Indian Grizzled Skipper
7	Striped Tiger	32	Bright Babul Blue
8	Lemon Emigrant	33	African Babul Blue
9	Mottled Emigrant	34	Plains Cupid
10	White Orange Tip	35	Small Cupid
11	Yellow Orange Tip	36	Gram Blue
12	Small Orange Tip	37	Dark Grass Blue
13	Common Leopard	38	Zebra Blue
14	Common Castor	39	Pale Grass Blue
15	Common Mormon	40	Tiny Grass Blue
16	Common Crow	41	Common Gull
17	Small Grass Yellow	42	Pioneer
18	Common Grass Yellow	43	Common Three Ring
19	Spotless Grass Yellow	44	Conjoined Swift
20	Common Banded Awl	45	Psyche
21	Pierrot (<i>Taracus sp.</i>)	46	Indian Red Flash
22	Red Pierrot	47	Common Rose
23	Small Salmon Arab	48	Common Silverline
24	Large Salmon Arab	49	Rice Swift
25	Small Grass Jewel		



Being a nature education and awareness initiative, NINOX - Owl about Nature has led several butterfly walks and surveys (butterfly counts and host-plant diversity) at Aravali Biodiversity Park in Gurgaon. We have all the reason and data to believe that this Park is a marvel in itself and is perhaps one of the richest insect-rich habitats around Delhi - NCR, keeping in mind the native biodiversity of the Aravalis.

We observed several breeding records of butterflies from inside the Park, which is a clear indicator that the Park comforts them with the presence of several native host plants of varied species of butterflies.

A few of the host plants are: *Barleria*, *Zizyphus*, *Calotropis*, *Capparaceae*, *Castor*, *Cassia* sp.

The Park is home to several creatures, that collectively maintain the health of the ecosystem, thus playing a far greater role in sustaining our delicate ecosystem web.

With increasing urbanisation, concretisation and pollution in Delhi NCR, Aravali Biodiversity Park in Gurgaon serves as a breather for all citizens. It is not merely a mini-forest, but is also an exemplary model of how a forest should be planned, keeping in mind the general habitat of the area.



Abhishek Gulshan is a keen naturalist and an educator. He has founded NINOX-Owl about nature to promote nature awareness.

MONITORING BIODIVERSITY

- Misha Bansal



A community led monitoring programme is established at the Park. Every year citizen volunteers come to record observations.

THERE IS A STRONG association between birds and vegetation. Studying bird communities can be rapid assessment tool for evaluating habitat restoration.

We conducted a study in the Park with the objective to examine if birds could be useful indicators to study ecological succession following habitat restoration. The study compared bird communities between restored and adjacent invaded sites. The study area was gridded and classified into different restoration habitats.

Using stratified random sampling, 14 one hectare grids were chosen within the restored area. In the adjacent invaded site, 5 one hectare grids were randomly chosen. At the centre of each grid, we carried out a 5 minute fixed radius point count. Each grid was sampled a total of 12 times over two winter seasons spanning 2016-2018.

Sites were compared on the basis of bird species richness abundance and foraging guilds. The cumulative number of individual birds recorded over spatio-temporal replicates were used as an indicator of bird abundance (encounter rates). Detection probabilities and density estimates are being analysed for different habitats.

