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TECHNICAL CONTRIBUTORS

Peush Kumar Ekta Khurana

PHOTOGRAPHY

Mohan Singh Yasir Arafat Naresh Sharma

PUBLISHED BY

Public Relations Department, DDA

DESIGNING AND DEVELOPMENT OF E-BOOK

Degree 360 Solutions Pvt. Ltd.
EDITORIAL CO-ORDINATION

Sanjai Srivastava

Susmita

CREATIVE DIRECTOR Arvind Restogi

ART DIRECTOR

Desh Raj

CREATIVE SUPPORT

Kapil Singh Priyanshu Kumar

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आवासन और शहरी कार्य राज्य मंत्री (स्वतंत्र प्रभार) नागर विमानन राज्य मंत्री (स्वतंत्र प्रभार) वाणिज्य एवं उद्योग राज्य मंत्री

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GOVERNMENT OF INDIA

MESSAGE

Biodiversity plays a crucial role in the life support systems and forms the basis of livelihood. Understanding a natural environment and sharing that knowledge with the next generation is critical to safeguard the ecosystem on our planet that sustain life, including ours.

The Aravalli Biodiversity Park - a green initiative launched by Delhi Development Authority in collaboration with the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi, to preserve the natural heritage of Delhi and enhance environmental sensitivities, is a step in this direction.

Place: New Delhi Date: 10.03.2021 I am certain that this 'e-Book' on Biodiversity Parks : Nature Reserves of Delhi which provides glimpses of the resplendent flora and fauna and explaining the unique biodiversity of the city, should be of interest to young students and environmental enthusiasts alike.

I would like to place on record my appreciation to the team that has been at the vanguard for propagating the greening of Delhi and thus enhancing the quality of urban environment.

I am confident that DDA will continue its efforts and will give the city more lung spaces.





Hardeep S Puri



MESSAGE

Biodiversity parks are models of urban environment sustainability and resilience. The present book "Biodiversity Parks: Nature Reserves of Delhi" encapsulates DDA's arduous efforts in establishing Biodiversity Parks of Delhi with a view to protect and preserve the natural habitat of the capital city. It illustrates the successful journey of how administrators, scientists, engineers and landscape architects together transformed the degraded landscapes of Delhi - the ecosystems of the river Yamuna and the Delhi Ridge, the two life supporting natural features of the city into a perfect bliss.

In the year 2003, I had the opportunity to be associated with a momentous decision of bringing back the lost natural heritage of Delhi through the establishment of "Biodiversity Parks" when the initiative was taken by DDA along with Professor C. R. Babu in collaboration with Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi. The Delhi Biodiversity Foundation was created to oversee not only the development of Yamuna Biodiversity Park but also to create more Biodiversity Parks in future and to sustain them.

The development of the first Biodiversity Park was taken up on 63.5 hectares of land located in the upstream of Wazirabad reservoir on Yamuna River near Jagatpur village and soon thereafter work was started on the Aravalli Biodiversity Park. Today, seven Biodiversity Parks of Delhi, spreading over 1000 hectares, represent high density closed canopy forests, grasslands and wetlands with 3000 species of plants and animals thriving in approx. 70 self-sustaining biological

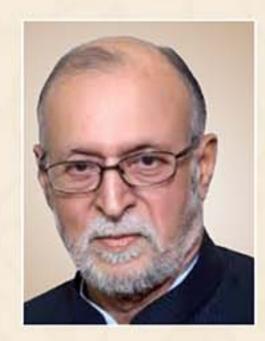
communities. The Biodiversity parks have transformed the barren and degraded landscapes into luxuriant forest, grassland and wetland communities.

The forest ecosystems, grasslands and wetlands of Biodiversity Parks are excellent sinks for carbon dioxide. They also serve as effective filters for various sources of air pollution and as excellent dust trappers thus contributing in pollution mitigation and adaptation of Delhi to climate change. Besides conserving the natural heritage of Delhi and the flora and fauna, these parks are an integral part of blue-green urban infrastructure. It would only be befitting to promote these parks as environmental education hubs and places of interest for visitors in coordination with the Tourism Department and Education Department of Govt. of NCT of Delhi. Not only this the rich plant resources are also of great medicinal value with potential for commercial use. However to avoid any human-wildlife conflict around the Biodiversity Parks an effective Action Plan needs to be drawn to ensure harmonious coexistence.

The book bears testimony to earnest and passionate efforts towards conserving and preserving the ecological and environmental assets of the city. I am certain by effectively documenting the efforts and processes of restoration of Biodiversity Parks, this book shall inform and inspire administrators, environmentalists, educators and students to take up similar initiatives towards preservation of natural heritage in various urban areas.

'Jai Hind'

Place : New Delhi Date : 03.03.2021



Anil Baijal

MESSAGE

Protecting the Biodiversity is an integral part of establishing a functional and ecological environment. Establishment of network of Biodiversity Parks in Delhi is an initiative taken by Delhi Development Authority in collaboration with Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi to promote conservation of natural resources in the expanding urban matrix of Delhi, These Parks serve as a hub of education, culture and conservation activities through connecting the biodiversity to the city and its people.

I have personally visited all the seven Biodiversity Parks which not only showcase the restored natural ecosystems but also the ingenious methods to treat the sewage by constructing wetland systems. I congratulate

Place: New Delhi

Date: 26.02.2021

the team at DDA under the technical guidance of Prof.

C.R. Babu, which with its innovative & positive approach
have created these natural resources in the form of
Biodiversity Parks. I appreciate the team involved in this
task for bringing out an illustrated and informative
document.

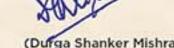
SECRETARY, MINISTRY OF HOUSING & URBAN AFFAIRS

This e-book provides the framework for taking action for conservation of biodiversity, substantial use of its components and fair and equitable sharing of benefits arising out of their use. It may motivate other urban areas to replicate the models in enhancing clean and green spaces in their city limits.

I wish DDA all the best for this endeavor!

सचिव, आवासन और शहरी कार्य मंत्रालय

GOVERNMENT OF INDIA





Durga Shanker Mishra



MESSAGE

The importance of biodiversity in our lives cannot be overstated. Beyond maintaining functional ecosystems and regulating climate, biodiversity renders invaluable cultural, economic, and educational benefits to our society. However, local flora and fauna have degraded due to rapidly urbanizing landscapes of metropolitans like Delhi, and are in critical need of systemic & scientifically-backed strategies for their protection, conservation and propagation.

Rejecting obsolete notion of development and environmental conservation being at loggerheads, biodiversity concerns are getting integrated with urban planning principles. The understanding of sustainable green infrastructure in DDA, has evolved from manicured lawns to biodiversity parks through collaborative efforts with the Centre for Environmental Management of Degraded Ecosystems (CEMDE), the University of Delhi. The establishment of such parks has been a key effort by the DDA to reclaim green and blue spaces in the city under its objective of creating sustainable physical and social environments for improving the quality of life. Presently, seven biodiversity parks have been successfully established and have gained traction as conservation models worthy of replication.

The main aim is the recreation of locally extinct ecosystems and restoration of degraded landscapes and waterscapes. This is exemplified by the results at Yamuna Biodiversity Park, a degraded land earmarked for dairy

Place: New Delhi Date: 16.03.2021 production with only 141 recorded species of flora and fauna, which now boasts of over 1,359 species-almost ten times the previous number. The projects also emphasize the use of technically and scientifically sound sustainable models which leverage all-natural processes for conservation. For instance, the Neela Hauz Lake, a previously dead ecosystem due to sewage deposits, has been revived through a constructed wetland system (CWS) to treat the sewage water through bioremediation. The quality of water in Neela Hauz is now comparable to that of a flowing river and supports rich biodiversity. This successful experimentation with CWS has served as a prototype for numerous wetlands and water bodies in Delhi and is being recreated in Kalindi Biodiversity Park on Yamuna floodplains.

This e-book on DDA's biodiversity parks would provide many such tangible and educational experiences to the readers. It guides one back to nature, into the forests and lakes, discovering fascinating flora and fauna while explaining the significance of conserving their natural habitat and preserving the biodiversity of our planet.

This success wouldn't have been possible without Prof C.R. Babu, CEMDE, and our team, who look after these biodiversity parks and are committed to safeguarding the ecosystems that sustain all life, including that of the generations to follow.

Congratulations!

(Anurag Jain)



Anurag Jain

FOREWORD

Urban Centres across the world are facing multiple environmental crisis such as air pollution, water scarcity, depletion and contamination of ground water, deterioration of soil health, loss of Biodiversity etc. Invasion of exotic species of flora and anthropogenic activities causing habitat fragmentation have led to degradation of the two major zones of biodiversity in Delhi ie. the Yamuna & the Delhi ridge. In order to curb this trend, a unique & novel concept of Biodiversity Parks has been taken up by the DDA in technical collaboration with the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi, DDA's Landscape and Environment Planning Department, Engineering Department in coordination with the team of CEMDE under the guidance of Prof. C.R. Babu have been steering the Biodiversity Parks Programme since year 2001.

Due to concerted efforts, well planned and properly executed ecological interventions, a barren degraded landscape in Yamuna floodplain has been completely transformed in to a beautiful landscape full of luxuriant forests, grasslands and wetlands. Similarly ridge forests, which lost biodiversity due to encroachment of invasive species like Lantana camara, Prosopis juliflora are in process of restoration by gradual replacement of weeds and invasive species with native species. Effort has been made to develop a multi-storeyed structure of diverse forest community and larger tree height heterogeneity in the Biodiversity parks, which has also helped in achieving higher faunal diversity besides acting as natural filter for dust pollution and a sink of Carbon.

प्रधान आयुक्त दिल्ली विकास प्राधिकरण

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In short, these Biodiversity Parks have become Nature Reserves aiming at conserving Delhi's natural heritage and for promoting education on environmental and nature conservation by acting as living museums among students, researchers, nature enthusiasts and general public. I feel pride in presenting this eBook on behalf of DDA on the journey of development of seven Biodiversity parks of Delhi.



Rajeev K. Tiwari

Place : New Delhi Date : 16.03.2021

(Rajeev K. Tiwari)



प्रोफेसर एमेरिटस परियोजना प्रभारी (बायोडायवर्सिटी पार्क कार्यक्रम) दिल्ली विश्वविद्यालय PROFESSOR EMERITUS PROJECT INCHARGE (BIODIVERSITY PARKS PROGRAMME) UNIVERSITY OF DELHI

PREFACE

Natural heritage is virtually wiped out from the developmental matrix of Delhi city. Though Delhi is greenest but when compared to some of capital cities of the world, the proportion of Delhi greens (19%) is less than half of what has been found in Moscow, Singapore, Sydney and London. Even the part of Delhi greens - the Ridge which, once, served as a shield against dust storms, is represented by a massive biological invasion of Vilayti Kikar (Prosopis juliflora). Similarly, the 22 km long urban stretch of the river Yamuna has lost much of its floodplain including its wetlands, marshes, swamps, forests and grasslands, and riparian ecosystems, all of which are critical for sustenance of healthy river ecosystems.

To bring back the lost pristine glory of the Ridge and river Yamuna, the Delhi Development Authority in joint collaboration with the Centre for Environmental Management of Degraded Ecosystems (University of Delhi) launched Biodiversity Parks Programme to develop, manage and sustain Biodiversity Parks and to restore the lost natural heritage of Delhi on degraded landscapes. These Biodiversity Parks are unique landscapes of wilderness and differ from recreational Parks in having diverse ecosystems that harbour native plants, animals and microbes, and render multiple ecological services such as carbon sequestration, recharge of ground water and reduce pollution load,

besides contributing to urban environmental sustainability and resilience to climate change.

It is my duty to mention here briefly how the successful journey of DDA Biodiversity Parks of Delhi is accomplished. Shri Vijai Kapoor and Shri Anil Baijal team as the then Lt. Governor of Delhi and the Vice-Chairman of DDA, respectively and subsequently Shri Anil Baijal as Lt. Governor of Delhi played key role in the successful venture of DDA - the establishment and sustenance of Biodiversity Parks of Delhi. The journey started in 2001 when I met Shri Vijai Kapoor at a conference and brought to his attention about the loss of native biodiversity from Delhi and the need to conserve it. It was during this discussion that the concept of Biodiversity Park was evolved, and within few weeks both Shri Vijai Kapoor and Shri Anil Baijal initiated due processes for establishing the first Biodiversity Park of the Country and perhaps in the world - Yamuna Biodiversity Park, The DPR was prepared and necessary approvals from the Delhi Development Authority were accorded for the establishment of Yamuna Biodiversity Park on 63.5 hectares land located in the upstream of Wazirabad reservoir on Yamuna River near Jagatpur village.

Meanwhile two pivotal events with respect to Biodiversity Parks took place: Shri Vijai Kapoor and Shri Anil Baijal took initiative and created Delhi



Professor C.R. Babu

Biodiversity Foundation under Section 5a of DD Act 1957 to oversee the development of Yamuna Biodiversity Park but also to create more Biodiversity Parks in future. The second event was that Shri Anil Baijal chaired a meeting on 1st September 2003 as Vice-Chairman of DDA wherein a crucial decision was taken for bringing DDA and CEMDE (University of Delhi) together for the development of the first Biodiversity Park, as the scientific expertise for the development of ecosystems was not available within DDA, it was also decided in the meeting to recruit Scientists and Technical persons by the University of Delhi, who will work in the foundation; and this matter was reported and approved in the meeting of Delhi Development Authority vide minutes no. PA/Dir. (F)2002/DDA/D-500/Vol.I/D-119, dated 17/09/2003.

The foundation for Yamuna Biodiversity Park was done by planting saplings of silk cotton tree by Shri Vijai Kapoor, Shri Anil Baijal and Professor Deepak Nayyar (the then Vice-Chancellor of DU) and these saplings are now full-grown trees of 30 to 45 feet height. With success in bringing back the lost Yamuna river basin ecosystems in Yamuna Biodiversity Park, particularly wetlands, Shri Vijai Kapoor and Shri Anil

Baijal took decision to develop Aravalli Biodiversity Park within one year after the foundation of Yamuna Biodiversity Park. The foundation stone of Aravalli Biodiversity Park was laid by the then Deputy Prime Minister of India, Shri L.K. Advani,

As both the Biodiversity Parks gained popularity among the public and students community who receive their practical environmental education coupled with the realization by the Public Authorities and Judiciary the need for preservation of natural heritage for urban environmental sustainability, the Yamuna and Aravalli Biodiversity Parks soon became models for replication not only in Delhi but also across the country. In Delhi itself, DDA has established five more Biodiversity Parks at different locations and the Biodiversity Parks became flagship of DDA.

As Lt. Governor of Delhi, Shri Anil Baijal has been promoting the creation and protection of bluegreen urban infrastructure. As a part of blue-green urban infrastructure of Delhi, Shri Anil Baijal's vision of Biodiversity Parks for enhancing the quality of life in Delhi led to the creation of Delhi Biodiversity

Society that ensures the development and sustainable management of existing and future Biodiversity Parks.

The spectacular success story of DDA Biodiversity Parks is showcased in the present Book on "Biodiversity Parks: Nature Reserves of Delhi". The prime objective of this Book is to get the attention of Policy Makers and Planners for replication of Biodiversity Parks of Delhi as a model for environmental sustainability and resilience. The genesis, the concept, the structural elements and management of Biodiversity Parks are briefly explained in the introductory chapters of the Book. The bulk of the book illustrates the diverse biological communities and their plant and animal diversity established in the seven Biodiversity Parks of Delhi. The natural heritage in terms of flora and fauna of Delhi are vividly depicted in pictures. There are brief accounts on medicinal plants and animal interactions as well as interactive learning in Biodiversity Parks.

Place: New Delhi Date: 24.02.2021

(Professor C.R. Babu)



ABOUT THE BOOK

To ensure a good quality of life for residents of Delhi, the Delhi Development Authority (DDA) has been

creating green-blue infrastructure through its Master Plans of Delhi (MPDs) and has taken a lead in restoring, maintaining & preserving the natural heritage of Delhi. Keeping this as a major goal, DDA has been actively promoting the development of green belts, theme parks, urban woodlands etc.. This is a part of DDA's efforts for enriching the environmental quality of the city and thereby improving the quality of life.

To bring back this lost natural heritage of Delhi, and to enhance the quality of environment which in turn enhances the quality of life, DDA took the initiative of developing Biodiversity Parks in collaboration with the Centre for Environmental Management of Degraded Ecosystem, University of Delhi. These were created on degraded landscapes/riverscapes through the nurturing of forest and wetland ecosystems. These restored ecosystems not only preserve the vanishing flora and fauna but also provide a range of ecological goods and services. The DDA has so far developed seven Biodiversity Parks spreading over more than 1000 Hac. These include Yamuna, Aravalli, Tilpath Valley, Northern Ridge, Neela Hauz, Tughlaqabad and Kalindi Biodiversity

Parks and have more than 3000 species of plants and animals thriving in about 70 biological communities. The Yamuna and Aravalli Biodiversity Parks have become Nature Reserves of Delhi and contain wildlife and biodiversity that were seen in Delhi about 100-150 years ago. These Biodiversity Parks have become global models for urban environmental sustainability and resilience. DDA has brought out the present E-book to showcase the natural heritage of Delhi that has been brought back through the establishment of Biodiversity Parks within a span of two decades.

The reader will find himself or herself amidst the splendours of Delhi's natural history from seven different Biodiversity Parks. The photographs presented in the Book are lively and capture and provide a visual feast to those who peep through the chapters. To sum up, the Ebook on "Biodiversity Parks: Nature Reserves of Delhi" provides glimpses of what the natural heritage of Delhi is, and how it has been brought back and sustained through DDA's Biodiversity Parks This splendid outcome of DDA's efforts for providing quality of life in Delhi is an example to be adopted for urban resilience across the world in the face of ever increasing environmental and public health crises arising out of pollution and pandemics.



Poonam Dewan





Place : New Delhi Date : 16.03.2021





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Paradigm of Man & Nature's Harmony

- Introduction
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Introduction /-

Jewels in Delhi's Green Treasure

Delhi is one of the oldest inhabited cities in the world and was the seat of power of many dynasties and rulers since the 6th century BC. As a result of the rise and fall of mighty empires and powerful kingdoms, Delhi is well-known for its past glories, cultural heritage and archeological splendors but has lost much of its natural heritage.

After India's Independence, Delhi has become a mega metropolis with massive urbanization and population touching 30 million in 2019. It is expected to be the most populated capital city in the world by 2030. The period of 73 years of development led to further loss of natural heritage and is threatening the life supporting potentials of two major landforms, the Ridge and the River. These life-supporting ecosystems have deteriorated to such an extent that the quality of life is threatened.

For example, the entire Ridge forest has not only shrunk in size but harbours a massive biological invasion by the Mexican species 'Prosopis juliflora (vilayati kikar)' which was introduced by the British approximately in latter half of the 19th Century to green the Ridge. The 22 kilometer urban stretch of the river Yamuna in the downstream of Wazirabad, is dead and has become an open sewer, with the floodplains reduced to channel banks. The loss of sinks to air pollutants coupled with enhanced vehicular pollution, has made the air quality "severe to very severe" with marked increase in PM2.5 concentration in winter months. This has also contributed to extreme temperatures.

Delhi Development Authority (DDA), a land owning and city building agency under the Ministry of Urban and Housing Affairs, Government of India has been concerned with declining environmental quality and quality of life. In pursuit of enhancing the quality of life, DDA has been developing and managing several green spaces in the urban matrix and most of them are recreational parks. Besides DDA, other local government agencies have also been developing green spaces, but these are also recreational areas. These recreational green spaces cannot substitute the lost natural heritage in terms of providing and sustaining environmental quality and other ecological services much needed by the city and its citizens. particularly the ground water availability.

To bring back the natural heritage lost in the urban matrix of Delhi; DDA has been developing a network of Biodiversity Parks – A new concept evolved and implemented for the first time in the world by DDA in joint collaboration with CEMDE, University of Delhi. Presently seven Biodiversity Parks, viz., Yamuna, Aravalli, Neela Hauz, Northern Ridge, Tilpath Valley, Tughlagabad and Kalindi Biodiversity Parks are notified by DDA.

This Book recounts the development of Biodiversity Parks through visuals with simple text narrating their evolution to become global models for conservation and urban environmental sustainability.

The network of biodiversity parks in Delhi are unique landscapes that harbour a diversity of plants, animals and microbes living in ecologically sustainable biotic communities. They have been rendering multiple ecological services including carbon sequestration and recharge of ground water and educational and recreational benefits to the urban society.

