

HEALING TOUCH

ARAVALLI BIODIVERSITY PARK GURGAON



Photo credit: M Shah Alam

A degraded land in the heart of an urban jungle looks forward to its revival with a forest, birds, animals, flowers, water, grasses and of course, people.

Vijay Dhasmana, Consultant Naturalist on the ongoing process...



The original site for Aravalli Biodiversity Park at Gurgaon had many mining pits which were operating since 1980s-90s. It was also a stone crushing zone with eight active crushers. The Supreme Court banned mining in 2002, but it was implemented only in 2009. The same happened with stone crushing too. In 2009, the Municipal Corporation of Gurgaon MCG came in existence and all the land was given to MCG. Atal Kapoor from 'iamgurgaon', an NGO identified the site and gave a proposal to MCG for an urban park. The design brief had a heritage trail (in reference to few old structures on site), a herbal garden, a medicinal garden and an amphitheatre. MCG was unable to generate tourism funds for the work but in the meanwhile started building its boundary wall, pathways and amphitheatre as per *iamgurgaon's* plan. It also carried out plantation of few trees with HDFC-Life to green the area.

Later, *iamgurgaon* was engaged to develop this area as an ecological restoration project. We were professionally engaged in 2011 to "rewild" and re-

store the area with native plant species. We reworked on the vision and convinced the team and MCG to make it a place into a forest to showcase the native flora of Aravalli.

A long history of mining on the site on a 350 acres of area has resulted in barren hill slopes of Aravalli range with a deep water table and almost no soil cover. Few forest patches were left in a much degraded state, mainly colonized by *Prosopis juliflora* (vilayati keekar).

Plant listing

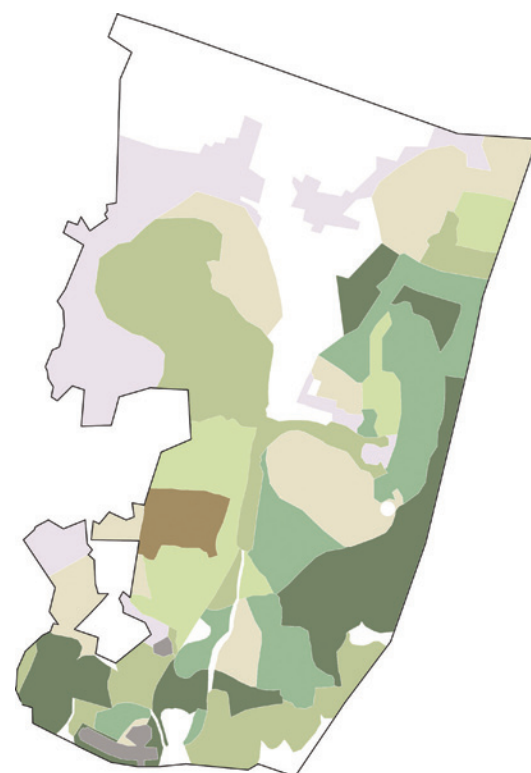
We first carried out an extensive document research on Northern Aravalli range Eco Zone Flora records of 19th and 20th century by Champion and Seth (*A revised survey of Forest types of India*, 1968) J.F. Duthie, R. N. Parker and J.K. Maheshwari. We also travelled extensively to the Aravalli forests to get to know about different plant associations. Then we did field surveys and studies, trying to establish a link between what we studied and what we saw. We made a mental picture of various vegetation areas with relation to their broad locations. There are sub zones of the vegetation but main geological composition of the region from Delhi to Alwar is almost similar – mostly quartzite in the age group of 1.5 billion years 2.5 billion years. Our hope lay in some flora pockets in forests such as Mangarbani, a sacred grove in Gurgaon-Faridabad road and some remnant pockets of plants in the Central, Southern and Northern ridge in Delhi. However, we can only say that they represent only a small possibility in Aravalli.

This research led us to a list of about 200 missing species of trees, shrubs, climbers, herbs and grasses. With the list in our hand, we started looking for plants in forest and commercial nurseries of northern and western India. In our search of about three years, we went as far as Pune to look for plants. Unfortunately, this search did not yield more than thirty species. Therefore, it became inevitable to start an ambitious project to grow these plants on our own.

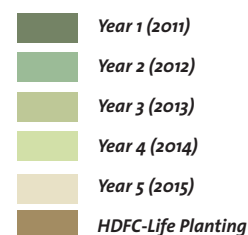
Seed propagation

This is certainly not an easy task. You have to start from collecting seeds, for which you have to extensively travel in the Aravalli forests, know healthy specimens, collect seeds during travels and identify locals who can collect seeds for you during the season, train on seed selection, labelling and packing them so that they are transported in good condition and remain viable till they are sown.