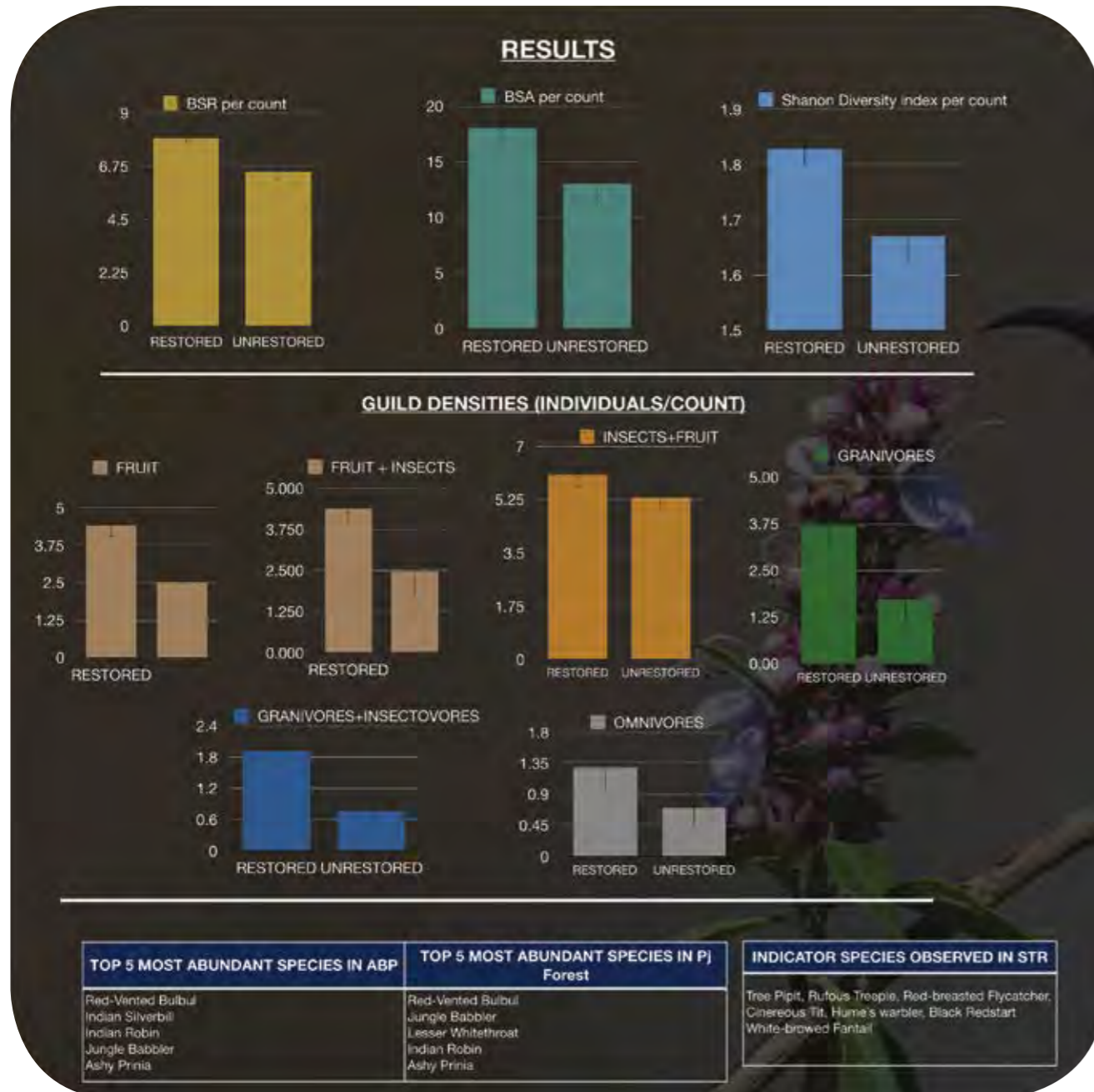
Our results revealed that the total and average number of species per count was higher in the restored site compared to invaded site (1.5 times and 1.4 times respectively). 16 species were unique to the restored habitat while only 3 species were unique to the invaded habitat. Average encounter rates were also 1.5 times higher in the restored site. Average encounter rates of Granivorous and Frugivorous birds were significantly higher in the restored site (2 and 2.5 times respectively). As aforementioned, finer density estimates and guild analyses are in progress.



Photos: Vijay Dhasmana

Dr. Soumya designing the research study and creating permanent monitoring plots

STUDY RESULTS COMPARING RESTORED v/s UNRESTORED SITES



The Park is dominated by open country birds which are in sync with the vegetation structure of a young forest. The restored site fared better in terms of bird species richness, abundance and diversity of feeding guilds. At the restored site, with ecological succession, native woodland species are expected to arrive as the vegetation matures. Our study has established a baseline monitoring program for the Aravali Biodiversity Park restoration program and can be useful for both the management of this site, and also other restoration activities within the Aravalis.



Photos: Vijay Dhasmana

Community participating in collecting scientific data

Acknowledgement: Dr. Soumya Prasad Nature Science Initiative, Dehradun.

Misha Bansal is a researcher and environmental educator working with Nature Science Initiative, Dehradun.

SIGNIFICANCE OF THE PARK



The Park has diverse habitats for its wildlife

OVER 380 ACRES of a once severely degraded mining site have been completely restored into an urban forest with over 300 plants, trees, shrubs, creepers and grasses. Over one lakh saplings have been planted since 2011 after uprooting many vilayati keekar, consisting of over 200 species which were grown in the nursery. The planting has a survival rate of 95% plus. Many of these species were a reintroduction to Haryana, a large number of these fall under the rare or endangered categories as per the IUCN Red List.