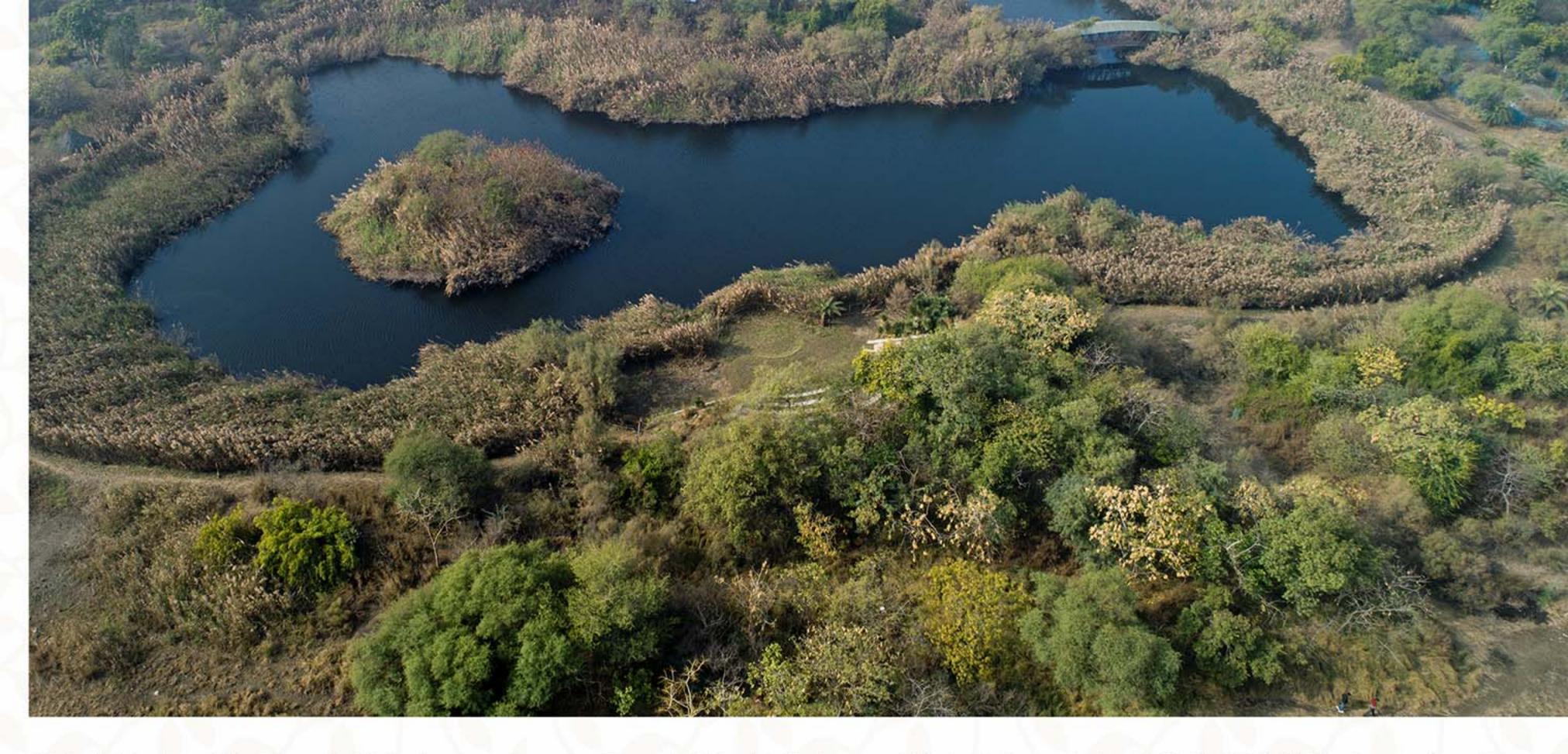


The complex forest ecosystem allows a diversity of animals to interact: Blue bull, Peacock and Cattle egret

Concept of Biodiversity Park

Biodiversity refers to all kinds of living organisms found in the biosphere, their interactions within themselves, and between them and their environments. There are four categories of biodiversity: (i) the genetic diversity (diversity at gene level): (ii) species diversity (number and kinds of species); (iii) ecosystem diversity (the number and kinds of ecosystems and (iv) cultural diversity that refers to diversity in human culture (such as food, language, religion, beliefs and others). A park refers to the landscape/area where biodiversity is recreated. This is a layman's definition of Biodiversity Park.

Conceptually a Biodiversity Park is a unique landscape of wilderness where native species of a particular region are assembled into ecological communities that function as ecosystems. These ecological assemblages of species are recreated in the form of ecosystems over a few hundred hectares of marginal/degraded landscapes. These Biodiversity Parks are nature reserves and harbour natural heritage and have conservation, educational and cultural values. The Biodiversity Park is a new conservation approach which involves conservation of populations, species, communities and ecosystems and in this respect it differs from all other forms of ex-situ conservation approaches (Botanical Gardens, Zoos, etc.). The Biodiversity Parks simulate National Parks / Wildlife Sanctuaries/ Nature reserves / Wilderness habitat but differ from these protected areas (PAs) in the sense that the Biodiversity Parks are smaller in size than the Protected Areas (PAs). The concept of Biodiversity Parks is also applicable to Riverscapes.



A Biodiversity Park can be created on a plot as small as 20 hectares to as a large as few thousand hectares. Small patches of 10 ha each that are interconnected can also be used for development of Biodiversity Parks.

The concept of Biodiversity Park has been successfully implemented by Delhi Development Authority for the first time in the country. Some of the Biodiversity Parks are fully functional and others are being developed. DDA Biodiversity Parks of Delhi have become environmental sustainability models for successful replication not only in India but also in the world.

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Biodiversity Park's Element for the Harmony of Man & Nature

The Biodiversity Park has a wide range of landscape elements or structural features, which can broadly be categorised in two zones:

(A) The Nature Reserve/Conservation Zone

The nature conservation zone includes the different terrestrial biological communities of the area and the mosaic of wetlands and marshes interspersed with grasslands.

(B) The Visitors Zone

The visitors' zone will have a wide range of landscape elements such as

- (i) Butterfly Corner or Conservatory
- (ii) Herbal Garden
- (iii) Scented Garden
- (iv) Climbers Grove
- (v) Conservatory of Threatened Plants
- (vi) Wetlands, Marshes, Swamps and Lakes
- (vii) Field Gene Bank
- (viii) Conservatory of Fruit Yielding Plants
- (ix) Amphitheatre
- (x) Nature Interpretation Centre having Exhibits of Representative Ecosystems of the Area
- (xi) Small Recreational Parks
- (xii) Bambusetum
- (xiii) Orchidarium
- (xiv) Fernery
- (xv) Conservatory of Plants that Cling to the Soil (Algae and Bryophytes)
- (xvi) Cactus House











Ecological Goods & Services of Biodiversity Parks

Green Treasure of Urban Life

A Biodiversity Park has diverse natural ecosystems, and as such it harbors a rich environmental microbiome which is the source for enrichment of human microbiome. This enrichment of human microbiome will enhance the immunity and thereby reduce health risks and public health burden.

The diverse forest communities with 2-3 storey canopy having with 40 feet - 45 feet high top canopy act as effective and efficient filter for both point and non point source of air pollution, and thereby mitigating air pollution hazards and improving the local air quality.

The wetlands of Biodiversity Parks store millions of cubic meter of flood water every year and recharge the ground water which is rapidly depleting due to heavy extraction. The forest communities together with grasslands and wetlands recharge substantial amount of rain water to the ground water annually.

The Biodiversity Parks serve as major sinks for CO₂ and store huge carbon stocks and, therefore, contribute to mitigation and adaptation to climate change and impart climate resilience to

A Biodiversity Park with diverse forest communities buffers local weather conditions, particularly ambient temperature, and even set up local cloud formation resulting in localized precipitation.

The diverse ecological niches in Biodiversity Parks are ideal habitats for vanishing flora and fauna, and hence serve as Nature Reserves and harbor natural heritage. The Biodiversity Parks are the tools for promoting practical environmental and nature conservation education among students and environment awareness among the public.

The Biodiversity Parks serve as living Museums/

Laboratories for undertaking research on

ecosystem processes and functions.

Biodiversity Parks provide recreation to the public and promote ecotourism.

Biodiversity Parks generate livelihoods for local communities by way of engaging locals as guides to the tourists for guided nature walks and for imparting nature education to the public.

Biodiversity Parks connect the city and its public to the Biodiversity.

The rich plant resources of Biodiversity Parks provide a myriad of products / drugs that can be used through AYUSH mode in treating health disorders, and thereby contributing to human health care system.

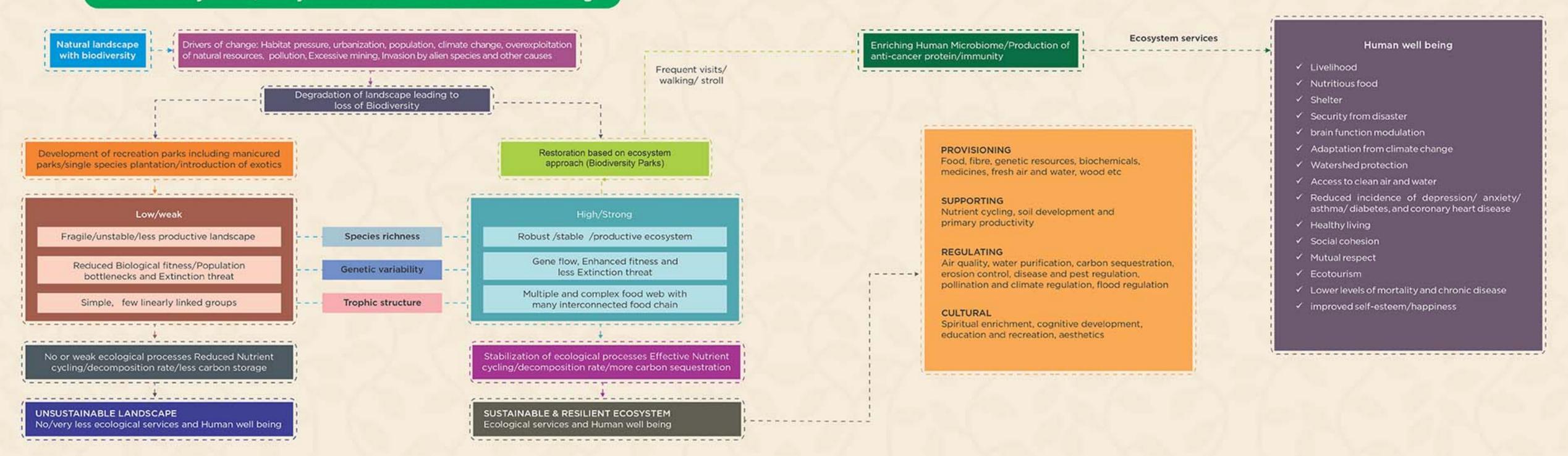
Biodiversity Parks can also contribute to rejuvenation of rivers and lakes through the use of natural and/ or constructed wetlands for the treatment of waste water before it enter into the rivers/lakes.

3

Biodiversity Parks being natural reserves maintain a balance between the nature & mankind. Also it harbor natural heritage of the area and have conservation, educational and cultural values, helping to enhance the quality of environment.

Biodiversity Park has been the necessity and integral part of our environment for proper functioning and existence of ecological world. And, hence Biodiversity should be conserved both for welfare of the human population in particular and the natural environment in general.

Biodiversity Parks, Ecosystem services and Human well being



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The Blueprint of Green Undertaking

- Genesis of Biodiversity Park
- Management And Sustenance of DDA Biodiversity Parks of Delhi
- Landforms and Biodiversity Parks



Initiation of plantation by the Lieutenant Governor of Delhi, Shri Vijai Kapoor in Yamuna Biodiversity Park in July 2004.



The Foundation of Aravalli Biodiversity Park was laid by Shri Lal Krishna Advani, Deputy Prime Minister of India on 21" February 2004.

2004



Lt Governor of Delhi Shri Tejendra Khanna inaugurated and dedicated the Yamuna Biodiversity Park to the nation on 11" February 2012.



Inauguration of Aravalli Biodiversity Park by Shri Najeeb Jung, Lt Governor of Delhi on 22rd April 2015.

2004

Genesis of Biodiversity Park

A Vision that Scripted Ecological Renaissance

Sometime in 2000-2001, a conference was organised by the Department of Environment of NCT of Delhi jointly with the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi. The conference was inaugurated by the then Lt. Governor of Delhi, Shri Vijai Kapoor. Professor C. R. Babu, the then Pro Vice- Chancellor of Delhi University and Director of the Centre for Environmental Management of Degraded Ecosystems, University of Delhi, had given a keynote address on the conservation of Biodiversity at the conference. After the inaugural speech, Professor Babu interacted with Shri Vijai Kapoor and apprised him about the rampant loss of

native biodiversity of Delhi and natural heritage of Ridge and River basin. The Lt. Governor was so concerned about the loss of natural heritage, that he responded quickly by earmarking 63 hectares in the upstream of Wazirabad to develop a Biodiversity Park over the degraded land near Jagatpur, Wazirabad. Shri Anil Baijal was the then Vice -Chairman of DDA. Within a week the land was made available to CEMDE for the development of the Biodiversity Park. The word 'Biodiversity Park' emerged during the discussion and was subsequently conceptualised by Professor C. R. Babu.

The Detailed Project Report (DPR) for the development of

2012

Yamuna Biodiversity Park - the first Biodiversity Park in the world- was formulated and presented before the Lt. Governor and officials of DDA and it was approved. The matter was reported to the Delhi Development Authority meeting. The foundation of Yamuna Biodiversity Park was done by planting saplings of silk cotton trees by Shri Vijai Kapoor, Shri Anil Baijal and Professor Deepak Nayyar (the then Vice- Chancellor of Delhi University).

Both Shri Vijai Kapoor and Shri Anil Baijal took the initiative for the creation of the Delhi Biodiversity Foundation for development and management of Biodiversity Parks of Delhi. The Delhi Development Authority approved the creation of the Delhi Biodiversity Foundation as a committee under section 5 (A) of DDA Act 1956.

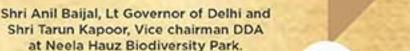
2015

After the successful development of wetlands at Yamuna Biodiversity Park, Shri Vijai Kapoor announced the development of Aravalli Biodiversity Park over 280 hectares near Vasant Vihar- Vasant Kunj area which was declared by the Supreme Court as Green Area. The foundation stone for the Aravalli Biodiversity Park was laid by the then Deputy Prime Minister of India, Shri L. K. Advani on 21th February

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2019



Shri Anurag Jain, Vice-Chairman,
DDA planting a sapling of Bel Aegle marmelos
in the Kalindi Biodiversity Park.



Shri Durga Shanker Mishra, Secretary, MoHUA and Shri Anurag Jain, VC, DDA on the nature trail of Neela Hauz Biodiversity Park.

Shri Anurag Jain, Vice Chairman, DDA.

2018

2004. Shri Anil Baijal also attended the function as the Secretary, Ministry of Home Affairs, Govt. of India.

Shri Anil Baijal, Lt Governor of Delhi had dedicated

Tilpath Valley Biodiversity Park to the nation

on 3th February 2018.

To ensure smooth development of the Biodiversity Parks and their management, Shri Anil Baijal took a meeting as Vice - Chairman of DDA where it was decided that the DDA Biodiversity Parks of Delhi will be developed in joint collaboration with the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi and the required staff will be recruited by the University of Delhi for the Delhi Biodiversity Foundation for the development and Management of Biodiversity Parks. This was a key decision that led to the successful establishment of seven Biodiversity Parks, the first of their

kind in the world, attracting global attention for replication as a model for urban environmental sustainability and resilience. These Biodiversity Parks have been and are being developed by a team of scientists supported by technical, multitasking staff together with landscape architects and engineering staff of DDA.

Today, there are seven Biodiversity Parks in Delhi spreading over 1200 hectares and rendering a wide range of ecological services to the city of Delhi and its citizens. Yamuna Biodiversity Park was dedicated to the Nation by the then Lt. Governor of Delhi, Shri Tejendra Khanna in 2012 and the Aravalli Biodiversity Park was dedicated to the Nation by the then Lt. Governor of Delhi, Shri Najeeb Jung in the year 2015.

2020

He also dedicated Neela Hauz Biodiversity Park to the Nation in the year 2016. The Tilpath Valley Biodiversity Park was dedicated to the Nation by Lt. Governor of Delhi, Shri Anil Baijal in the year 2018.

Although all the Lt. Governors of Delhi since 2002 till date have been providing full support for the development and management of DDA Biodiversity Parks, Shri Vijai Kapoor (2002-2004) and Shri Anil Baijal as Vice-Chairman (2002-2003) and later as Lt. Governor of Delhi (2017 - till date) played significant roles for the development of Delhi Biodiversity Parks and also laid the policies that contributed to the development and management of world class Biodiversity Parks for urban environmental sustainability.

To have greater flexibility and autonomy in making decisions, the Lt. Governor of Delhi, Shri Anil Baijal and Shri Tarun Kapoor, Vice-Chairman DDA helped in establishing the Delhi Biodiversity Society - a society outside DDA but supported by DDA. The Secretary of MoHUA, Shri Durga Shankar Mishra also played a role in directing DDA to form such a society. Today, DDA Biodiversity Parks of Delhi have become Nature Reserves of Delhi, contributing to urban environmental sustainability and imparting climate resilience to the city. The work on Kalindi Biodiversity Park has been taken up in 2020 - 21 and a sapling of a sacred tree species was planted by

2021

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Management and Sustenance of DDA **Biodiversity Parks of Delhi**



Biodiversity Parks are Nature Reserves and harbor recreated natural heritage in the form of biological communities/ ecosystems. Development of Biodiversity Parks, therefore, requires a team of scientists supported by technical and multitasking staff. The scientists specializing in taxonomy, ecology, wildlife, soil microbiology, field biology and conservation biology are critical for development and management of Biodiversity Parks. Since such expertise is not available with Delhi Development Authority (DDA), the development of DDA Biodiversity Parks of Delhi was undertaken in joint collaboration with the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi, with a provision for the recruitment of the requisite staff by the University of Delhi for Delhi Biodiversity Foundation, a committee under section 5(a) of DD Act 1956 - notified by the Government to oversee the development of Biodiversity Parks. The Chairman of the Foundation is the Lt. Governor of Delhi and it has an Executive Committee, which is chaired by the Vice-Chairman, DDA. The Executive Committee looks after the day to day activities of Biodiversity Parks.

The Biodiversity Parks Programme at the University of Delhi runs in a project mode with full funding from DDA. The entire programme is



A typical wetland ecosystem comprises shoreline vegetation, islands and marshes: an aerial view of Yamuna Biodiversity Park's wetland

under a Project-Incharge who is entrusted with the development of Biodiversity Parks along with scientific staff, engineers and landscape architects of DDA, where Landscape department prepare the conceptual maps and Engineering department execute the works on the ground.

For long term sustenance of Biodiversity Parks, with staff already working, the DDA approved a Society named as Delhi Biodiversity Society registered under the Society Registration Act, 1860. The Society is not constituent of DDA but it works through suitable institutional arrangement with DDA.

The Lt. Governor of Delhi is the ex-officio President of the Society and the Vice Chairman of DDA is its ex-officio Vice President who is also ex-officio Chairman of the Governing Board of the Society which has five representatives from DDA as its ex-officio members, besides other members.



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Landforms and Biodiversity Parks

Land of Ecological Values

Delhi has two major distinct natural features (landforms). These are (i) Yamuna river and its floodplains and (ii) Rocky tracts of the Ridge (Aravalli Ranges of Delhi). These geomorphic features have developed due to diversified geology, which harbours characteristic biota that is native to this region.

Riverscape of Delhi

(The River Yamuna and its Floodplains)

Yamuna Biodiversity Park and Kalindi Biodiversity Park are located on river Yamuna floodplains, the former on the upstream and the latter on the downstream of river, respectively, while other biodiversity parks are located at different places on Delhi Ridge that is Aravalli hill ranges. Based on their location in the landform, diverse landscape elements appropriate to the landform have been developed.

Biodiversity Parks located on the river floodplains have the following landscape elements: wetlands, islands and shoals, marshes, swamps, lakes and floodplain forests with diverse biotic communities and grasslands. In addition, constructed wetland systems are developed for the treatment of sewage water that otherwise enter directly into River Yamuna. Therefore, these biodiversity parks have a mosaic of different types of wetlands interspersed with patches of grasslands, floodplain forests and marsh communities besides upland terrestrial biodiversity. Yamuna Biodiversity Park also has a defined visitor's zone where conservatories of herbal plants, butterflies, fruit plants, sericulture zone, sacred grove, rangelands, field gene bank and wetlands have been developed.



Vast expanse of wetland in Yamuna biodiversity park harbors aquatic plants like lotus, hydrilla and potamogeton. These plants are food for fishes and birds.