Various plant seeds were procured from the forest of Mangar, Nahargarh and Kumbhalgarh that showed compatibility with the kind of natural conditions prevailing on site. Our effort yielded some 250 species collected in three seasons with around 200 germinating successfully. The seed collection is still going on. While this was an achievement, we met another roadblock in terms of documentation on propagation methods of native plant species. Through trial and error we have been successful in germinating thirty species in 2012. These included *Boswellia serrata* (salai), *Sterculia urens* (kullu), *Anogessius pendula* (dhau), *Mitragyna parvifolia*



ARAVALLI BIODIVERSITY PARK
PLANTING PLAN





- ↑↑ THIS PAGE | TOP ROW
The pond and surrounding area in 2010, and now in 2016
- ↑ THIS PAGE | SECOND ROW
Preparing for plantation, and the front area of the developed park
- ↗ FACING PAGE
General views of the developed biodiversity park

(kaim), *Wrightia tinctoria* (khirni), *Wrightia arborea* (kala indrajao), *Holarhenna pubescens* (indrajao), *Diospyros cordifolia* (bistendu), *Commiphora wightii* (guggul), *Helectris isora* (marodphali), *Grewia flavescens*, *Albizia odoratissima* (kala basa), *Grewia tenax* (gangeti), *Mallotus phillipensis* (sinduri), *Mimosa hamata*, *Wrightia arborea* (khinna) and many more, along with associate species as they are found in the finest forests of the Northern Aravalli.

These native plant species were propagated in two large nurseries, Aranya and Vanaja, that were created in 2011 and 2012 respectively. One should always remember that in forests, most saplings grow under shade so are always protected. Here, it is all in open land with extremely hot summers. We propagate the seed in the nursery for at least a year before it is planted to its designated place. *Hymenodictyon exelsum* (bhormal) is a rare species that we found in the Mangarbani forest while carrying out its flora study and thus got added to the list. This species is otherwise not reported in Aravalli. It took us three years to grow it from seed. As noted earlier, it is a trial and error method. At present, there are 168 native plant species in the nurseries.

Species selection

Planting at the Gurgaon Aravalli Biodiversity Park is inspired by pockets of pristine forests still left in the Aravalli, from Mangarbani in Haryana to Sariska and various forests till Kumbhalgarh in Aravalli. The richest undisturbed forests of Aravalli are salai forests on hill tops. Pure patches of dhau forests and some kumath, khair, dhak forests can also be found in relatively more disturbed climatic zones. The lower hill valleys have kaim forests with soil prone to water logging in monsoon season. The areas have babool and wild khajoor as its chief occupant. Many other species are generalists such as dhak, khair, ronjh, goonja, barna, peepal, badh and doodhi. These are many kinds of forests in varying proportions in Aravalli. In the



last five years, around 80,000 plants of 160 species have been planted on the degraded land of the site including 40 species of native grasses.

Some of the newly planted species are very rare or almost locally extinct from the Gurgaon region. The positive outcome of planting 'right' species is that with each passing year, there has been a noticeable surge in the population and diversity of fauna and avifauna population in the park. Therefore, it is a learning experience that if the right native species are planted, one will get a huge response from wildlife. For example India eagle owl, Sirkeermalkoha, Jungle prinia, Rufus fronted prinia, yellow eyed babblers are some of the uncommon birds of Delhi National Capital Region (NCR) that are easily

spotted in the park. Diverse eco-zones have been able to attract 160 bird species spotted with many wild animals like neelgai, jackal, wild hare, common palm civet, mongoose and monitor lizards which have made the park their habitat. It has become one of the birding hot spots in the NCR.

One of the main strategies of the ecological restoration process was also to create water catchment areas for recharging water which will help in raising the level of the ground water table. In 2013, two large ponds were constructed lined by bentonite, on low lying areas which hold water seasonally and recharge the water table of the region. The recovery of flora and extensive planting has also helped in recharging the ground water. The surface

runoff now gets percolated in ground and is gradually absorbed by the plants and infiltrates into the ground. At a very conservative estimate of recharge of 33% of annual rainfall of approximately 600 mm, ground water recharge is to the tune of 20 lakh litres per hectare per year. In the coming years, the park will work as a large ground water recharge zone. The forest plantation on it along with soil and water conservation measures this over 350 acres to recharge zone will be a boon for the Gurgaon region.