The Park is becoming a small sanctuary of endangered and rare plants of the Northern Aravalis, most of which Haryana is losing rapidly to development and encroachments. In the last seven years, the Park has become a favoured habitat for birds (e-bird has listed 201 species) and wild animals (jungle cat, common palm civet, jackal, porcupine, neelgai and various kinds of butterflies & reptiles) of Gurugram. This indicates that the rewilding

has been in the right direction providing a conducive habitat for fauna and avi-fauna.

Today, the area functions as a native Aravali flora and fauna repository, a water conservation and recharge zone, a carbon sink, an educational space to spread awareness about environmental issues, and a recreational space for the citizens of Gurugram. Corporates have pitched in with their CSR Funds as well as hours of employees' volunteering time. Individuals have also contributed their time and money in the making of the Park. The Aravali Biodiversity Park stands apart from the typical definition of a park or a garden and brings the essence of the Aravalis as an urban forest back into a growing metropolitan like Gurugram.

In times of severe water crisis in Gurugram, with the groundwater depleting at 5ft per year as the city pumps out 300% more groundwater than it recharges, the Park serves to recharge over 320 million (32 crores) litres of water annually.



Photos: Vijay Dhasmana

The Park is a very important space to learn about nature and biodiversity. Citizen and children attending moth awareness week.

International Union for Conservation of Nature (IUCN), India Country Office was given a task to assess the biodiversity of the Aravali Biodiversity Park, impact of works undertaken so far and planning for future. Here is what they had to say about the project.

“It was a delight to work in an area that is now not only almost free of *Prosopis juliflora* and other weeds but also rich in floral, avifaunal and pollinators diversity. This area used to be degraded earlier due to various anthropogenic and biotic factors like mining and cattle grazing in the past and waste dumping in recent times. With improvement in the habitat and the floral diversity, it has now become an important birding area in NCR Delhi.

maintenance of plantation by rigorous efforts in watering and mulching. In a water deficient area located in semi-arid region, timely, meticulous and consistent efforts are required to ensure survival of plants. This has been achieved at ABPG”.

IUCN report; Aravali Biodiversity Park Biodiversity Assessment and Action Plan, April 2017

CENTRE FOR ENVIRONMENTAL RESEARCH AND EDUCATION (CERE) undertook a study in 2018 of the Park. The study covered the biodiversity aspects, value addition through carbon dioxide sequestration, oxygen generation, value of the trees, green space per capita in Indian cities and ground water potential.



Signature Spider



Purple Sunbird

Today, ABPG represents a fine example of natural regeneration and assisted regeneration of native species. This has been brought about by implementing various measures including protection, intensive plantation of native species by sourcing seeds from wild, consistent removal and control of weeds and invasive species and

The study shows that the Park potentially supplies 7.07% of the oxygen requirement for Delhi NCR. : 5.6.3 The report emphasizes the importance of spaces such as the Park for general well being of people. It also showcases the model as an exemplary one to follow which has brought together MCG, Corporates and citizens together.

While summarising the value-added assessment of the Park, it is essential to consider the following:

1. The Aravali Biodiversity Park plays an invaluable role in improving the air quality of Gurugram, Delhi and the entire NCR Region, providing water security by recharging the groundwater table and extending a host of ecosystem services through its rich biodiversity.
2. Amidst the rapid urbanization and industrialization in NCR, an urban forest such as the Aravali Biodiversity Park also helps in maintaining the ecological balance for human well-being and helps mitigate the effects of global warming.
3. The Park is presently contributing towards maintaining the UN standard of green space per capita which is 9 m² /capita.

4. The Park showcases a unique social model where local communities are an integral part of governance and have worked closely with the government in order to develop the green lungs for the city of Gurugram. This urban forest has also received support from the corporate world which has invested heavily in developing a green community space.
5. This Park has been developed based on the principle of ‘of the people - for the people - by the people’.

Hence, this can be an exemplary model which should be encouraged in other parts of the country.

Aravali Biodiversity Park: A Value Creation, Centre for Environmental Research and Education, Oct 2018



Photos: Vijay Dhasmana

Doctors explaining the importance of clean air and importance of green pollution sinks in the city

FUTURE ENDEAVOURS



Colony of Baya weaver and many other birds give assurance that the Park is a safe haven for birds and wildlife.