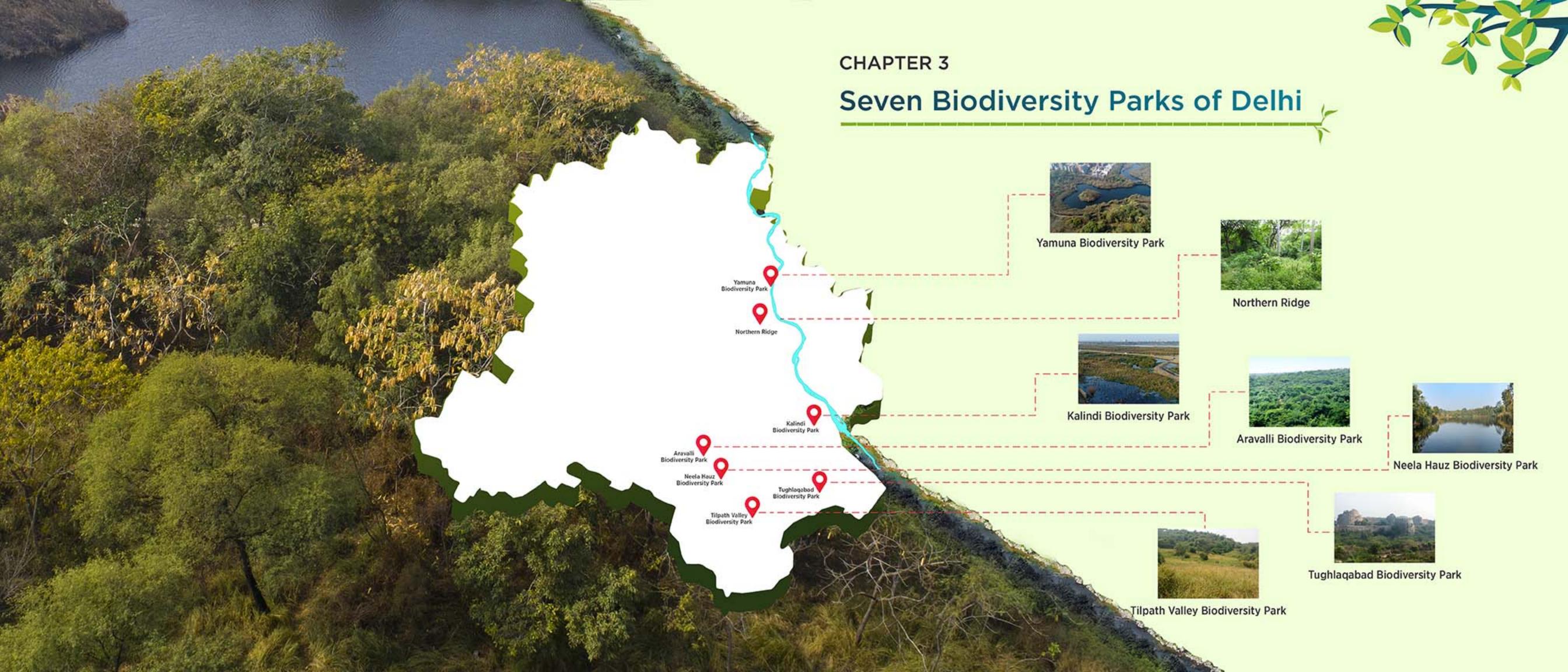
Rocky Tracts of the Delhi (Aravalli Hill Ranges)

Biodiversity Parks located on Delhi Ridge viz. Aravalli Biodiversity Park, Tilpath Valley, Tughlaqabad and Northern Ridge Biodiversity Parks have different landscape features like deep depressions of varying sizes, shapes and depths, with gentle to steep slopes, rocky outcrops, plateaus, shallow and deep valleys, seasonal nallahs, flat hill tops and caves of varying length. Depending upon the specific conditions, various forest communities belonging to Aravalli hill ranges, edaphic communities, shrubland, bulbous and succulent plants of rocky habitat, grasslands and savannahs, etc. are developed. The visitor area of Aravalli Biodiversity Park consists of conservatories of medicinal plants and butterflies, rock garden, fernery, orchidarium, rosarium, bougainvillarium, arboreta, representatives of Aravalli vegetation types and also viewing spots for animals.

Neela Hauz Biodiversity Park is surrounded by a large watershed of Aravallis, the Sanjay Van, and includes a historical lake - the Neela Hauz - used to receive the entire catchment from Sanjay Van. It was dead but now restored to its pristine glory.



The excessive mined out Area of Aravalli hills is a monoculture of Vilaiti Kikar, Prosopis juliflora







Yamuna Biodiversity Park /-

Reclaimed from Waste Land. Transformed into Green Land.



Area 184 Hectares



Plants 1017 species



Birds 203 species



Butterflies 82 species



Mammals 22 species

The luxuriant forest ecosystems alongwith wetlands, grassland and marshes of Yamuna Biodiversity Park offer a range of ecological services to the society.

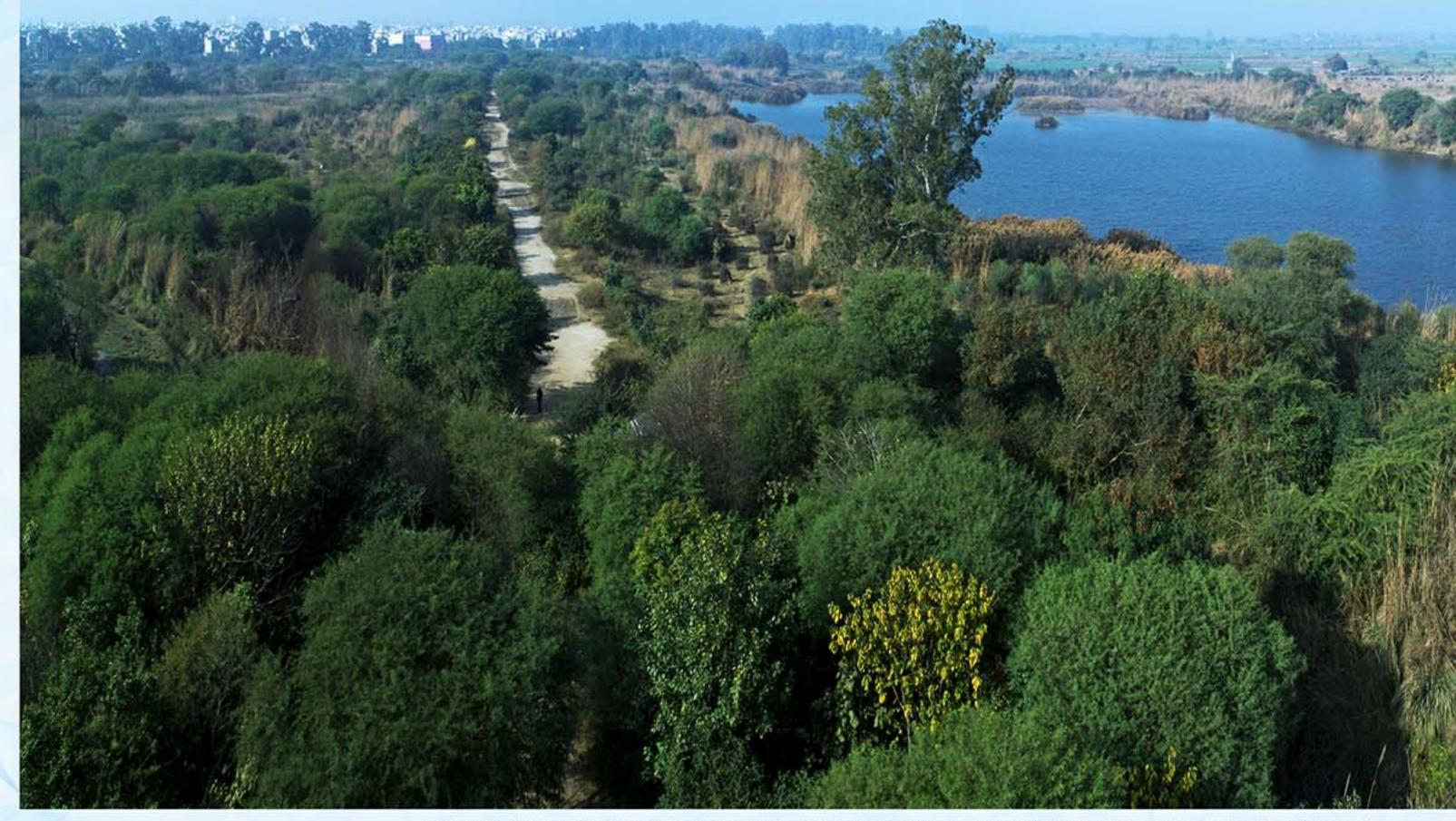
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Yamuna Biodiversity Park A-Visitor's Area 8- Interpretation Center C-Wet Land F-Main Trail E-toop Trail D-Parking Sal Dominated Mixed Evergreen II Teak Dominated Mixed Deciduous III Mixed Evergreen Without Bamboos IV Mixed Evergreen With Bamboos V Mixed Deciduous Without Bamboos VI Mixed Deciduous With Bamboos VII Thom Scrub Forest VIII Mosaic Of Acacia Grass Lands IX Riparian Community X Wetland Community

The Yamuna Biodiversity Park spreads over an area of 184 Hectares near Wazirabad on the flat alluvial floodplains of the Yamuna. The park is divided into two phases: Phase I consisting of 63 Hectares. Phase II consisting of the rest of 121 Hectares and located on the active floodplain of river Yamuna and consists of mosaic of wetlands together with the grasslands and floodplain forest communities. The restored wetlands serve as nurseries by storing a diversity of life forms.

A wetland of 100 acres not only impounds substantial amount of flood waters and recharge the ground water but also provides ideal habitat for the rich aquatic communities including resident and migratory birds.





The luxuriant forest ecosystems alongwith wetlands, grassland and marshes of Yamuna Biodiversity Park offer a range of ecological services to the society.

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Structural Components of Yamuna Biodiversity Park

The Phase I is divided into two zones: visitor zone and nature conservation zone. Visitor zone includes several modules like mounds representing communities of river Yamuna basin, wetlands etc. Repositories like medicinal garden, butterfly conservatory, sacred grove and conservatory of fruit plants are also developed which act as living museums for promoting conservation education and environmental awareness among students, civil societies, and also to promote ecotourism.

The nature conservation zone has diverse forest, grassland and wetland communities.

Native to India, Dhak Butea monosperma, is also called

Flame of the Forest as its bright red coloured flowers

bloom when whole forest is leafless. The hindi phrase

prominent three leaflets of this tree

ढाक के तीन पात ("Dhaak ke teen paat") comes from the

Habitat Characteristics before Inception of Yamuna Biodiversity Park

With an objective to establish historically representative natural ecosystems within a defined space to achieve ecological integrity, and to repair habitats that have been damaged by human activities, the restoration work in Phase I of Yamuna Biodiversity Park was started in 2002.

Before restoration work started, the area was highly alkaline and the underground water, too was highly saline (electrical conductivity 1500-5000 µS cm⁻¹). The Park harboured only a few species of halophytes (Salt loving bushes) and common weeds.

To restore the pristine glory of Yamuna river basin, various restoration strategies and principles for reconstruction of ecosystems and ecological succession were utilized. Different forest types, wetlands, grasslands and marshes were developed.

Mahua Madhuca latifolia is multipurpose tree is known for its delicious and nutritive flowers



2002 2004 Development of Natural **Ecosystems** Through Ecological Restoration Restoration involves habitat improvement, ecological assemblage of species and development of plant communities. Similar restoration procedures have been followed for development of other Biodiversity Parks depending upon the site conditions. These procedures can be 2010 followed for replication of Biodiversity Parks elsewhere.

Development of Natural Wetland Ecosystems

Year-wise development of natural ecosystems are illustrated .

Resident Ducks' Wetland







2004

2006

Migratory Ducks' Wetland







003

2004

2005

A barren nutrient deficit area of Yamuna Biodiversity Park

Restoration of silted wetland

Revival and Fostering of the Habitat

Habitat improvement involved planned and scheduled interventions that were both site- and time-specific. For creation of wetlands and to deal with salinity problem, the terrain at some areas was modified by increasing the ground level and creation of mounds. Soil excavated from dredging the existing silted waterbodies was used to create mounds of different sizes and shapes. The development of mounds served two important purposes. Firstly, it raised the level and allowed leaching of salts, thereby permitting the habitat to regain some fertility. Secondly, it contributed to habitat diversity by positively influencing micro-climatic variables and creating conducive niches. Some areas were ploughed prior to introduction of vegetation. Ploughing allowed good aeration for the growing root system and also helped mixing of biological inputs. It also helped break the hard soil aggregates (formed due to high amount of clay in soils) that otherwise prevent proper growth of lateral roots by offering resistance. Many grass species were used to start the successional processes and to add the nutrient content of the soil.



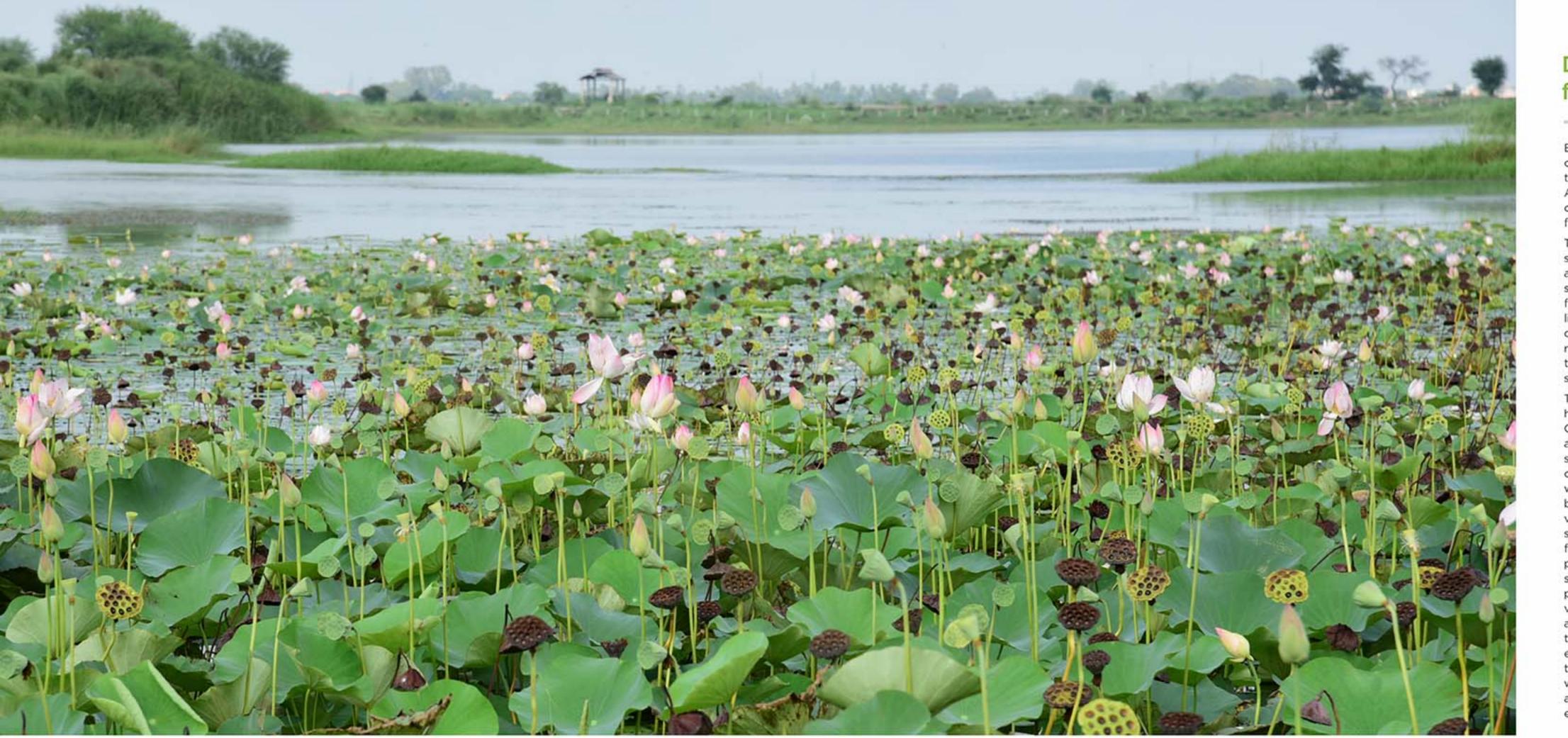


Introduction of leguminous plants

Introduction of grasses

These grasses were Leptochloa fusca, Vetiveria zizanioides, Cenchrus ciliaris etc. Some nitrogen fixing legume species and some characteristic grass species were used for improving the nitrogen content. Noteworthy legumes include Crotalaria sp., Sesbania sesban, Sesbania aegyptica, Indigofera tinctoria, Trifolium alexandrinum, Medicago sativa, Melilotus sp. and Trigonella sp. and Rhynchosia sp. A three layered barrier was also made by planting trees viz. Holoptelea integrifolia, Terminalia arjuna, Dendrocalamus strictus and Albizia sp. to avoid heavy noise from nearby human settlements.

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Lotus Nelumbo nucifera blooming in wetland of Yamuna Biodiversity Park

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Diverse Plant Species for Ecological Efficacy

Extensive surveys of forest and wetland areas were conducted all along the Yamuna river basin and its tributaries to study the various biotic communities. After thorough field-based studies at species and community levels, many forest, grassland and floodplain communities were simulated.

To start the successional processes, grasses of 25 species—such as Leptochloa fusca, Bothriochloa and Cenchrus sp were planted. Seeds of wild plant species—were collected from the natural forest floor and were germinated. Based on the species' life history traits such as seed size and longevity, dispersal syndrome, germination requirements, relative growth rate, shade dependence, ability to tolerate moisture stress, and successional status, strategies for massive plantation were developed.

Two wetlands, which simulate natural water bodies, have been created in the Yamuna Biodiversity Park. One is 1.8 km long and narrow simulating the river, and the second one is more open and deep, and is spread over about 2 hectares. Creation/ construction/ reconstruction/ development of wetlands require systematic ecological designing based on sound ecological principles so that various depth gradient of a developed wetland should be able to accommodate desired floral and faunal communities of a wetland ecosystem. Other physical and biological attributes of the wetlands such as presence or absence of vegetation, patchiness or openness of vegetation, type of vegetation, physicochemical properties of water and type of sediments also play important role on the composition of wetland communities. For example some birds and fishes forage for food in the sediments of wetlands; some find food in the water column, and some feed on the vertebrates and invertebrates that live on submerged and emergent plants.

Chronicling the Transformation





A Comparative View of the Nature Reserve Area

Plantation of seedlings of different forest species in the form of upper, middle and lower canopy was done each year in the monsoon. The whole park is designed in a way that ecotones of different forest types exist among the communities and, thus the whole area represents a stretch of natural ecosystems





A Comparative View of the Visitors Area

Today, the area has become Delhi's most charismatic Natural heritage site that harbors thousands of plant and animal species living together in the form of diverse communities/ecosystems which used to exist along the river Yamuna Basin in the past. With abundant food and safe nesting sites for birds and diverse ecological niches, Yamuna Biodiversity Park is home for over 203 bird species, 82 species of butterflies, 18 species of reptiles, 22 species of mammals and 18 species of fishes, in its different ecosystems.



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Started from the barren landscape, the forest communities have attained the height of 30-35 feet.

Forest Communities: Flora and Fauna

The forest communities of Yamuna Biodiversity Park are diverse and represent different ecosystems of Yamuna river basin. Various forest communities such as tropical dry deciduous, riparian, floodplain forest communities and others were simulated. Trees like Jamun Syzygium cumuni, Arjun Terminalia arjuna, Shisham Dalbergia sissoo, Babool Acacia nilotica, Pilu Salvadora persica, Chilbil Holoptelea integrifolia, Anjan Hardwickia binata, Kadamb Mitragyna parviflora, Mahua Madhuca latifolia and others were established based on the community structure and composition. Today, the Park is home and habitat for over 900 species of flowering plants.

Forest communities have complex structure with various forest layers i.e. top canopy, middle storey, understory shrub, herb and grass layers, that offer diverse micro-habitats allowing many animal species to come, survive and breed.

Birds of Yamuna Biodiversity Park



Increase in complexity, diversity and abundance in floral components of various plant communities of Yamuna Biodiversity Park led to enhanced faunal diversity. The habitat processing enabled many bird species to find their suitable niches thereby enhancing the size of food web and trophic structure. Birds living in various biotic communities are illustrated in next pages. The noteworthy bird species are Shikra, Munia, Prinia, Shrike, Bulbul, Parakeets, Bee Eaters etc.

The nesting success of majority of resident birds indicates the maturation of forest communities that ensures continuous food supply, shelter and protection from predators.



Peacock Pavo cristatus, a charismatic bird of pheasant family is a national bird of India that breeds in Yamuna Biodiversity Park

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Green Bee-eater Merops orientalisare, a naturalborn killers of bees, "disarm" its prey by removing the stinger and eliminating the venom by hitting and rubbing the bee against a branch

Identified by metallic blue colour, Purple Sunbird *Cinnyris asiatus* is known for parental care

metallic blue colour, Wire-tailed Swallo pird Cinnyris asiatus for parental care

Wire-tailed Swallows Hirundo smithii



Terrestrial Migratory Birds of Yamuna **Biodiversity Park**

The species rich forest communities of Yamuna Biodiversity Park harbour rich insect diversity offer multiple environmental niches with a wide range of foraging guilds that attract several terrestrial migratory birds for making their temporary home.

Identified by the peaked head shape Grey-headed Canary Flycatcher Culicicapa ceylonensis is a treat to see in Yamuna blodiversity Park



An open forest bird Verditer Flycatcher Eumyias thalassinus is seen perching on top of the tree in winters



Red-breasted Flycatcher Ficedula parva a charming perky bird winters in Yamuna Biodiversity Park



A woodland bird of deep canopy, Orange-headed Thrush Geokichla citrina is a consistent guest of Yamuna Biodiversity Park

Owls of Yamuna Biodiversity Park

Owls are birds of prey and are important in the ecological balance; they scavenge and dispose carrion, control rodent populations, and eat various pests that are harmful to crops. In natural forest ecosystems, owls are top predators and feed on other birds, hares, rodents and other animals. They control the prey population which are surplus and remove the weaker member of populations thereby improving the health and viability of prey populations.