Many of the plants are watered optimally from an intensive drip irrigation network. Water is only provided for three years in stress period after which the plants become self-reliant in tapping ground water. Water for irrigation



↖ ↑ *The park development has involved citizens, children and schools*

is sourced from sewage treatment plants and therefore reduces water stress on ground water. After planting, plants are mulched well so that the water provided to the plants is not lost to evaporation and they retain moisture.

The issues of an urban forest include that of security and vandalism. Its location in the urban region poses many challenges like issues of clear ownership, grazing of cattle and cutting of grasses by the neighbouring villages. This has led to grazing and trampling of well-established saplings. For the last three years now, grazing has been shifted to the adjoining open area and the boundary towards that side has been fenced.

Study plots

Every forest is an evolving ecosystem. It is not static but dynamic. It keeps changing on its own as a response to climatic and environmental conditions. In this case, the changes are mainly engineered. So we wanted to know whether we took the right decisions. With the idea of learning from this whole exercise by long term monitoring, we have cre-

ated fourteen permanent study plots of one hectare each. These plots are areas of study of the newly established ecological restoration work sited in various zones like top hills, middle slopes, low lying areas and valleys among others. The objective is to study and learn scientifically from each plot about species interrelationship, listing, carbon sequestering data and its relationship with climate change. Scientists from the Jawaharlal Nehru University, JNU, New Delhi have been helping us out in establishing these plots. Very soon we will have a baseline prepared of restored plots and unrestored plots so as to be studied by interested scholars of ecology, botany, landscape design and institutions like School of Planning and Architecture, Delhi University, Tata Energy Research Institute among others. It will be a good repository of knowledge that will guide many more such projects in future.

Urban forest and its conservation

In Delhi NCR, we have two such ecologically restored parks. Yamuna Biodiversity Park, Wazirabad and Ar-

valli Biodiversity Park, Vasant Vihar are government funded projects. These have the support of scientist community. The financial and working model of our project is still very fragile. The involved NGO is always under threat. In such cases, the MoU with Government needs to be very clear and legally strong. There has to be an advisory board of experts that monitors the work of the agency. We also need to create institutional structure to sustain the work done so far. Then only it can work in the long run.

The strength of this park has been that it has always received the support of people. *iamgurgaon* made it a point to involve citizens, children and schools part of the park development. Every year hundreds of citizens come to plant in the park or to undertake voluntary work at the park. Till date, 43 corporate houses and 18 schools have visited the park for planting and cleaning. Therefore, it is important for the local people to participate in the development of the park. We have been organizing guided tours, orientation programmes, education activities on the site. Senior citizens and the young population are especially in-

terested and keen to know more about the park. Nature trails, walking tracks, jogging & bicycling tracks and amphitheatre are some of the features here. In the coming years, the park will also play an important role in educating the citizens, especially children on the significance of Aravalli, its flora, fauna, avifauna, ecological restoration and water conservation. The park will include an interpretation centre and interpretation panels for raising awareness on the above mentioned subjects. Educational

and appreciation walks and workshops will be conducted regularly in the park for the above purpose.

Forests like these can only exist in the cities only if they interact with the city. Most of the Central Ridge forest, though is under forest department is used by the President's Bodyguard unit for exercising their horses. People are not allowed to enter. We also have a model of an institution building sited in a forest like the JNU. Another

example is the Sanjay Van, where people go for recreation and natural beauty. Mangarbani forest is sacred grove and has religious commutation and is therefore protected by the local people. It is very important for such natural assets to engage with the community in some way. The right kind of engagement needs to be created. A strong sense of belonging will only make people save and maintain this asset. Citizens support counts immensely in their survival.





List of Plant Species

HILLY ROCKY OUTCROPS

Forest of *Boswellia serrata*, salai

On hill tops, ridges and spurs where soil is usually bouldery, pebbly, shallow and dry.