THE ARAVALI BIODIVERSITY PARK has now become an ecological hotspot and is one of the preferred destinations for nature lovers of Gurugram and NCR. The Park sports more than 300 species of plants. More than 200 of them (are rare and endangered plant species of the Gurugram region) were added to the Park in our restoration effort.

The habitats have formed and results are showing in the form of thriving wildlife. Bird species recorded on the Ebird site, which is the most authentic online site for bird record is 201 species, which by far is highest for any similar habitat in NCR.

It is a young City Forest and needs concerted effort to develop it further. It needs phase II level of intervention. Below are a few such initiatives that are a *must* for this place, that has a huge potential to be an international destination.

Legal Status

The Park still does not have a legal sanctity. In our opinion it has to be declared as a Biodiversity

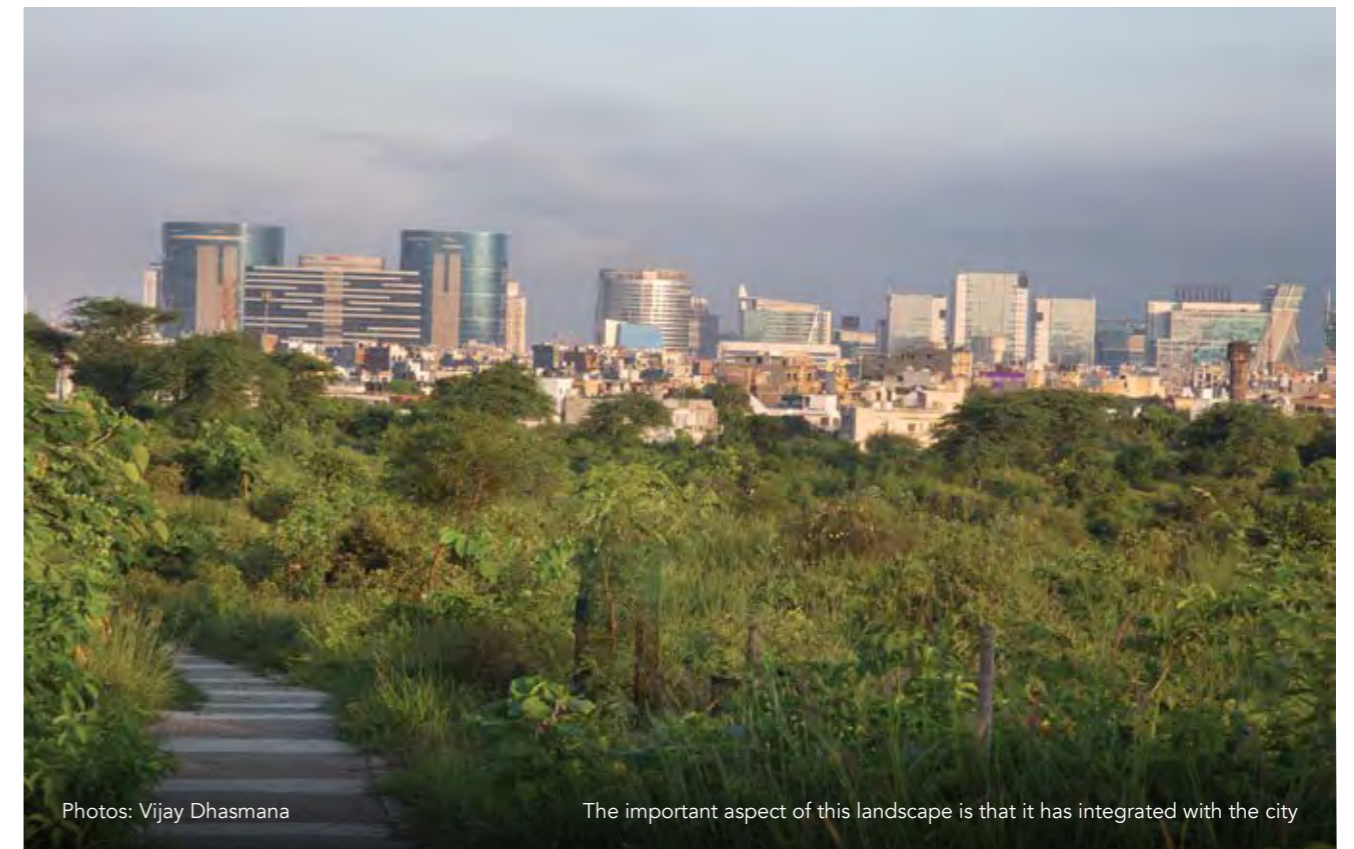
Heritage Site under the Biological Diversity Act. By declaring the Park as a Biodiversity Heritage site, we shall be able to add value to Gurugram's heritage.