Barn Owl Tyto alba, a medium-sized raptor has strong grasping talons for killing prey, and a hooked upper beak for tearing meat is



Eurasian Scops Owl Otus scops is hard to see due to its cryptic plumage



Indian Scops Owl Otus bakkamoena is identified by its conspicuous ear tuft and can be seen hiding in the trees

Spotted Owlet Athene brama





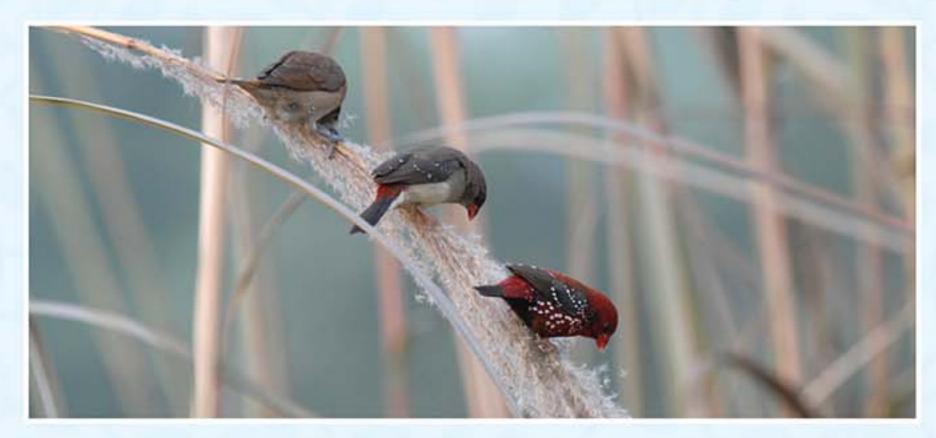


Grasslands of Yamuna Biodiversity Park

Grasslands of Yamuna Biodiversity Park are unique ecosystems that offer a wide range of ecological goods and services and are home for a diversity of insects and grainivorous birds like Prinia species, Red Avadavat, Black-headed Munia etc. A number of wild grasses like Khas, Khui, Narsal, Munj along with associated animals not only form intricate grassland ecosystems that are highly productive, dynamic and resilient but also offer forage for herbivores. They lead to protection and conservation of soil and water resources and furnish a habitat for wildlife.

A view of grassland of Yamuna Biodiversity Park

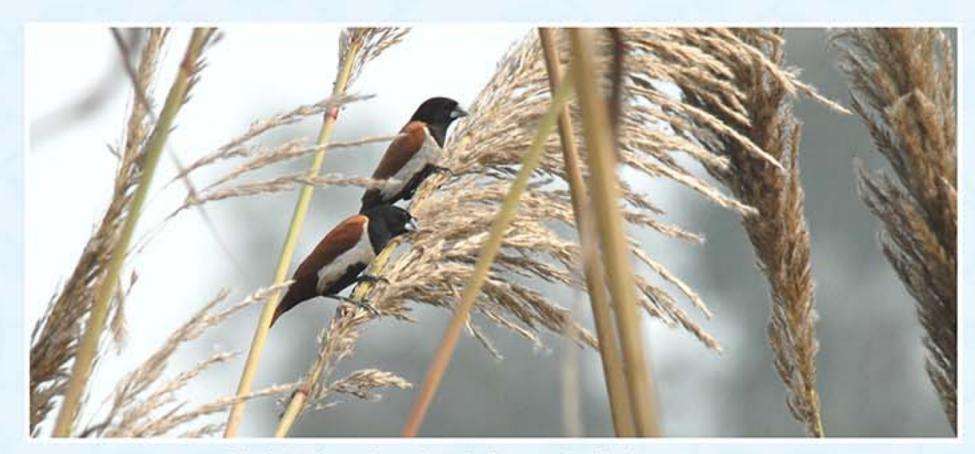
Grassland Birds of Yamuna Biodiversity Park



Red Avadavat Amandava amandava, often seen in small flocks



Scaly breasted Munia Lonchura punctulate a tiny shy bird feeding on seeds of Brachiaria mutica



Tricolour Munia Lonchura malacca feeding on seeds of Saccharum spontaneum



Silver bill Euodice malabarica feeding on seeds of Brachiaria mutica

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Rose-ringed Parakeet Psittacula krameria feeding on Pomegranate Punica granatum fruits



Common Rosefinch Carpodacus erythrinus, a migratory bird often seen feeding on mulberry Morus alba fruits



Asian Koel Eudynamys scolopaceus feeding on fruits of Lisoda Cordia myxa



Coppersmith Barbet Psilopogon haemacephalus feeding on mulberry Morus alba fruits

Conservatory of Fruit Plants

Frugivorous Birds

The Conservatory of Fruit Plants preserves the land races of fruit yielding trees grown all along the river Yamuna basin and harbours around 150 varieties of 50 species of fruit plants. These wild genetic resources contain useful genes which can be used in the development and improvement of modern cultivars in terms of growth rate, pulp and fibre content and resistance to various insects and pests. The major fruit yielding plants include Ber, Anar, Khirni, Mulberry, Cheeku, Lisoda, etc. The conservatory is home of many frugivorous (fruit eating) birds like Parakeets, Yellow-footed Green Pigeons, Coppersmith Barbets and migratory birds like Rosefinch, etc.

Small Indian Civet Viverricula indica is a solitary, nocturnal animal that makes holes in bushes.



Indian Hog Deer Hyelaphus porcinus, an endangered species, reappeared in Yamuna floodplains

Animals of High Trophic Levels

The biologically rich forest, grassland and marshy communities consisting of a variety of plants, animals and microbes in interaction with the chemical and physical features of their environment make a complete ecosystem. The animals living in these ecosystems are interdependent on one another for survival and make a complex trophic structure. Around 24 mammal species have been recorded in Park including Wild Pig, Mongoose, Indian Hare, Hog Deer, Porcupine, Leopard etc.



Wild Pig Sus scrofa an omnivore commonly seen digging out tubers and juvenile shoots

Leopard Panthera pardus

A success story written on Biodiversity Chapter

Restoration of habitats with the help of assemblage of plant species belonging to the Yamuna River Basin has made Park home to many herbivores like Indian Hare, Wild pigs, Nilgai etc. The Park is connected to Protected Areas through the Yamuna river corridor, attracted a top carnivore-the Leopard. In the winter months of 2016, a leopard was spotted in the Yamuna Biodiversity Park (YBP) of Delhi. On November 7, 2016 a villager called YBP office informing about a yellow coloured animal with large head and a long tail, while guarding his farmland during the night on the periphery of the Phase II of Yamuna Biodiversity Park. Following this, a team of staff was constituted under the supervision of a Scientist (Wildlife Expert) of the park. Several pugmark

impression pad (PIP) were made on every possible trail of the Park. The next morning the expert team was delighted to see the pugmarks of a leopard. Then, camera traps were installed at various strategic locations within the park. Several camera photographs confirmed the presence of a young male leopard in the Park. It was observed that the Leopard hunted two nilgai calves within two weeks. Since big cats have the habit of exploring neighbouring habitat before finally establishing their home range, the leopard used the ecological corridor to visit Phase I of the Park. However, to avoid any human-wildlife conflict it was caught and released into its natural habitat.



Food Web

Forests, grasslands and wetland communities of Yamuna Biodiversity Park have diverse ecological niches that harbour a wide range of plant and animal species forming a complex food web.



Shikra Preying on Red munia



Indian Hare foraging on grass



Indian White-eye Bird Feeding on a caterpillar



Checkered Keelback Snake Preying on a fish



Garden Lizard Devouring on Praying mantis

Recycling of Nutrients

Soil microbes are known to play a significant role in nutrient cycling. The rainy season invites a different group of species to the Park, the fungi that are inimitable recyclers and decomposers. Bamboo scales and leaves are supposed to be highly inflammable but in Yamuna biodiversity Park, the fallen leaves of bamboo are rapidly decomposed by fungi.









Animals of Forest Floor

The dry season in Yamuna Biodiversity Park has its own splendor. The thick litter layer of the forest floor attracts a diversity of faunal elements that form an important component of food chain. Reptiles and insects play an important role in the ecosystem both as predator and prey species; they also serve as bio-monitors in controlling many pests and as excellent ecological indicators due to their high degree of sensitivity to even a minor changes in the environment



Six spot ground beetle Anthia sexguttata often inhabit ant's nest, is seen moving on the forest litter.



Striped grass mabuya Eutropis dissimilis, a typical forest dweller skink



Palash Butea monosperma

Colours in the **Forest Communities**

Flowers, the most fascinating creations of nature add colour to life. They are not just beautiful to look at, but they also serve a vital role in our ecosystem. They provide food for several birds, butterflies, bees etc. They are part of the reproductive system of the plant for producing seeds and enhancing biodiversity. They ensure the continuation of life on the planet by providing food for other life forms. Flowers help our ecosystem to thrive by attracting insects and birds, which help in pollination leading to seed production.

The park glistens with beautiful flowers in the spring.

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Maror fali Helictris isora is a small medium shrub often recognized by twisted screw like pods.



Cherished for its orchid-like flowers

Kachnar Bauhinia racemosa blooms in the February-March



Drumstick Moringa oleifera, a storehouse of nutrients is part of middle storey in forest communities.



Semal Bombax ceiba, the enchanted red flowers of this tree blooms in summer



Rosy Milkweed Vine Oxystelma esculentum, a perennial creeper is native of Yamuna floodplain

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Wetlands of Yamuna Biodiversity Park

Wetlands are a very important component of the Yamuna Biodiversity Park that help in maintaining ecological processes and functioning of ecosystems. Wetlands also render a range of ecological services and goods. They are known to serve as nurseries for river ecosystems by providing a diversity of insects, fishes and plants. They are important bird habitats as birds use these wetlands for feeding, resting, sheltering, breeding, nesting, rearing young ones and for social interactions. Yamuna Biodiversity Park encompasses wetlands of different shapes, sizes and depths performing specific functions. The mosaic of wetlands ranging from marshes and shallow to deep water bodies are unique in terms of home to a diversity of fresh water reptiles like Seibold snake.

Seibold water snake Ferania sieboldii is largely restricted to the rivers of Indian subcontinent. However, due to destruction of habitats and sewage discharge in the river Yamuna, this snake vanished from Delhi, a few decades back. Restoration of wetlands in Yamuna Biodiversity Parks not only provided the suitable habitat but also allowed its successful breeding.



Seibold Snake Ferania sieboldii



Active floodplain of River Yamuna

Yamuna Biodiversity Park Phase II spreads over an area of 121 hectares and consists of a mosaic of wetlands together with the grasslands and floodplain forest communities. The restored wetlands serve as nurseries by storing a diversity of life forms such as phyto- and zooplanktons, fishes, amphibians and turtles. The wetlands support many aquatic plants such as *Hydrilla*, *Vallisneria*, *Potamogeton sp.*, water lilies, lotus, etc.

The floodplain forests together with the mosaic of wetlands (i) provide flood relief in downstream; (ii) prevents siltation of reservoir; (iii) purifies water; and (iv) enhances ground water recharge.

A wetland of 40 hectares not only impounds substantial amount of flood waters and recharge the ground water but also provides an ideal habitat for the rich aquatic communities including resident and migratory birds.



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Wetland in Bloom

Lotus, National flower of India and a diversity of waterlilies are flourishing in the wetlands of Yamuna Biodiversity Park.





Marshes of Yamuna Biodiversity Park

Marshes, the transition between the aquatic and terrestrial ecosystems have distinctive soils, microorganisms, plants, and animals. The marshes of Yamuna Biodiversity Parks attract waders that walk on the shallow water and wade to forage for food (such as insects or crustaceans) in the mud or sand.



Asian Openbill Stork Anastomus oscitans and Black-headed ibis Threskiornis melanocephalus inhabit shallow waterbody



Painted Stork Mycteria leucocephala: a Near Threatened bird is common in Wetlands of Yamuna Biodiversity Park



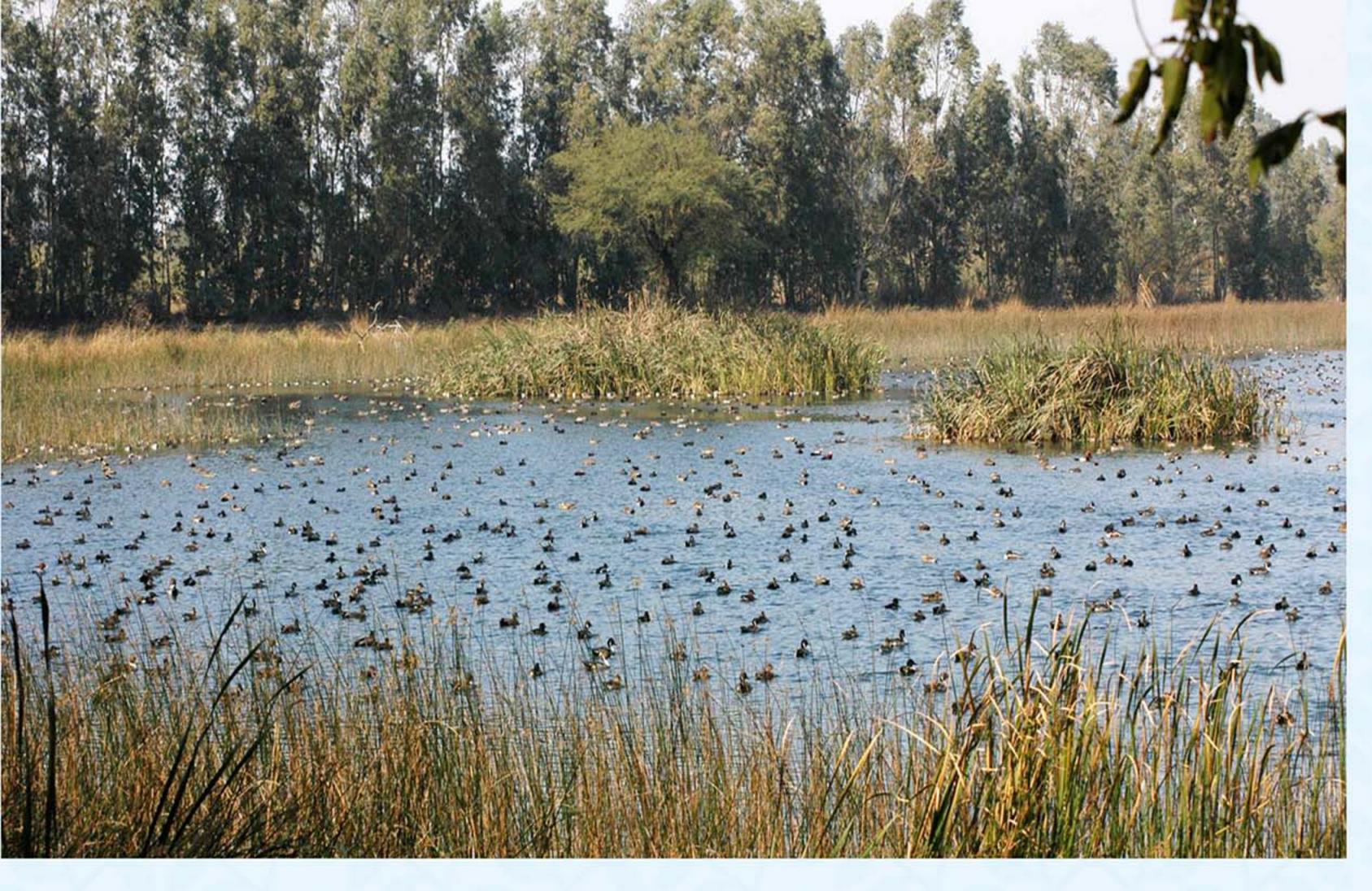
Black tailed Godwit Limosa limosa is a widespread winter visitor



Pheasant- tailed Jacana Hydrophasianus chirurgus can be seen on floating vegetation

78 BIODIVERSITY PARKS
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Migratory Ducks Wetland of Yamuna Biodiversity Park

This wetland of Yamuna Biodiversity Park covers an area of 2.8 hectares with maximum 7 feet depth, that varies at different places. Not only it recharges aquifers by storing rain water, which infiltrates into the ground, but it is also an important bird habitat. It has a variety of niches that support mainly diving ducks which includes both resident and migratory birds. Each year in winters this wetland attracts more than 5000 migratory ducks which begin arriving in late November, stay here for around four months and return back in late March. Some of the notable migratory birds include Red Crested Pochard, Tufted Duck, Eurasian Wigeon, Large Cormorant, etc. These birds mainly feed the wetland vegetation, several invertebrates, molluscs and fishes. The islands of this wetland act as a roosting and resting ground for many species. Therefore, this wetland is a fully functional and self-sustainable ecosystem which integrates every trophic level, viz., producers, consumers and decomposers.



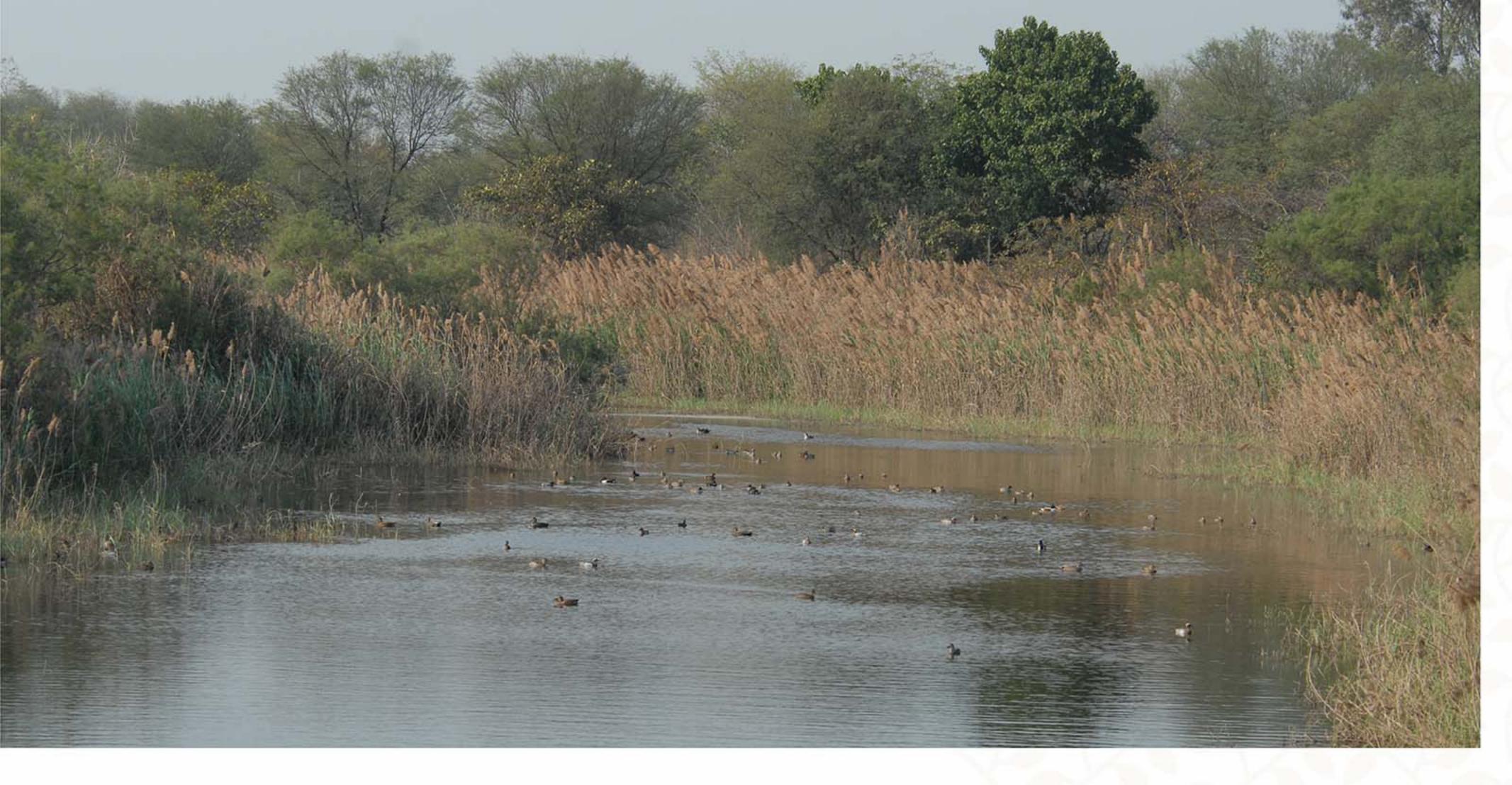




Red Crested Pochard Netta rufina is indicator of healthy wetland ecosystem

82 BIODIVERSITY PARKS BIODIVERSITY PARKS NATURE RESERVES OF DELINI NATURE RESERVES OF DELINI







Resident Ducks' Wetland of Yamuna Biodiversity Park

Resident ducks' wetland or Shallow Wetland of Yamuna Biodiversity Park is an important ecosystem that harbours riverine, riparian, marshy communities at different places.

Different physical and biological attributes of this wetland of Yamuna biodiversity Park, such as variability in water depth, presence or absence of vegetation, patchiness or openness of vegetation, type of vegetation, water chemistry, type of soils, and associated faunal elements are able to attract different species of birds.

Resident ducks wetland is about 1.8 km long with maximum 4 feet depth but varies at different places.

The resident birds include Spot-Billed Duck, Indian Moorhen, Purple Swamphen, Little Cormorants, Darter, Pond Heron etc.