Companion species

Lannea coromandelica, gurjan
Sterculia urens, kullu
Wrightia tinctoria, doodhi
Bauhinia racemosa, jinjheri
Acacia catechu, khair
Flaucourtia indica, kakai

Shrubs

Holarhena pubescens, kuda
Helicteres isora, marodphali
Grewia flavescens
Grewia tenax
Fluggea leucopyrus
Diospyros cordifolia, bistendu
Vallisneria spiralis

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

Acacia leucophloea, ronjh
Acacia senegal, kumath
Albizia odoratissima, basa
Crateva adansonii, barna
Wrightia tinctoria, doodhi
Bauhinia racemosa, jinjheri
Manilkara hexandra, khirni

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↖ TOP ROW
Capparis decidua (kjair)
Dichrostachys cinerea (goya khair)

↖ MIDDLE ROW
Barleria prionites (vajradanti)
Boswellia serrata (Salai)
(Indian frankincense)
Carissa spinarum (jungli karonda)
Mulching with stones

↖ BOTTOM ROW
Mimosa hamata (alay)
Accipiter badius (shikra), looking for a prey
Ploceus manyar (streaked weaver bird)

Shrubs

Grewia tenax
Dichrostachys cinerea
Fluggea leucopyrus
Diospyros cordifolia
Ziziphus nummularia

Forest of *Acacia catechu*, khair

These are often found in degraded patches of forests in Aravalli.

Forest of *Acacia Senegal*, kumath

Mixed forest of *Acacia leucophloea*, ronjh

Acacia Senegal, kumath
Holoptelea integrifolia, chudail
Butea monosperma, dhak
Manilkara hexandra, khirni
Ehretia laevis, chamrod

Forest of *Butea monosperma*, dhak

It is found in small patches in valley forests in Aravalli.

Acacia leucophloea, ronjh
Crateva adansonii, barna
Diospyros cordifolia, bistendu

Dominant grasses

Crypsopogon fulvus
Apludamutia
Heteropogon contortus
Chrysopogon fulvus

VALLEYS

Forest of *Mitragyna parvifolia*, kaim

These forests are often found in valleys of the salai or dhau forests where seasonal streams flow.

Butea monosperma, dhak
Albizia odoratissima, basa
Diospyros cordifolia, bistendu
Bauhinia racemosa, jinjheri
Crateva adansonii, barna
Ficus religiosa, peepal
Ficus benghalensis, badh

Understorey

Holarhena pubescens, kuda
Helicteres isora, marodphali
Adhatodavasaca, adusa
Urena lobata

Forest of *Acacia nilotica*, babool

With deep soil deposits

Companion species

Capparis decidua
Capparis sepiaria
Salvadora persica
Salvadora oleoides
Ziziphus mauritiana

Grasses

Cenchrus ciliaris
Cymbopogon martinii
Desmostachya bipinnata

GRASSLAND

Phoenix sylvestris
Wild date palm
Ehretia laevis, chamrod
Salvadora persica, jaal
Acacia nilotica, babool

Grasses

Saccharum spontaneum
Saccharum benghalensis
Desmostachya bipinnata

SEASONAL WATER BODIES

Phoenix sylvestris, khajoor
Acacia nilotica, babool
Mitragyna parvifolia, kaim
Tamarix dioica, farash

Understorey

Holarhena pubescens, kuda
Helicteres isora, marodphali
Adhatoda vasica, adula
Diospyros cordifolia, bistendu
Capparis sepiaria, himsra

Grasses

Saccharum spontaneum
Saccharum benghalensis
Desmostachya bipinnata
Cenchrus ciliaris
Cymbopogon martinii

MOIST PATCHES

Saccharum spp.
Desmostachya bipinnata
Seasonal grasses

HILLY SLOPES

Forest of *Boswellia serrata*, salai

Companion species

Sterculia urens, kullu
Cordia gharaf, gondi
Butea monosperma, dhak
Anogeissus pendula, dhau
Gmelina arborea, gamhar
Crateva adansonii, barna
Ehretia laevis, chamrod

Forest of *Anogeissus pendula*, dhau

Acacia leucophloea, ronjh
Acacia senegal, kumath
Crateva adansonii, barna
Wrightia tinctoria, doodhi

Forest of *Acacia catechu*, khair

Anogeissus pendula, dhau
Acacia leucophloea, ronjh
Acacia senegal, kumath
Crateva adansonii, barna
Wrightia tinctoria, doodhi
Ehretia laevis, chamrod
Acacia senegal, kumath
Anogeissus pendula, dhau
Acacia leucophloea, ronjh
Wrightia tinctoria, doodhi
Cordia gharaf, gondi
Ehretia laevis, chamrod

Mixed forest

Acacia leucophloea, ronjh
Acacia senegal, kumath
Holoptelea integrifolia, chudail
Cordia gharaf, gondi
Butea monosperma, dhak

Understorey

Holarhena pubescens, kuda
Helicteres isora, marodphali
Grewia flavescens
Grewia tenax
Fluggea leucopyrus
Diospyros cordifolia, bistendu
Dichrostachys cinerea
Urena lobata
Vallisneria spp.

Text, images and list courtesy Vijay Dhasmana