Management Plan

The Park is still a work in progress. This is the right time that we start thinking about its long-term management. It is very important that management plans be created, such as the future protocols, ecological plan, management and financial plans etc.,. IAG, would be more than happy to take it up if MCG gives the permission.

Creation of an Interpretation Centre and Entrance

The Park needs an interpretation centre along with an office space for smooth functioning of the Park management. We are working on an interpretation strategy for an enriching visitor experience. It is important that the rare plants, birds, animal species and habitats are interpreted correctly for the public.



Photos: Vijay Dhasmana

The important aspect of this landscape is that it has integrated with the city

Development of Public Conveniences

Facilities like toilets and drinking water points at suitable locations should be provided in the Park. Care has to be taken to ensure that the design is compatible with the natural surroundings and overall design of the Park.

Education, Monitoring and Research

As a rich bio-diverse habitat and a healthy representative of the Aravali forests, The Park provides Delhi-NCR with opportunities for education and research in this region. It can be used as a field laboratory in the field of ecological restoration, carbon sequestering, ecology and environmental studies.

Following monitoring should be done periodically:

- Carbon Sequestering
- Seasonal Bird Count
- Vegetation Sampling
- Seasonal Water-table and Water quality of Ground Water
- Soil Quality

Removal of Encroachments

The Park still has a lot of encroachments, mainly temples and houses. We request MCG to remove the encroachments or if not possible, then limit them with proper fencing. Often dumping happens due to access roads to these encroachments.



Flowering of *Sterculia urens*, Kullu



Salai forest on the amphitheatre rocks



Story-telling sessions with children



Photos: Vijay Dhasmana

Park lends beautiful setting for interactive sessions

DOERS & BELIEVERS



Photo: Vijay Dhasmana

Corporate volunteers listening attentively to Priti on the planting method

THE ARAVALI BIODIVERSITY Park has been in making for the last 10 years. Today it is a young forest and has already transformed itself into a self-sustaining ecological system. The Park would not have been possible without the support of MCG. Over the years, every officer of MCG has supported and stood by us during challenging times.



We are very grateful to Pradip Krishen for encouraging us and standing by us as and when needed. Chetan Agarwal, Rakesh Kacker, Perna Bindra, Vinita Singh, Nisha Singh, Darshan Singh and many others who stood by us during

the toughest of times. We are very thankful to the rewilding team led by Vijay Dhasmana, our supervisors — Joginder Kumar, Anil Kumar Thakur, Abdul Munim, Rakesh, Gautam Raj and more than 40 gardeners for working relentlessly to make the Park what it is today.

For us, the Doers and Believers are the citizens, children and corporates of Gurugram, who came forward to turn this barren land into a forest. Close to 68 Corporates, 50 schools and several thousand individuals participated in making this Park, facilitated by hundreds of citizen volunteers.

Our Sincere Gratitude



iamgurgaon Team



iamgurgaon is a citizens' initiative focused on restoring Gurugram's green habitat lost to rampant urbanization. The organization was formed by residents concerned about the degradation of their city's green cover and fast depletion of its natural resources.

With a desire to contain the damage, concerted efforts were made in collaboration with the government and civic bodies. Sponsorships by corporates and efforts by citizen volunteers have resulted in success of unexpected magnitude. Aravali Biodiversity Park, Eco Restoration of Chakkarpur Wazirabad Bundh, Badshahpur

Forest Corridor, Sikanderpur Watershed and Restoration of the Forest and Samadhan Hub are a few examples of what true will and grit of common citizens can achieve.

As a part of the 'Million Trees Gurgaon' campaign, iamgurgaon has planted over 1,74,389 trees till now. Apart from this, it is also engaged in making Gurugram a better place to live in by organizing cleanliness drives, plastic use reduction and recycling drives and educational campaigns on waste management, especially targeting children to ensure a more responsible generation of citizens.