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Knob-billed Duck Sarkidiornis melanotos



Common Sandpiper Actitis hypoleucos



Gadwall Mareca strepera



Eurasian Teal Anas crecca



Common Pochard Aythya ferina



Tufted Pochard Aythya fuligula



Garganey Anas querquedula



Cotton pygmy goose Nettapus coromandelianus



Eurasian Wigeon Anas penelope



Bamboo bridge is a perfect amalgamation of magnificence, culture and tradition. This is also a perfect location to view aquatic plants and birds closely.



Interaction of Common Moorhen Gallinula chloropus with chick

90 BIODIVERSITY PARKS



Indian Spot-billed Duck Anas poecilorhyncha with its chicks is

The restored Tamarix-Phragmites marsh community along shallow wetland of Yamuna Biodiversity Park is now the abode for thousands of Black-Crowned Night Herons. These birds regularly nest and breed here. Other species viz., cormorants, purple, grey herons, egrets and darters also successfully breed here.

The Black-Crowned Night Heron is a stocky, medium sized, wading bird. It has a black crown and the back of the bird is in contrast with its whitish to pale gray belly and gray wings. They have red eyes and short yellow legs. Two or three long white plumes, erected in greeting and courtship displays, extend from the back of the head. These social birds breed in colonies of stick nests usually built over water.



Oriental Darter Anhinga melanogaster

BIODIVERSITY PARKS 91

a common sight in the month of April-May



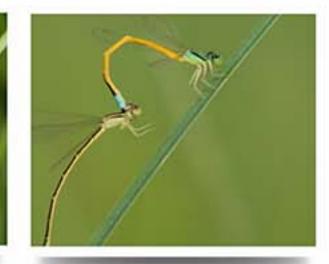


Dragonflies and Damselflies: Biological Control Agents

Dragonflies and Damselflies are colourful insects, and are easy to observe like butterflies. Being primarily aquatic insects they are dependent on water for their entire life. Their first half of life, the larval stage, is spent entirely in water and the latter half, the adult stage, is spent in and around waterbodies. They breed in rivers, marshes, lakes, ponds and even in manmade tanks. They generally feed on flies, mosquitoes, bees and other insects. Both the adult and larval stages are voracious predators which make them important components of the wetland ecosystem. As top predators they maintain trophic levels and regulate the population size of disease transmitting insects (vectors). Dragonflies and Damselflies are beneficial insects of ecosystems and provide a diversity of health services for humankind. The fully functional wetland ecosystem of Yamuna Biodiversity Park harbours as many as 35 species of these insects.







Golden Dartlet Ischnura aurora



Small Pincertail
Onychogomphus grammicus

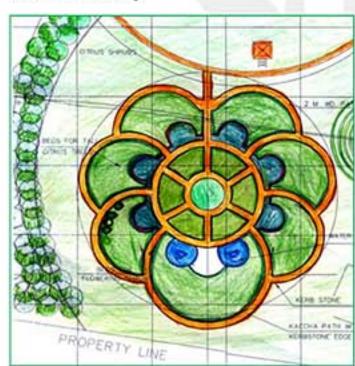


Common Castor Ariadne merione savoring nectar from the bamboo shoots

Butterfly Conservatory of Yamuna Biodiversity Park

Butterflies play important role as pollinators, as part of the web of life and as cultural icons for human beings. They provide food for birds and other animals, but they are also indicators of environmental health and resilience. Butterfly Conservatory of Yamuna Biodiversity Park is a major ecotourism destination, in which host plants and flowering plants create ideal habitat for breeding of butterflies.

Butterfly conservatory, home to 82 species of butterflies, is like a living laboratory where all the life stages of butterflies can be seen. Some of the notable species found in conservatory are Lemon butterfly, Peacock Pansy, Common castor, Common silverline etc. Other insects like moth, flies, aphids, spiders, bees and wasp are also common in the conservatory.



Conceptual Plan of Butterfly Park



Common Crow Euploea core



Danaid Eggfly Hypolimnas misippus, nature's great pretender as female mimic plain tiger, a toxic butterfly

Caterpillar of Lime

Butterfly Papilio demoleus on lemon plant



Common Jay Graphium doson, whose caterpillar resembles bird excreta to defend against threats



Egg of Common Crow butterfly



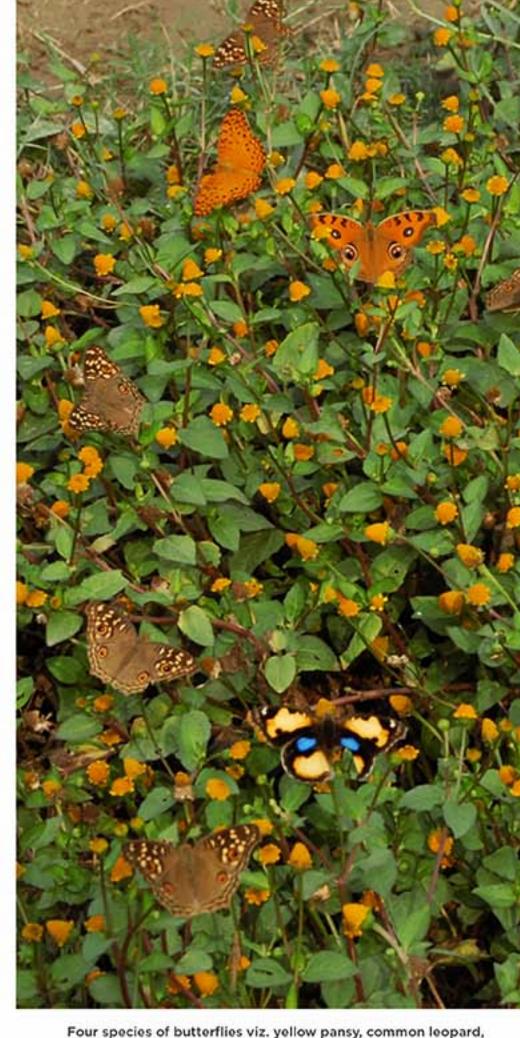
Caterpillar of Common Rose Pachliopta aristolochiae



Pupa of Common Crow Butterfly



Pupa of Common Rose Pachliopta aristolochiae



Four species of butterflies viz. yellow pansy, common leopard peacock pansy and lemon pansy

Tasar Silkworm Antheraea mylitta Tasar silkworm is generally found in Eastern and Central Indian Forests. It is utilized commercially to extract a highly valued silk called Tasar Silk from its Female moth cocoons (a silky case spun by the larvae). It is also found in the wild in Yamuna Biodiversity Park. Caterpillar feed on leaves of Arjun (Terminalia arjuna), Asan (T. tomentosa) and Ber (Zizyphus mauritiana) trees in Yamuna Biodiversity Park. Caterpillar Mating pair Male moth

Herbal Garden of Yamuna **Biodiversity Park**

Around 200 species of plants, traditionally used to cure multiple ailments are grown in the herbal garden of Yamuna Biodiversity Park. The most noteworthy among these are Akarkara, Ashwagandha, Bajradanti, Brahmi, Dama bel, Tulsi, Adusa, Sarpgandha etc.



Akarkara Spilanthes acmella, a toothache plant





Bajradanti Barleria prionitis, a toothache plant



Gokhru Tribulus terrestris used to treat kidney problems



Ashwagandha Withania somnifera used to reduce stress

Ghav bel Argyreia nervosa, an antioxidant a nti-inflammatory creeper



Park and People

Nature Education is a major mission of YBP to ignite young minds towards environmental conservation. Starting from the ecological literacy for the common person, the target audience is not only school and college groups but also teachers and various trainees coming from various educational courses. The rich flora and fauna of the YBP are ideal instruments for promoting conservation education that will ultimately have positive impacts on environmental quality and conservation ethics. The Park serves as a learning and orientation centre not only for students but also for academicians, policy makers and the general public.

The parks offers a wide range of opportunities to live, learn and adapt the ways and means by which humans live in harmony with the rest of the nature. Yamuna Biodiversity Park has emerged as a major center for enriching people's lives through environmental stewardship, education and awareness, especially for schools and colleges of Delhi and adjoining areas. Visitors of all age groups (from school children to adults) may find the Nature Interpretation Centre and the amphitheatre excellent learning resources.





A group of visitors in fruit conservatory



Celebration of World Wetland Day at Amphitheatre of Yamuna Biodiversity Park

Students watching panels in Nature Interpretation centre

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Morning walkers in Yamuna Biodiversity Park phase II

Yamuna Biodiversity Park functions as a living laboratory for a range of students, researchers and trainees. Students from various streams study the identification of prominent species of plants and animals, seed germination, bioremediation, ecosystem development, interactions between species and the flow of energy between biotic and abiotic components, food webs, life history strategies in the Biodiversity Park.

The major societal function rendered by the Biodiversity Park is to enrich human microbiome of thousands of citizens who use the main trails of Biodiversity Parks for morning and evening walks through different forest communities.



A visit of forest range officers



Students interacting with nature education officer



School students on the nature trail

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Yamuna Biodiversity Park

Jagatpur Village Road, Near Wazirabad Delhi - 110084 E-mail: yamunabiodiversitypark@gmail.com

Discover a Different World of Flora & Fauna

- From East Delhi through Signature Bridge
- From South and Central Delhi through Kashmiri Gate, ISBT
- From North Delhi through Burari. The Biodiversity Park is 15 kms north-east of Connaught Place, and 4 kms north of ISBT.







12 km from New Delhi Railway Station



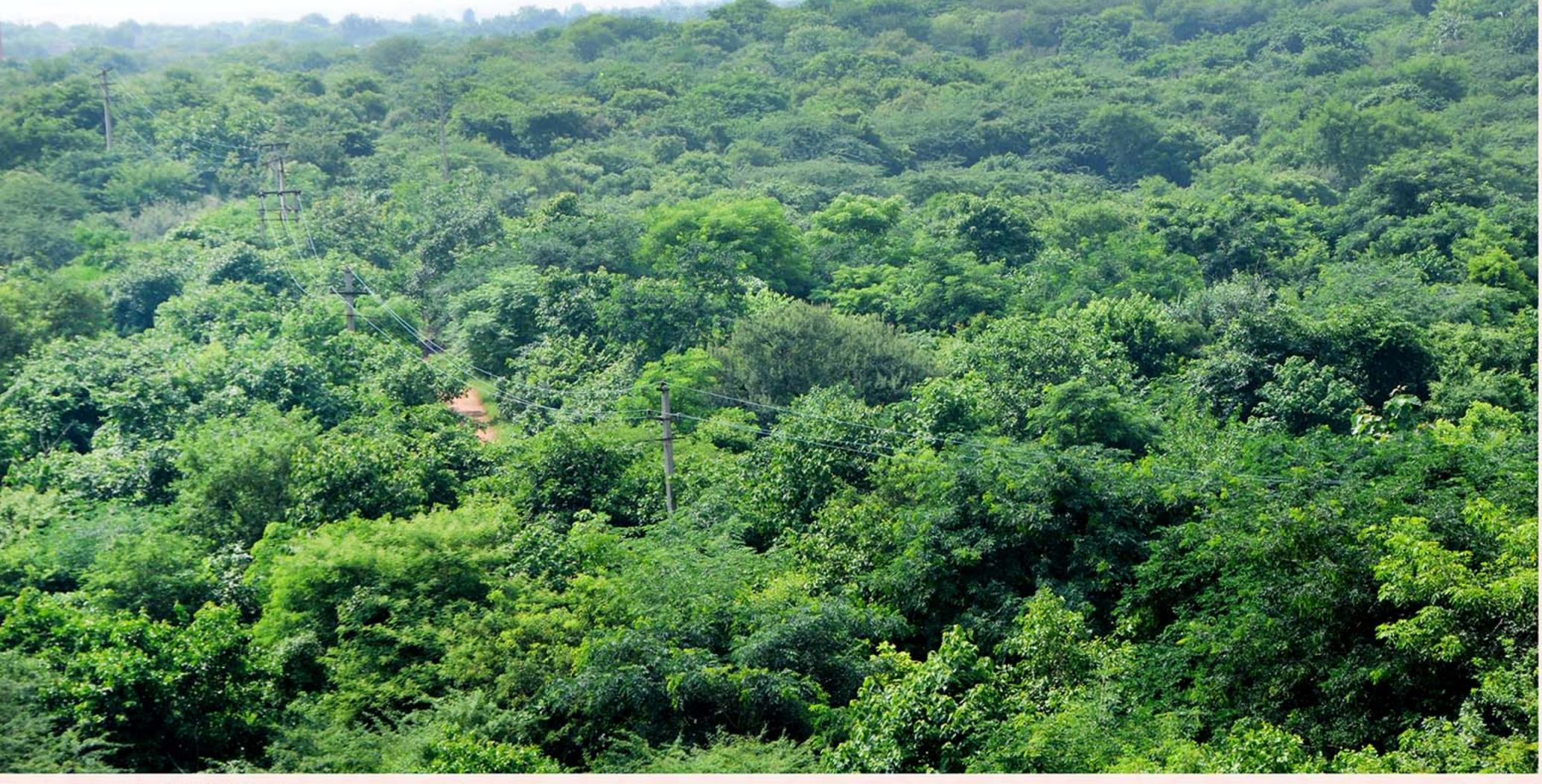
6 km from Vishwavidyalaya, GTB Nagar, Majlis Park



26 km from Indira Gandhi International Airport (IGI)



Scan QR Code to reach your destination





Aravalli Biodiversity Park /

A Barren Hilly Terrain. Transformed Into Green Heaven.



Area 280 Hectares



Plants

981 species



Birds 209 species



Butterfly/moths
113 species

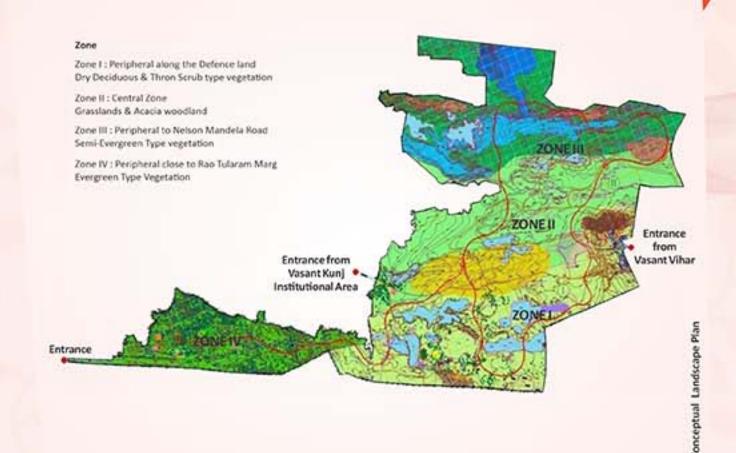


Mammals 19 species

A view of resorted Aravalli forest ecosystems

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Aravalli Biodiversity Park



The Aravalli Biodiversity Park (ABP) spreads over an area of 280 hectares. The topography of ABP is hilly with large number of depressions of varying depths, slopes, undulating terrain, flat hill tops, spoil heaps from mining, scattered murrum mined pits, quarries and caves of varying length.

The prime objective of the Park is to bring back the lost biodiversity of Delhi Aravallis and to make it as Nature Reserve of Delhi. The other objectives of ABP are: (i) promote nature education among students (ii) create environment awareness among the public and (iii) rendering ecological services and goods to the city and its citizens.





A view of visitor area



The Degraded Landscape of ABP before Restoration

The terrain is hilly with large number of depressions (mine pits) of varying sizes, shapes and depths, with gentle to steep slopes, flat hill tops and caves of varying lengths. The area was highly degraded due to past mining and infested with exotic weeds. The mining activity and weed infestation resulted in the extinction of native biodiversity from the area. The degraded landscape of ABP has been ecologically transformed into a wide range of forest ecosystems characteristic of Aravallis, within a span of fifteen years. The aesthetically planned and scientifically developed Aravalli Biodiversity Park has become a Nature Reserve of Delhi.



Habitat Improvement and Restoration

Since 2005, the restoration work has been initiated in a phased manner in Aravalli Biodiversity Park. Surveys were conducted in Aravalli hill ranges and different native plant communities were established according to topography. The area taken into consideration was treated with farmyard manure to enhance soil quality for plantation. Grass seeds of different native grass species such as Cenchrus, Hetropogon, Eremopogon sp., etc., were spread to maintain soil moisture and reduce surface runoff for recharging ground aquifers and maintaining site fertility. The forest canopies were developed by the strategic method called Canopy opening method in which mature Prosopis juliflora trees were pruned and the desired forest saplings species were planted beneath those trees by removing herbaceous and shrubby weeds. Once the desired trees attained maturity they out-compete the Prosopis juliflora. Cut root stock method was used in eradication of Lantana camara. Stabilization of cut slopes along the water bodies and other pits were carried out by grassing and plantation. Mulching was done for soil and water conservation, which included bark chips, straws, grass clips and sometimes stones. This helps in protection from soil erosion, conservation and maintenance of moisture in high temperature. Besides this, hilly slopes plantation techniques along the contours were adopted.



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Forest Communities of Aravalli Biodiversity Park

The Aravalli Biodiversity Park is divided into two zones: the nature reserve zone and visitors' zone. The nature reserve zone comprises forest ecosystem, wetland ecosystem, rangeland ecosystem, etc. The plant communities of Aravallis include communities ranging from grasslands, shrublands, tropical thorn forest to broad-leaved deciduous forests. About 1000 plant species native to Aravallis have been ecologically assembled into 35 communities which have become home for many insects, birds, reptiles and mammals. Some of the communities are: (1) Adina - Mitragyna, (ii) Terminalia tomentosa - Holoptelia, (iii) Anogeissus - Butea, (iv) Acacia - Balanites, (v) Wrightia - Holarrhena, (vi) Sterculia - Boswellia, (vii) Grewia - Carissa, (viii) Rhus - Lycium, (ix) Cenchrus - Heteropogon and others. These ecosystems have already been generating ecological services for the city such as recharging of groundwater, ameliorating local weather and serving as sink for carbon dioxide and other pollutants.



Garuga-Anogeissus forest community

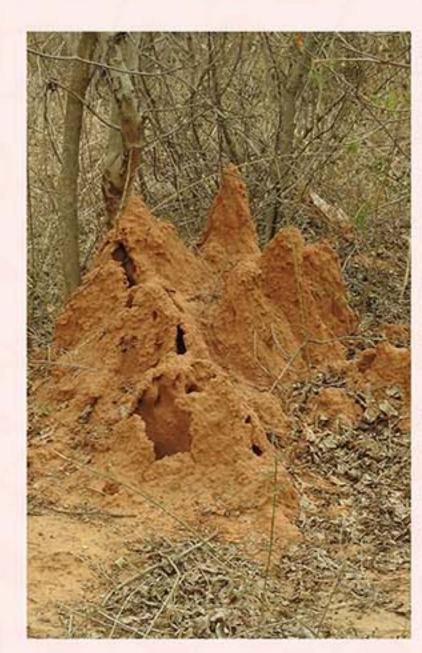


Dry Deciduous Forest Community Developed on a Degraded Barren Landscape of ABP

The different forest communities developed are at different seral stages. After the development of communities, the natural geomorphological processes have shaped the contours of degraded landscape features. The trees have attained a height of 35-40 feet and some of the canopies provide habitats for development of under wood species.

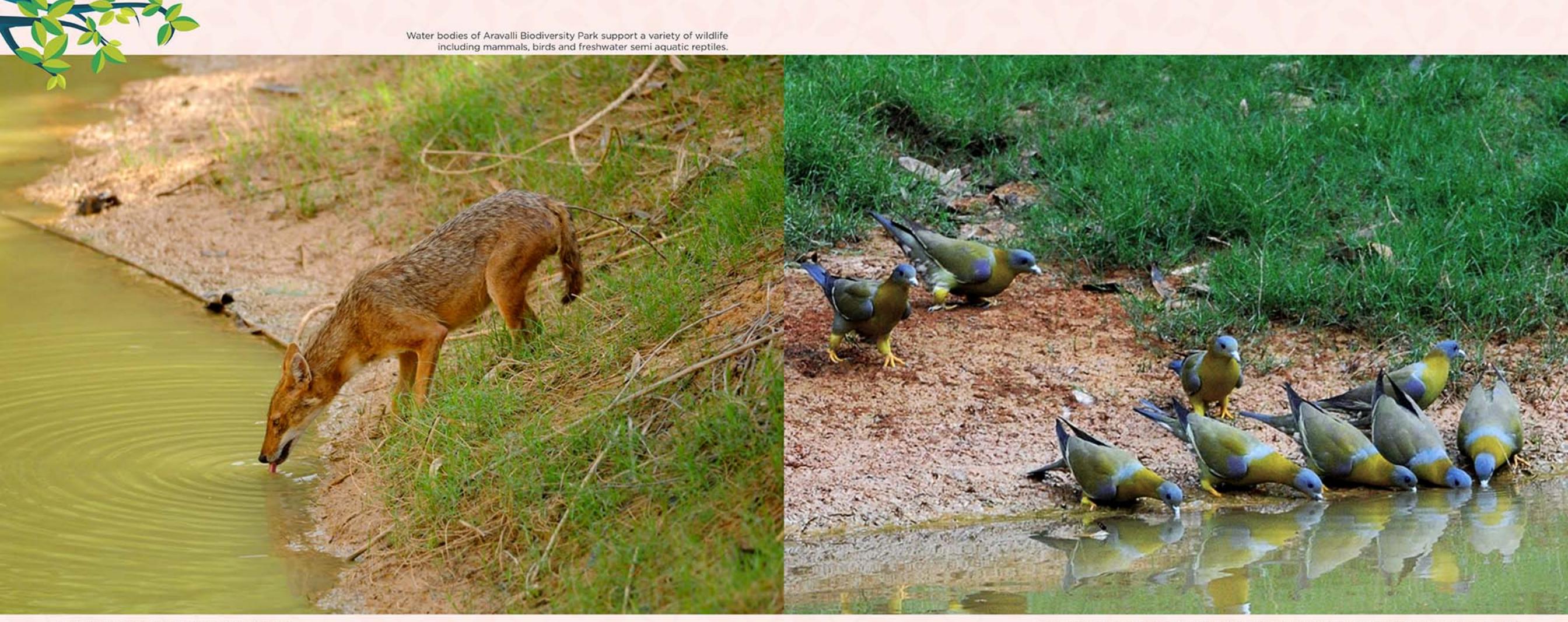


Aravalli Biodiversity Park is now transformed into a resource- rich habitat and is home for diverse animal groups representing different trophic levels and food webs. Termites, which are the main macro - invertebrate decomposers, create biostructures such as mounds, galleries, etc., having soils with different physical and chemical properties. The gradient in the distribution of natural resources such as water and nutrients across termitarium promotes diversity in soil microbes, plants and animals. Reptiles utilize termite mounds for their aestivation (summer sleep) and hibernation (winter sleep).

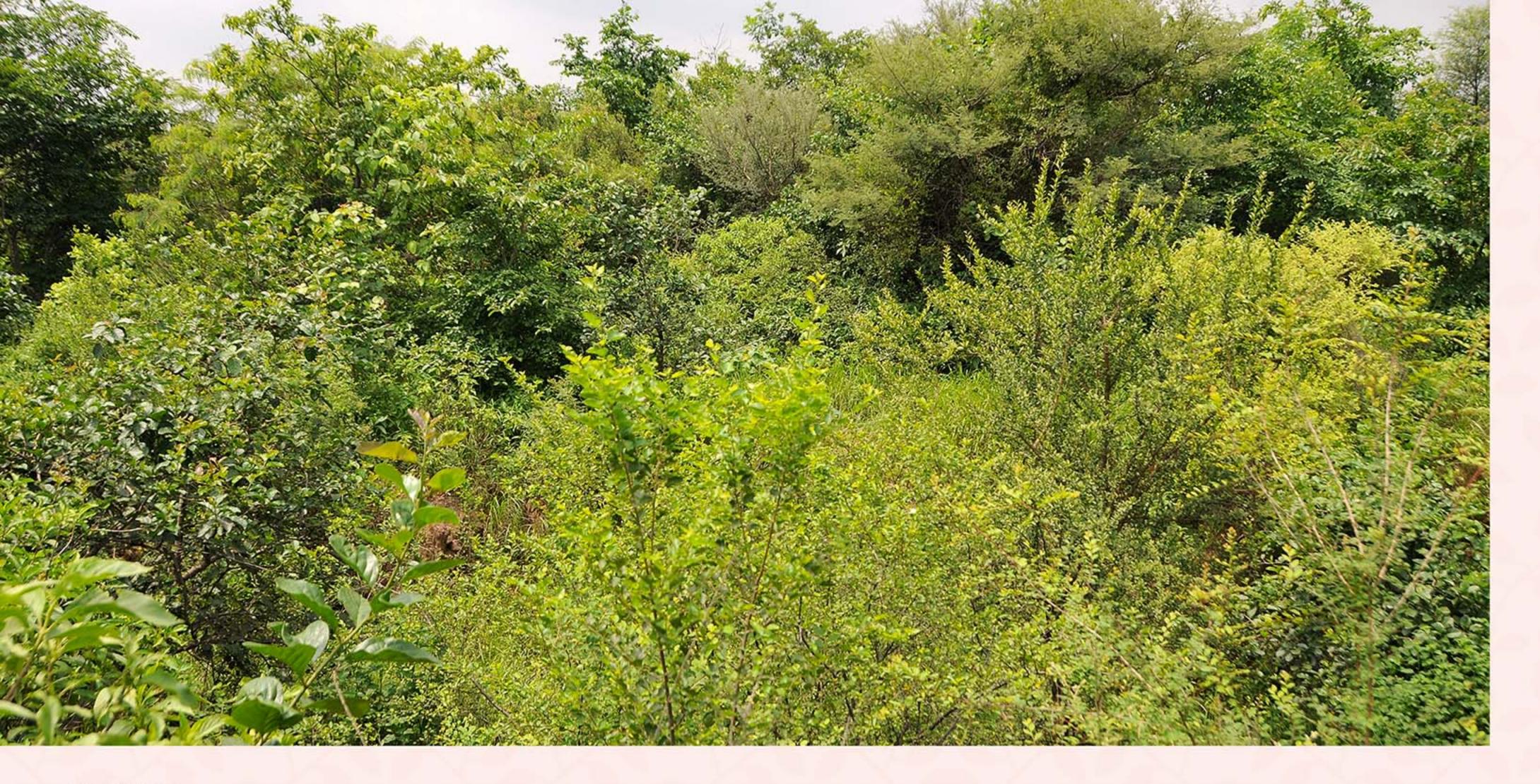


Termite mound (Termitarium) on the forest floor of Aravalli Biodiversity Park





Golden Jackal Canis aureus using wetland in harsh summer



Shrublands of Aravalli Biodiversity Park

Shrubland is a significant ecosystem of Aravalli Biodiversity Park and now an important birding area. It consists of patches of native shrubs bearing edible fruits such as Capparis, Carissa, Zizyphus, Grewia, Clerodendrum, Rhus, Lycium, etc. interspersed with grasslands.

Shrublands harbour a great variety of birds such as Grey Francolin, Peafowls, Indian Silverbills, Bulbuls etc. Shrubs provide nesting opportunities to many birds. Jackals also use bushes as cover.

Shrublands of the rocky areas are preferred microhabitat for Saw Scale Viper and Ribbon Snake.



The female sunbird taking nectar from flowers of Capparis decidua



Red-vented Bulbul feeding on fruits of Ehretia laevis



Rangeland of Aravalli Biodiversity Park

The central part of the park has a shallow depression and it has been developed into a vast rangeland. Spread over 60 hectares, the rangeland is occupied by native grasses, and shrubby vegetation which has become roosting, nesting, resting and foraging sites for a variety of animals. About 25 wild grass species, along with scattered shrubs and tree species are found in the rangeland.

The rangeland is not only home for large number of grassland birds, Indian Hare and reptiles but also generates a variety of ecological services. Perennial and palatable grass species like Cenchrus ciliaris, C. setigerus, Chrysopogon fulvus, Panicum sp., Heteropogon contortus, etc., are common in the rangeland.



Indian Hare Lepus nigricollis foraging Sporobolus grass



Indian Silverbill Euodice malabarica feeding on Cenchrus seeds

Wild Flowers of Aravalli Biodiversity Park



Khairi Dichrostachys cineria



Amaltas Cassia fistula



Rohida Tecomella undulata



Kachnar Bauhinia variegata

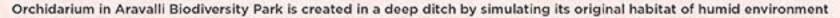
Restored Aravalli Biodiversity Park has high ecological diversity and now supports more than 1,000 plant species. For example, Butea monosperma, Sterculia urens, Prosopis cineraria, Madhuca indica, Ehretia, Crateva adansonii, Boswellia serrata, Tecomella undulata, Holarrhena antidysenterica, Bauhinia malabarica, etc., are common Aravalli plant species. Some of them produce colourful flowers in different seasons and also make the Park attractive to visitors.



Phalsa Grewia asiatica







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Conservatory of Orchids (Orchidarium)

Orchids are considered as a Royal family of plants because of their beautiful flowers, incredible shapes, magnificent colours, fragrance and long lasting nature. Orchids are flagship species. Delhi has only one terrestrial orchid species *Zeuxine sulcata* and it is nearly extinct. Orchids are both terrestrial (growing on the ground) and epiphytic (growing on other trees). Some of the Orchids are self-pollinating, while others have a landing pad in the flower called labellum for pollinating insects.

An abandoned mined out pit was developed as an Orchidarium and the temperature and relative humidity suitable for orchid growth was maintained by growing shade trees and climbers and also using sprinkler systems. A variety of orchids are grown in the conservatory and have bloomed. This is the only place in Delhi where one can see orchids in a simulating natural habitat. Some of the orchids grown in the conservatory are *Thunia alba*, *Vanda cristata*, *Aerides multiflora*, *Acampe praemorsa*, and *Coelogyne cristata*. The Orchidarium is a tool for promoting conservation education among students.



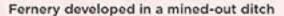


Vanda cristata

Dendrobium multiflorum

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Conservatory of Ferns (Fernery)

Ferns are plants which do not produce flowers. These plants generally reproduce through tiny spores found on the leaves. The ferns are an ancient group of vascular plants and are as old as the Carboniferous Period (beginning around 358.9 million years ago) and maybe even older. Ferns are extremely diverse in habit and reproductive structures. Ferns include resurrection plants like *Selaginella* and also some important medicinal plants like *Lycopodium*, which is used in AYUSH System of Indian Medicine. The height of ferns varies from 1–1.2 cm (*Salvinia*) to 10–25 metres (true ferns).

A cluster of three morrum mined pits was developed into a Fernery for the conservation of ferns such as *Pteris pellucida, Polystichum sp., Actiniopteris radiata, Marsilea minuta, Pteridium esculentum,* etc. The Fernery is used for imparting Nature Conservation Education to students and the general public.





Polysticum discretum

Acinopteris radiata

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Birds of Aravalli Biodiversity Park

The Aravalli Biodiversity Park became home for a variety of birds because of diverse forest communities which hold different microclimatic conditions and a rich food base. The habitat heterogeneity has provided diversity of foraging and breeding guilds. More than 200 bird species have been sighted in ABP. The most prominent ones are: Babblers, Barbets, Bee-eaters, Cuckoos, Bulbuls, Peafowl, Drongos, Flycatchers, Parakeets, Munias, Partridges, Quails, Owls, Woodpeckers etc. Not only generalist birds but specialist birds which were once found on Delhi ridge have also started coming back to Aravalli Biodiversity park.

During winter months many migratory species such as Verditer Flycatcher, Red-throated Flycatcher, Himalayan Warblers, Peregrine Falcon are sighted here. Black Eagle, Indian Pitta and Oriental Pied Hornbill (rare for Delhi) are also sighted. These birds were seen in Delhi about 70-100 years ago.



Indian Pitta Pitta brachyura



White-bellied Drongo Dicrurus caerulescens



Sarkeer Malkoha Phaenicophaeus virdirostris, non-parasitic cuckoo is a rare bird sighted in Aravalli Biodiversity Park



Oriental Pied Hornbill Anthracoceros albirostris, a bird with strong neck muscles to support large beak, is reported after several years of disappearance



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Black-breasted Weaver in grassland



Rose-ringed Parakeet feeding on Butea flowers

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Shikra Accipiter trivirgatus

Birds of Prey include species of birds that hunt and feed mainly on vertebrates. The presence of these birds serves as a barometer of ecological health. Birds of prey are extremely sensitive to many environmental changes in the ecosystem. They are predators at the top of the food chain and thus help in balancing the prey population sizes. There are many species of birds of prey reported from Aravalli Biodiversity Park.



Laggar Falcon Falco jugger



Eurasian Eagle Owl Bubo bubo bengalensis



Black-shouldered Kite Elanus caeruleus



Indian Golden Oriole Oriolus kundoo: Shy in nature, these songbirds inhabit thick canopy of jungles

Wire-tailed Swallow Hirundo smithii

White-throated Kingfisher Halcyon smyrnensis

White-eared Bulbul Pycnonotus leucotis



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Mammals of Aravalli Biodiversity Park

As pollinators, prey and predators, mammals play a significant role in maintaining ecosystems. The diverse ecological niches found in different forest communities of ABP enriched mammalian diversity. The most common mammalian species found in the forest communities of ABP are jackal, blue bull, mongoose, porcupine, Indian hare, small Indian civet and bats. The population size of these mammals is fairly large.

Indian Flying Fox and Greater short-nosed fruit bats feed on wild fruits and flowers of the park. The bats play an important role in seed dispersal and pollination. Aravalli Biodiversity Park has become a safe home for these mammals.



Greater short-nosed Fruit bat Cynopterus sphinx, a voracious fruit eater is common



Jackal Canis aureus



Indian crested Porcupine Hystrix Indica, if threatened, drives its rear spines into its enemy is common in Aravalli Biodiversity Park



Blue bull Buselaphus tragocamelus



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Black-headed Royal Rat snake Spalerosophis atriceps, a harmless creature to human beings, feed on rodents, lizards, birds and small mammals.

Snakes, Lizards and Frogs of Aravalli Biodiversity Park

Amphibians and Reptiles (herpetofauna) are ectotherms (animals that depend upon external sources for body heat) vertebrates found mostly in tropical parts of the world. These animals are cold blooded, and they are widely used as indicator species for climate change.

The dry deciduous and thorn forests of Aravalli Biodiversity Park harbour five species of Amphibians that depend largely on seasonal waterbodies. Aravalli Biodversity Park also hosts 25 species of reptiles such as turtles, lizards and snakes.

Being both predators and prey, herpetofauna are uniquely placed in the food webs of the ecosystem. Some of the reptiles in the Park are Striped Grass Skink, Banded Kukri Snake, Indian Cobra, Indian Rat Snake, Fan Throated Lizard, Saw Scaled Viper and Ribbon Snake. Leopard Gecko has been reported for the first time in Delhi in the Aravalli Biodiversity Park.



Ephemeral waterbody full of Skittering frog Euphlyctis cyanophylitis

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Paper Wasp Ropalidia sp. Painted Grasshopper Poekilocerus pictus

A Beehive at Aravalli Biodiversity Park Blister Beetle Mylabris pustulata

Insects of Aravalli Biodiversity Park

Insects are the most diverse and successful group of animals. They have three pairs of jointed legs and contribute significantly to vital ecological functions such as pollination, decomposition, pest control and providing food security to maintain wildlife species. Aravalli Biodiversity Park is home to a wide range of insects and other arthropod species found in soil, on vegetation and in waterbodies during different seasons. Many insects such as Bugs, Cicadas, Ants, Bees, Crickets, Grasshoppers, Termites, Beetles, Dragonflies, etc., are commonly seen in the Park.

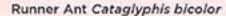


Cicada Platypleura sp. show their presence by buzzing and whirring noises, before the onset of monsoon



Honey Bee Apis florea an important pollinator







Jewel Bug Chrysocoris stolli





Cave Ecosystem

The excessive rat hole mining in Aravalli Biodiversity Park in the past led to the formation of caves and cave ecosystems have developed over a period of time. Many bats are found in these caves

Other than bats, many animals such as porcupine, Black-headed rat snake, millipedes, and many other invertebrates and vertebrates use the cave ecosystem. Blyth's Horseshoe bat and Dusky Leaf Nosed Bat are some of the species that are found in cave ecosystems. These bats feed on insects and can eat hundreds of insects in a day. They are very important for cave ecosystem as many animals depend on their guano (Bat faeces) to survive. Caves of Aravalli Biodiversity Park are the only known roosting place for Blyth's Horseshoe bat in the Delhi NCR region.







Bougainvillarium

Bougainvilleas are ornamental bushes, vines and straggling shrubs belonging to different species of Bouganvillea. The beautiful flowers of Bougainvillea species symbolize passion, liveliness and life experience. The plant brings a myriad of colours and life in its leaves and flowers in warm climates. The species exhibits versatility, which allows it to blossom throughout the year. Bougainvillarium located in the Visitor zone of Aravalli

Biodiversity Park consists of more than 40 cultivars (varieties). Some notable varieties are Rosa Delight, Touch Glory, Zakarina, Summer Time, Mary Palmer special, Parthasarthy, Poutorni etc. Bougainvillarium also attracts butterflies and bees and is a very ideal nesting habitat for small to medium sized birds.



Rosarium

The flowers of cultivars of Rosa sp. are known for their serene beauty, elegance and scent. A Rosarium is established in the Visi tors zone of Aravalli Biodiversity Park. More than 30 varieties of roses are grown. Some of the rose cultivars are Blue Moon, Double delight, Grand Mughal, Black Prince, Iceberg, Superstar, Echo, Virgo, etc.





Stapella scitula
Striped Tiger Danaus genutia

Conservatory of Bulbous and Succulent Plants

Succulent and bulbous plants are common in arid and semiarid climates due to their ability to adapt themselves in dry conditions. Most of these plants retain water in their leaves, stems and roots and many protect themselves with sharp spines or thorns; and some have waxy or woolly protective coverings to reflect sunlight and decrease water loss. Bulbous plants develop storage organs as a reserve to allow them to survive in hostile conditions

Aravalli Biodiversity Park conserves around 50 species of succulent and bulbous plants native to Aravalli hill ranges. The notable species are Euphorbia lactea, Agave lophantha, Agave leopoldii, etc.



Succulent Plants

Conservatory of Butterflies

Butterflies have a special place in the insect world. They have magnificent colours and fly cheerfully from flower to flower. They are not capable of biting, because their mouthparts are evolved to suck nectar. Butterflies along with moths are classified under order Lepidoptera of insects. Butterflies perform important ecological functions of pollination.

Two butterfly conservatories are established in Aravalli Biodiversity Park by planting more than 200 species of host plants.

The Butterfly conservatories of ABP harbour more than 100 species of butterflies and moths. The notable species are Red Pierrot, Grass Jewel, Common Rose, Spot Swordtail, Silverlines, Tiger moths, Skippers, Swifts, etc. Spot Swordtail *Graphium nomius* and Striped Blue Crow *Euploea mulciber* are two new species for Delhi reported from butterfly conservatory. By having maximum diversity of butterflies and moths, ABP is now labelled as First Butterfly Sanctuary in Delhi.



mmon Rose Pachliopta aristolochiae



Red Pierrot Talicada nyseus



Large Salmon Arab Colotis fausta



Tawny Coster Acraea terpsicore

Hadjod Cissus quadrangularis

Conservatory of **Medicinal Plants**

The Medicinal Plant Conservatory at Aravalli Biodiversity Park has more than 240 plant species of medicinal importance and promotes conservation education and awareness on the importance of plants in the health care system. Some notable species are Asthama bel, Brahmi, Gugal, Dardpaat, Nirgundi, Hadjod, bhang, salai, Jhinti, etc.

Loss of habitat coupled with over harvesting from the wild are threatening many herbal plants of Aravallis, and some of the native species of medicinal value are locally extinct.



Nili Nargandi Justicia gendarussa



Jhinti Barleria cristata

Threatened Tree Species Conservatory

Aravalli ranges are highly degraded and most of the indigenous tree species have locally vanished while some others are threatened with extinction. For the first time, species-specific arboreta were developed in Aravalli Biodiversity Park. Some of the species conserved are Sterculia urens, Anogeissus pendula, Anogeissus sericea, Prosopis cinereria, Boswellia serrata, Pterocarpus marsupium, Buchanania lanzan, etc.



Bija sal Pterocarpus marsupium



Indrokh Anogeissus sericea

Kulu Sterculia urens



Nature Education

Aravalli Biodiversity Park, with its unique and beautiful undulating landscape harbours Aravalli's natural heritage, is a paradise for nature lovers.

Nature Education at Aravalli Biodiversity Park involves activities to inculcate love for Nature and its Conservation among people, especially the younger generation. The park encourages all nature lovers and those interested in observing and learning from nature. It has become a hub for promoting environmental education among students.



Park and People

Situated in the middle of the concrete jungle of Vasant Vihar and Vasant Kunj, Aravalli Biodiversity Park has become a favourite place for regular walks of the local residents. Long Nature Trails provide opportunities to people to get access to clean air, fresh ambience, solitude and nature. It attracts people from all strata.

Aravalli Biodiversity Park has become an epitome for environmental values, nature conservation and recreation.



Nature Camp

The Aravalli Biodiversity Park is the only place in Delhi which provides unique camping facilities to school children for imparting environmental education in natural ambience. A number of schools and colleges of NCT of Delhi have been availing this facility since the inception of this park. These opportunities bring students close to nature which inculcate a relationship and respect for nature.



Aravalli Biodiversity Park

Near Air India and RBI Colony, Poorvi Marg, Vasant Vihar New Delhi - 110057 E-mail: aravalli_biodiversitypark@yahoo.co.in

Discover a Different World

of Flora & Fauna

One can approach to the Aravalli Biodiversity Park, at present, either from Vasant Vihar- Poorvi Marg gate located at about 4 km south west of Moti Bagh, and 2 km west of Jawahar Lal Nehru University (Munirka) or from the Vasant Kunj Institutional gate which is about 3.5 km north of Mahipalpur and one km west of Vasant Kunj Malls. The nearest Metro Station is Vasant Vihar.







27 km from New Delhi Railway Station



2 km from Vasant Vihar, Munirka Metro Station



12 km from Indira Gandhi International Airport (IGI)



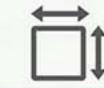
Scan QR Code to reach your destination





Tilpath Valley Biodiversity Park /-

A Land of Mythological Relevance Retrieves its Ecological Bounty



Area 70 Hectares



Plants

484 species



Birds 125 species

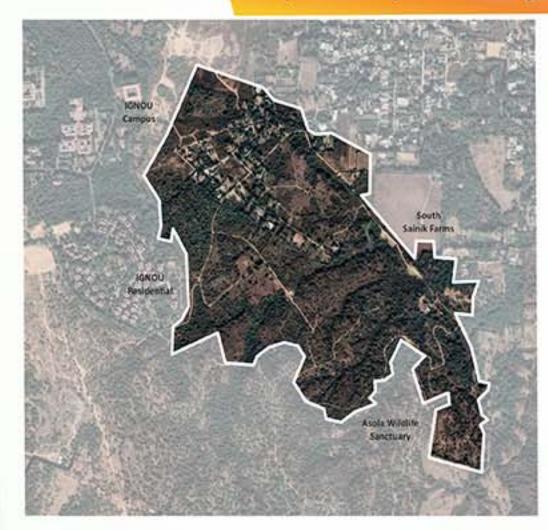


Butterfly/moths 55 species



Mammals 7 species

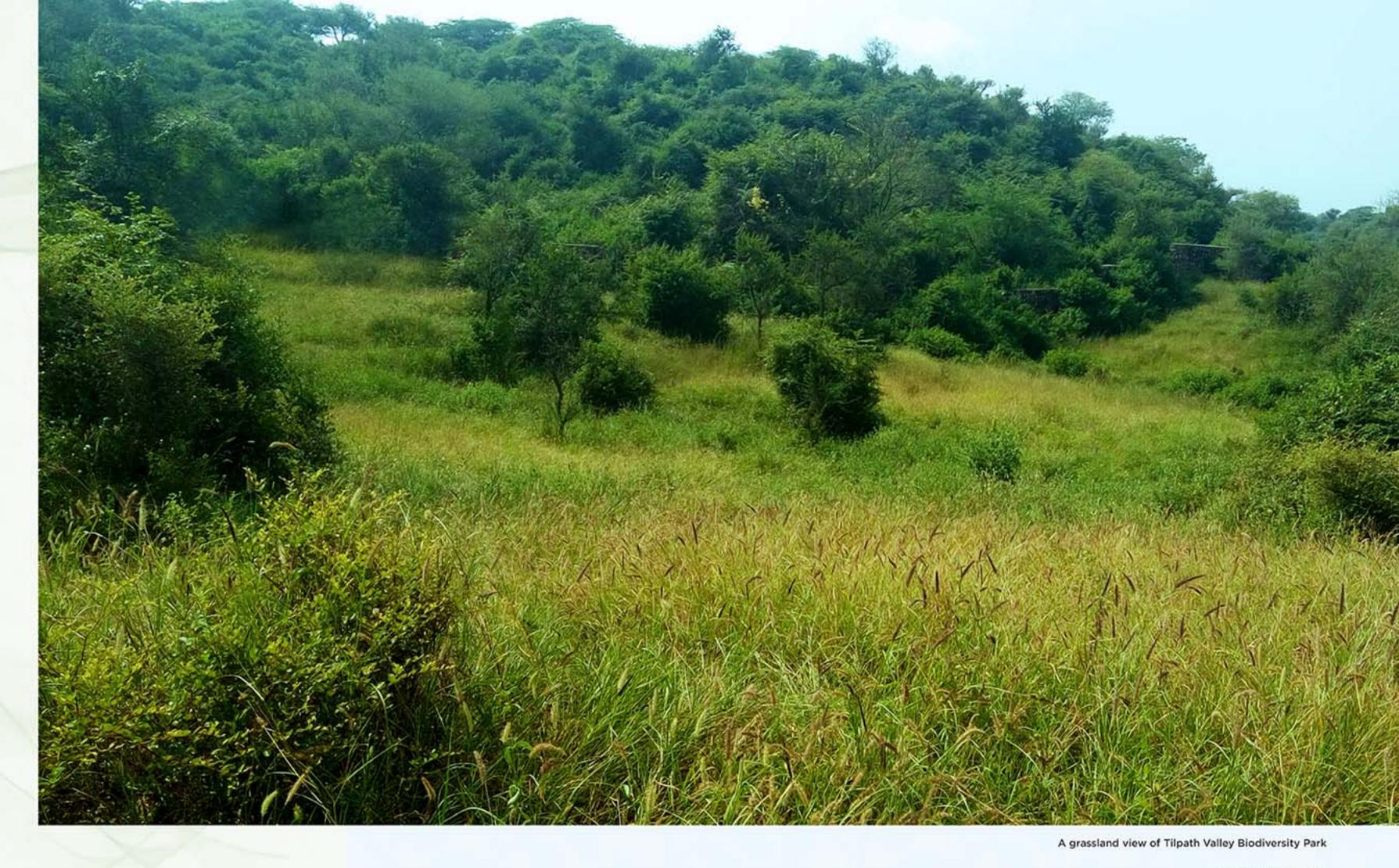
Tilpath Valley Biodiversity Park



Tilpath Valley Biodiversity Park, the most scenic natural landscape in the megacity of Delhi, spreads over 70 hectares with elevation ranging from 230 m to 253 m. It is located on the Southern Ridge - the last spur of Aravalli hills that enters into Delhi and is contiguous with Aravalli ranges of Haryana. These valleys receive drainage/catchment from all the surrounding hill ranges and extensive Chattarpur plateau and recharge into aquifer system.

Mythologically, Tilpath village gains a mention in local legends; it was one of the five villages demanded by Pandavas from Duryodhana. When Pandavas were defeated in the game of Chausar, they were forced to leave the Kingdom for 13 years. After a long time, the Pandavas sent a message to the Kauravas that they won't lay claim to the throne if they were given just five villages. Tilprastha (Tilpath), being a resource rich landscape, was one among the five villages spreading from Haryana to Delhi.







The Landscape Before Restoration Before the development of Biodiversity Park, the area had deep and shallow valleys, flat lands, gentle and steep slopes, hilltops and ridges which were highly degraded and harboured scattered trees of mesquite *Prosopis juliflora*. The site was also invaded by other invasive species like *Lantana* and *Parthenium*. Some of the hilltops and ridges supported relicts of native species such as *Tecomella undulata*, *Lycium europaeum*, *Flacourtia indica* and *Asparagus sp.* represented by a few individuals. There used to be springs in the area, but all of them dried up due to the destruction of recharging zones as a result of clearing of vegetation along with human habitation on some of the hilltops.

The Landscape After Restoration On the basis of topographical features of terrain, different forests, grassland and scrubland communities were developed. Low lying and plain areas were developed into grasslands and broadleaved tree species communities, respectively. Elevated undulating terrain was occupied by Scrub or Acacia communities. The gentle slopes and upper reaches of valleys were developed into tropical dry deciduous forest ecosystems. Steep slopes were developed into open thorny forest. Low lying moist area was developed into Bamboo brakes while the ridge and hill plateaus were covered with native shrublands.



Slope before Restoration After four years of plantation, degraded and barren landscapes and *Prosopis juliflora* (Vilayathi Kikar) dominated area have transformed into lush green natural forest communities with well developed forest canopies. Many of the trees have started

producing flowers and fruits, and some planted tree species have begun natural regeneration which indicates the success of the restoration programme.

Slope after Restoration

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Baya weaver (Ploceus philippinus)

Birds of Tilpath Valley Biodiversity Park

Birds are beautiful creature that are a joy to watch. Chirping around, communicating in their blissful vocals, the rhythm of their calls in Tilpath Valley Biodiversity Park, are nothing less than melodious music to animals and human alike, exuding perfect natural symphony. Birds of prey, which are known for their wild intense nature, such as Shikra, White-eyed buzzard and Black-winged kite are also present. A total of 125 species of birds are reported during different seasons. Rare bird sightings like Asian Paradise Flycatcher, Sirkeer malkoha, Plum-headed Parakeet, Blue-tailed Bee-eater, Eurasian Wryneck, White-capped Bunting, Yellow-wattled Lapwing, Common Wood Shrike indicate presence of diverse ecological niches for birds to live and to breed in the Park. Even nests of rare birds like Yellow-wattled Lapwing and Plum-headed Parakeet are spotted.



Baya weaver, nature's amazing architects where male construct nests. If the nest is not up to their standard and the female rejects, the male has to construct a new.



Grasslands of Tilpath Valley Biodiversity Park

Savannahs and grasslands have been developed on the undulating hilly terrain as well as on the plain area. Savannahs are vital ecosystems that not only generate a variety of ecological services for the society but also enhance the trophic level of the area. The major species found in the area are Cenchrus sp., Heteropogon, Chrysopogon, Aristida, Desmostachya, Apluda, Cymbopogon, Panicum and several annual grass species such as

Brachiaria, Eleusine, Chloris etc. Grasslands of hilltops are ready to revive springs and generating water for the area. This ecosystem also forms the food base for herbivores and support animals of higher trophic levels such as carnivores. Abundant grasslands birds such as Pied Bushchat, Crested Lark, Paddy field Pipit, Red headed Bunting are sighted. Animals like Indian Hare and Jackal are also present.



Mammals of Tilpath Valley **Biodiversity Park** Mammals such as Golden Jackal, Blue bull, Indian Civet, Indian Hare, Porcupine, and Common Palm Civet and Rudy mongoose are common. Howling of the jackals can be easily heard during the late evening time. A territorial fight of Nilgai Nilgai Boselaphus tragocamelus is the largest antelope in Asia and is Golden Jackal Canis aureus endemic to the Indian subcontinent. Their sexual dimorphism is prominentwhile females and juveniles are orange to tawny, adult males are larger with victims of superstition, and are hunted for their body parts which are Golden Jackals are one of the most prevalent inhabitants of Tilpath a bluish-grey coat with distinguished horn. Tilpath Valley Biodiversity Park is Valley. They resemble the grey wolf but are distinguished by its smaller used in black magic. However, they play an important role by a suitable habitat for them as they prefer areas with open grasslands and scavenging animal carrion and recycling the organic material in the size. Golden Jackals have a social structure, sometime in packs with scrub forests. the basic social unit of a breeding pair. They can be spotted relaxing on ecosystem thereby improving the whole ecosystem health. Tilpath

Valley with its protective boundary keeps them safe from such threats:

mud trails. Their howls can be heard in late evenings and during night.

They have been part of Indian folklore and in recent times they are

Mother Nilgai feeding her baby calf



Reptiles of Tilpath Valley Biodiversity Park

Tilpath valley is rich in Reptilian diversity like Monitor lizard, Leopard gecko, Oriental Garden Lizard, Yellow bellied house gecko. The Park is rich in different species of venomous and non-venomous snakes such as Indian Rock Python, Pakistani Ribbon Snake, Sand Boa, Rat Snake, Barred Wolf Snake, Common Kukri Snake, Indian Cobra, Common Krait and Saw-scaled Viper.



Monitor Lizard Varanus bengalensis



Leopard Gecko Eublepharis macularius a nocturnal ground dweller lizard is a rare records



Pakistani Ribbon Snake Psammophis leithii





Stroll in the jungle is today's new medical marvel

Park and People

A walk through Tilpath valley takes you to a journey of native forest communities that used to inhabit the region long back in Delhi NCR. The trail is a path that is not constructed but is an earthen path; this gives a sense of hiking through a natural forest. Trails start with the magnificent broad leaved mixed deciduous forests made of species which were the native inhabitants of this region originally. Further the trail takes you to the Rangeland which resemble typical African Savanahs. At the end of the trail the Thorny scrubland gives a sense of patience and strength, which is evident from the adaptation of the vegetation. They have an ability to withstand extreme weather conditions and still thrive.

Mass plantations are organized frequently to connect people to biodiversity and create awareness on the need to protect and conserve their natural environment. School and college students regularly visit the Biodiversity Park for nature education and also get direct insights on the functioning of ecosystems. Local residents visit regularly for health walks along the main trail.

Tilpath Valley Biodiversity Park

W22 Lane, Western Avenue, Sainik Farms
Delhi - 110062
E-mail: tilpathvalley@gmail.com

Discover a Different World of Flora & Fauna

Located around 4 km from Mehruali-Badarpur road, the approach to the Tilpath Valley is through Sainik Farm from Gate No. 1 (Central Avenue Marg) which joins Mehrauli - Badarpur Road near Khanpur. The other approach is from IGNOU Road through Gate no.3 of Sainik Farms, which is close to Saket Metro Station Gate no. 2. One can also reach through Gate no. 2 of Sainik Farm (General Cariappa Marg) through Western Avenue.





17 km from ISBT Sarai Kale Khan



21 km from New Delhi Railway Station



8.6 km from Chhattarpur Metro Station



18 km from Indira Gandhi International Airport (IGI)



Scan QR Code to reach your destination





Neela Hauz Biodiversity Park

A Lake Lost to Time Transformed and Revived



Area 03 Hectares



Plants 135 species



Birds 131 species



Butterfly/moths 40 species

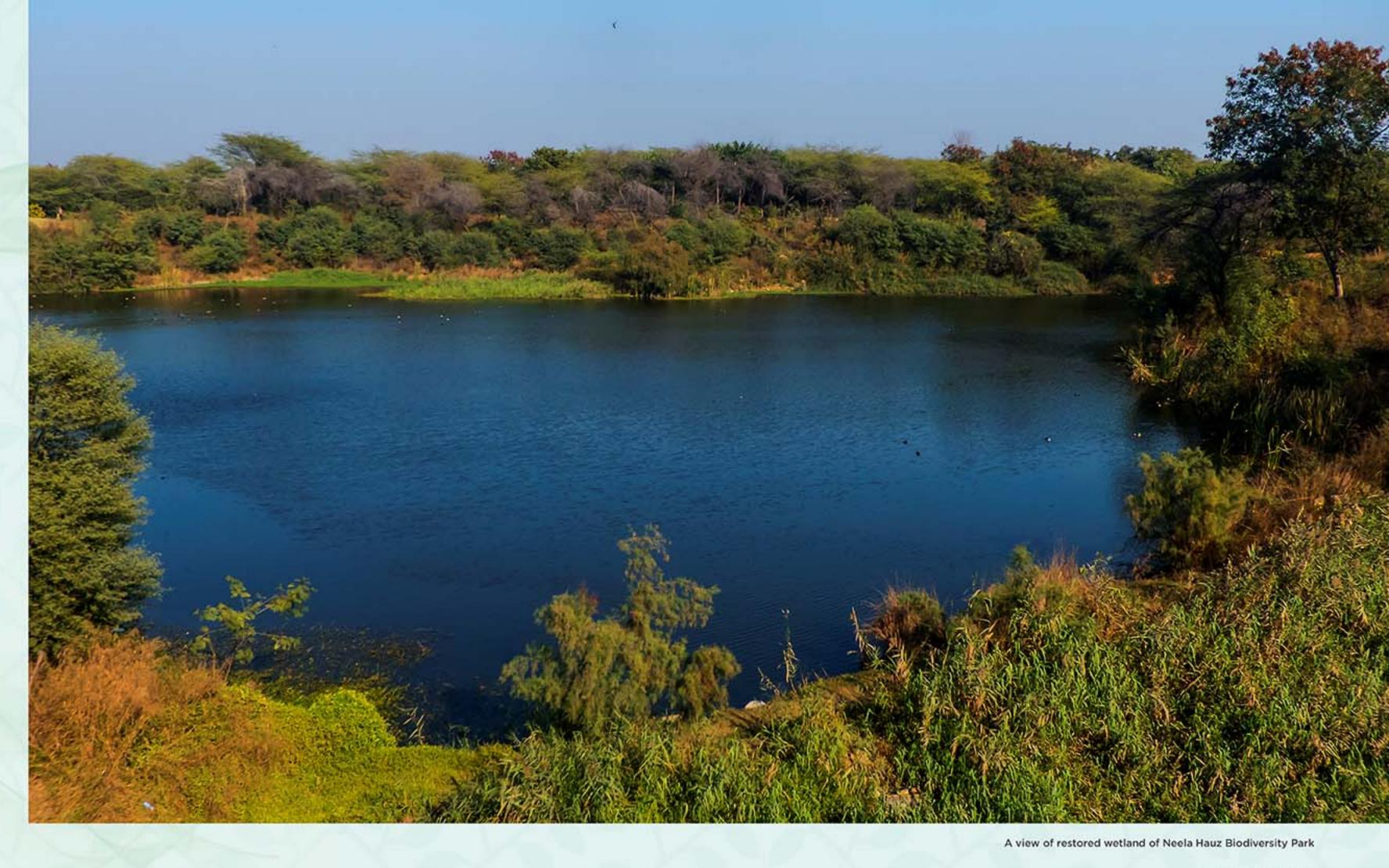


Mammals 4 species



Neela Hauz Biodiversity Park is located on Aruna Asaf Ali Marg, opposite to Jawahar lal Nehru University and adjacent to Sanjay Van. One can approach to Neela Hauz, either from Abdul Gaffar Khan Marg or from IIT Flyover through Ber Sarai.







Neela Hauz was a natural fresh water lake in the shallow valley depression of Southern Ridge and surrounded by low lying Aravalli hills that represent Sanjay Van of today. The lake, occupying an area of more than 10 hectare, was used to receive catchment from all the surrounding hills and supply drinking water to Rajput city of Qila Rai Pithora. It was also a breeding ground for cat fish (singara) in the past.

Due to urbanization and development of roads, the lake size was reduced to 3 hectares and was filled up with solid waste. When Aruna Asaf Ali Road Bridge was constructed across the lake, in 2009, the lake turned dead and further shrunk in its size. What was left out at the lake site was a small highly silted depression which received raw sewage from the neighbouring unauthorized colonies and the marsh was infested with water hyacinth.

The residents of JNU along with Kishangarh residents (Neela Hauz Citizens Group) filed a petition against PWD at Hon'ble High Court of Delhi against the degradation of lake, with a prayer that the lake should be restored back to its pristine glory. The High Court of Delhi ordered PWD to restore the lake. Since the land belongs to DDA, the PWD requested DDA to restore the lake. DDA notified it as Neela Hauz Biodiversity Park not only to restore the lake to its pristine glory but also to bring back the biodiversity of the area, to improve the ecology of the area and also serve as recreational site for the local communities.

The lake was desilted up to 4 meter depth and the excavated material was used for making embankment. The solid waste dumps were removed and the material was used for creation of mounds. The mounds have been developed into recreational areas and a greenway with a walkway was developed along the embankment. About 15000 native trees and shrubs belonging to 35 species were planted. A butterfly corner, a Phoenix grove and scented garden have been developed. A shrubbery of threatened shrubs characteristic of Aravallis has been developed.

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Constructed Wetland System with its components developed to make sewage water into clean water







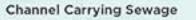
Oxidation Pond II

An in-situ constructed wetland system has been developed to treat Imillion litre per day raw sewage that enters into the lake. This is the only source of water to the lake. The designed constructed wetland system consists of 2 oxidation ponds, 3 physical treatment tanks and one constructed wetland. The system works with zero energy and within less than 20 hours the sewage water having 80 mg/l Biochemical Oxygen Demand (BOD), 200 mg/l Chemical Oxygen Demand (COD),600 mg/l Total Dissolve Solid (TDS) and zero Dissolve Oxygen (DO) is made into water that has the same quality as that of river water (< 4 mg/l BOD, < 1 mg/l COD, 298 mg/l TDS and 8.5 mg/l DO).



Restored Neela Hauz







Filteration Zo

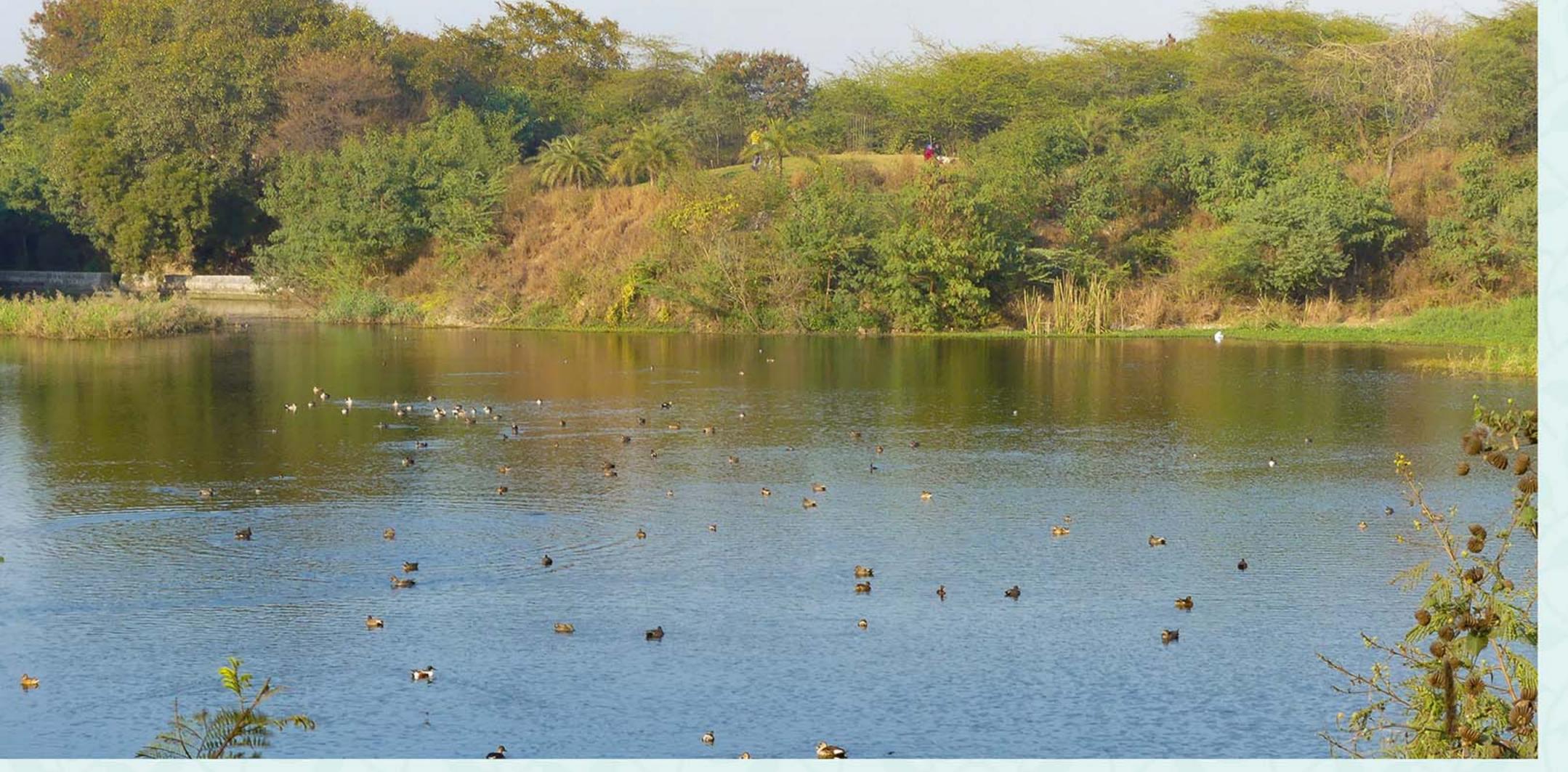
The constructed wetland system designed is not energy driven and can be easily replicated in other water bodies. This clean treated sewage water transformed a dead Neela Hauz lake into a natural lake that harbours large number of resident and migratory birds. As many as 75 bird species have been reported from Neela Hauz Biodiversity Park. The constructed wetland system developed at Neela Hauz Biodiversity Park is today replicated for insitu biological remediation of drains in Delhi as a part of rejuvenation of river Yamuna.







Constructed Wetland

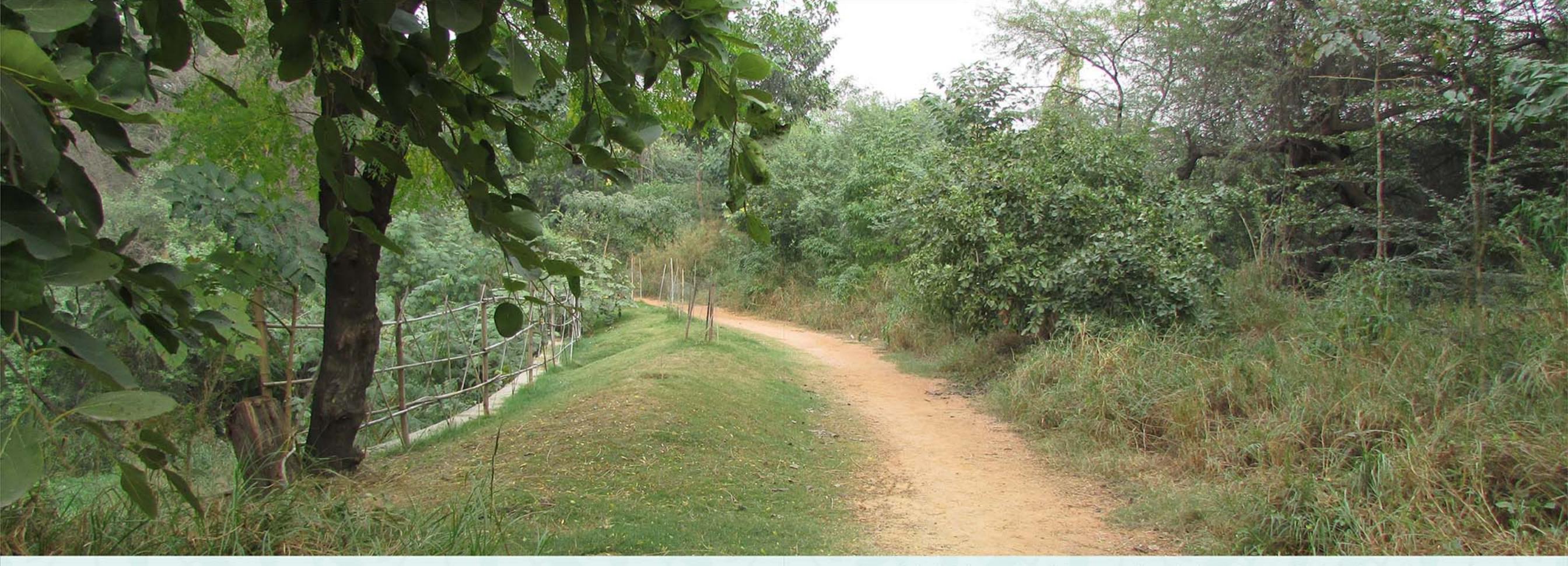


Rejuvenated Lake Ecosystem

The restored lake, the green way with a walkway, the manicure lawns of the mounds, the Phoenix grove, butterfly corner and Constructed Wetland System made Neela Hauz Biodiversity Park as destination for public and tourists for recreation and also for learning how constructed wetlands are useful in treatment of sewage and help in rejuvenation of lakes and rivers.

The rejuvenated lake also attracts many resident and migratory water birds. Many shallow water birds such as Sandpipers, Stilt, Egrets, Herons, Waterhen, Moorhen, Little Grebe, etc., and deep water birds like Spotbill Duck, Gadwall, Northern Shoveler, Ferruginous Pochard, Coot, etc., may be seen. Bar-headed Goose has also become a winter visitor to Neela Hauz Biodiversity Park.

The restored lake



Forest Communities of Aravallis Fringing the Lake and its Embankments

Neela Hauz Biodiversity Park has established six forest communities ranging from grassland, shrubland, riparian forest, to slope community, to dry deciduous forest. About 100 native plant species have been ecologically assembled into these communities which have become a home for many insects, birds, reptiles and mammals. Grasslands harbour wild grasses like Cenchrus ciliaris, Chrysopogon fulvus, Panicum sp., Heteropogon contortus, and Bothriochloa. This grassland attracts many granivorous birds and Indian hare.

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Butterfly Conservatory

Although butterflies can be seen in the whole park, a specific small area has been dedicated to these flying jewels. Many flowering plants and other host plants chosen for their larvae have been planted here. More than 40 species of butterflies can be spotted here during breeding season, i.e., from June to October. This conservatory also attracts other insects such as bees, wasps, and beetles. The prominent species are Tigers, Pansies, Blues, Emigrants, Grass yellows, etc.

Scented Garden

A scented garden has been established near constructed wetlands in the Biodiversity Park. Many shrubs bearing scented flowers have been planted, these include Nyctanthes, Jasmine (Chameli), champa, motia, mogra, bela, Rat ki rani, Rajnigandha, Murraya paniculta, and Lemon grass. Their fragrance attracts a range of moth species during the night and provides a scented and peaceful walk to visitors.



Park and People

Neela Hauz Biodiversity Park has become a model for cleaning sewage water through constructed wetlands with zero energy input. This concept attracts many students, environmentalists, city planners, Government agencies, etc. Bird and butterfly watching is also a main attraction of this park for the nature lovers and students.

Neela Hauz attracts the local residents and people from nearby Institutions for nature walk. With its scenic beauty and peaceful environment, the park is being used by the people living nearby. People from all sections and strata of society visit the park. This place provides a pleasant walk in all seasons throughout the year.



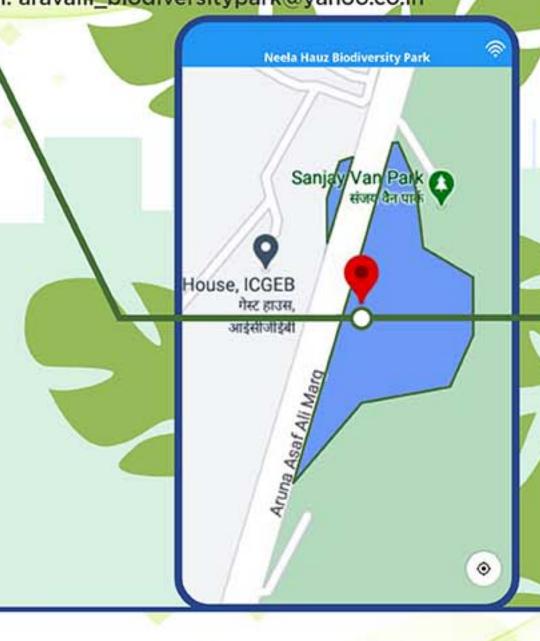
Students understanding concept of the constructed wetland

Neela Hauz Biodiversity Park (Near to Sanjay Van, Opposite NIPGR and UGC-IUAC, close to JNU East Gate) Aruna Asaf Ali Marg, New Delhi - 110067

E-mail: aravalli_biodiversitypark@yahoo.co.in

Discover a Different World of Flora & Fauna

Neela Hauz Biodiversity Park is located on Aruna Asaf Ali Marg, opposite to Jawahar lal Nehru University and adjacent to Sanjay Van. One can approach to Neela Hauz, either from Abdul Gaffar Khan Marg or from IIT Flyover through Ber Sarai.





21 km from ISBT Kashmere Gate



16 km from New Delhi Railway Station



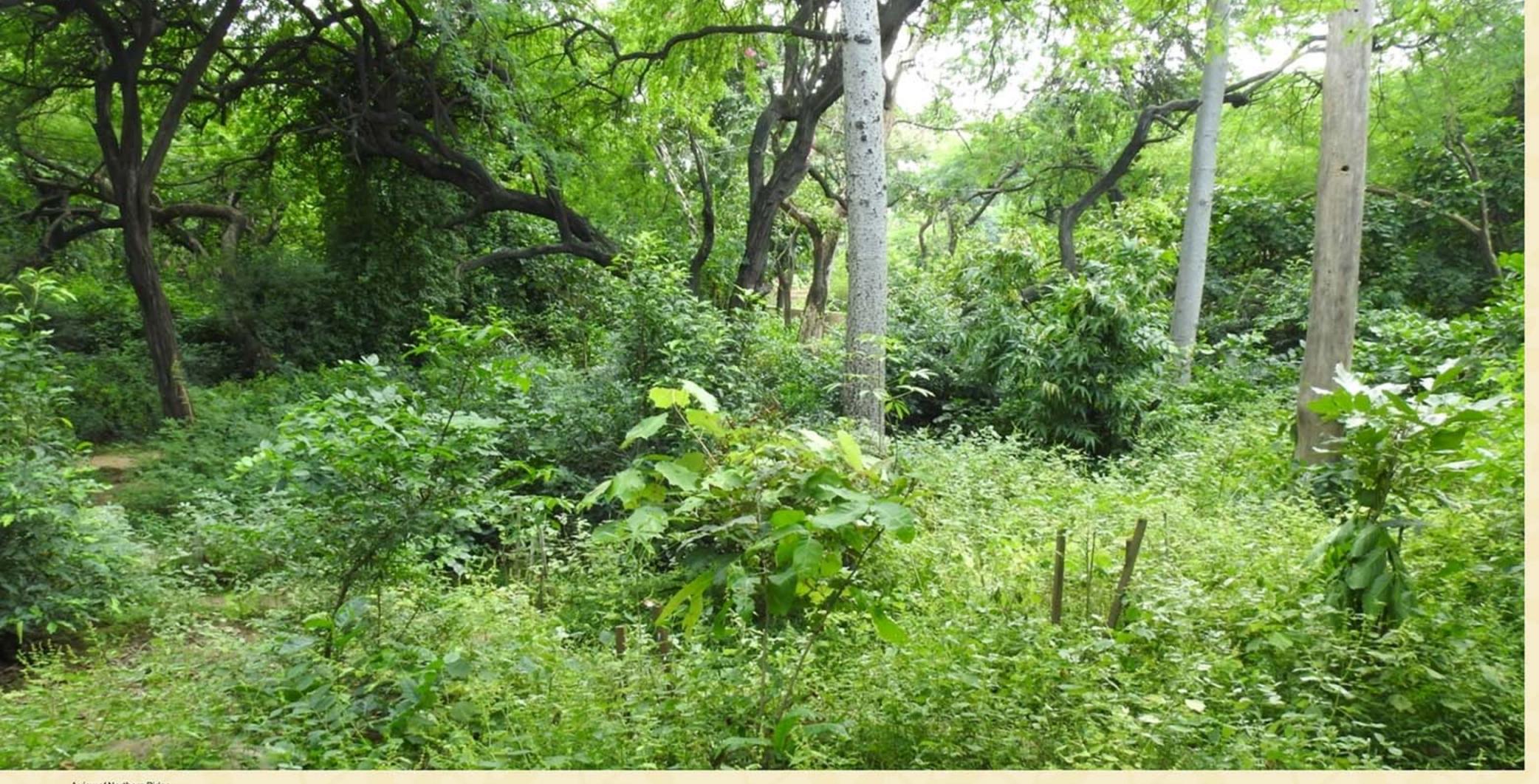
2 km from **Qutub Minar and** Chhattarpur Metro Station



11 km from Indira Gandhi International Airport (IGI)



Scan QR Code to reach your destination





Northern Ridge

The Hotspot of Independence War



Area 87 Hectares



Plants 435 species



Birds 71 species



Butterfly/moths
46 species



Mammals 7 species

A view of Northern Ridge

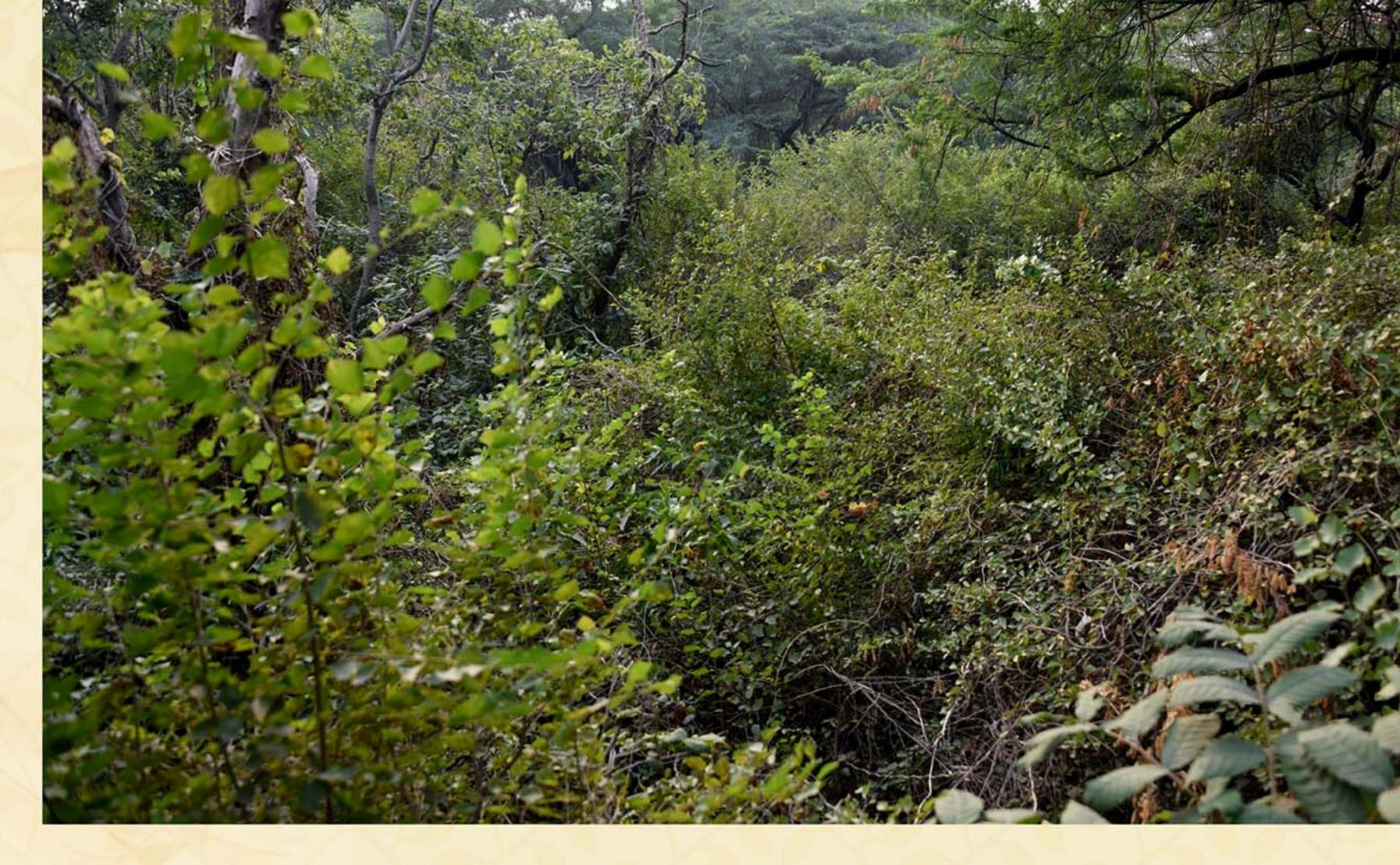
Delhi's 'Ridge' is the last spur of Aravalli hill ranges that stretches 800 kilometers from Gujarat through Rajasthan and Haryana, pushing into Delhi from Gurgaon to the south-west. In Delhi this is divided into four major zones, namely Southern Ridge, South-Central Ridge, Central Ridge and Northern Ridge, The Northern Ridge (Kamla Nehru Ridge) spreads across 87 hectares and is the northernmost part of the Aravalli hill ranges. It lies in the heart of North Campus of the University of Delhi. The Northern Ridge (Kamla Nehru Ridge) is fragmented into patches by various public roads that pass through the Ridge. The Ridge is highly weathered resulting in undulating topography with many high and low points. Consequently, the Ridge has flat hill tops, shallow valleys and gentle slopes.

Northern Ridge



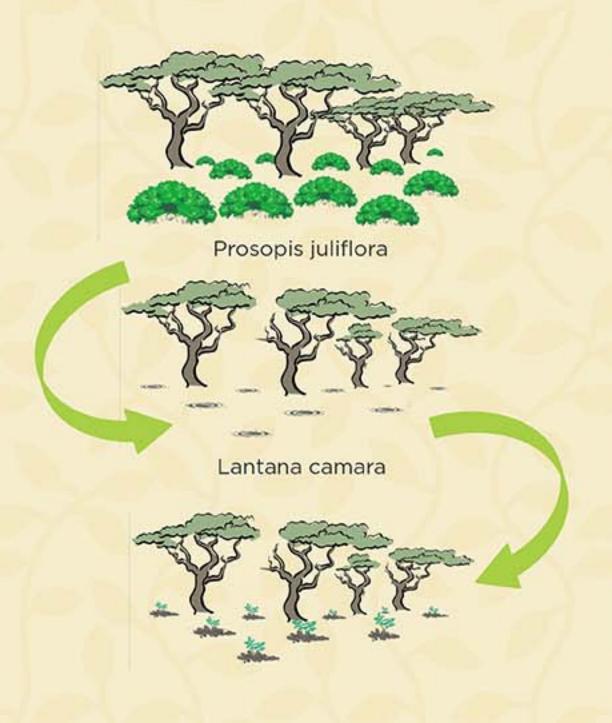
Northern Ridge, which was originally a tropical thorn forest, was envisioned as an appropriately magnificent backdrop to the new Imperial capital of British and, therefore, the British wanted to develop ridge as "a sea of foliage". To make the ridge a lush green forest, Prosopis juliflora, often called Vilaiti Kikar, a Mexican mesquite was introduced. Being of a highly invasive nature and with capability to suite in multiple environments, Prosopis juliflora had outcompeted the indigenous vegetation and swathe the whole Delhi Ridge. The ground vegetation is further occupied by another noxious invasive weed, Lantana camara. As a result, the environmental, social and ecological values of Ridge forest were degenerated drastically. The objective is to restore the pristine glory of the ridge so that it can render the much needed ecological goods and services to the city and its citizens.





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Canopy-opening of *Prosopis juliflora* and cut- root stock methods for *Lantana* are being used to manage the invasive species as part of restoration of degraded landscape of Northern Ridge to its pristine glory



Restoration of Northern Ridge

Canopy Opening and cut rootstock methods have been used for the management of Prosopis juliflora and Lantana. To allow the saplings planted to grow, small canopy gaps have been created by pruning dead branchlets of the invasive alien Prosopis juliflora, which as per International Conventions, and recommendations of FAO, has to be eradicated. Lantana, another noxious alien species, which is being eradicated from protected areas, has been removed by Cut Rootstock method developed by CEMDE (University of Delhi) to create space on the ground. With opening of the canopy, native plants get abundant sunlight for their growth and survival and slowly they out-compete the Prosopis juliflora. The approach involving the creation of small canopy gaps and removal of weedy species from the ground for allowing the growth of saplings of native tree species is novel and simulates the natural ecological succession process, the end product of which is the original natural ecosystems of the area. The canopy approach is being adapted for replacement of Prosopis juliflora by native species.



Relict Tree of Acacia senegal (Gum arabic)

The hill-tops and slopes with boulders which had some native remnants of Acacia senegal and other species are being further enriched with native biodiversity. Some of the native species which are already planted are Acacia catechu, Acacia modesta, Prosopis cineraria, Holoptelea integrifolia, Lannea coromandelica, Sterculia urens, Butea monosperma, Nyctanthes arbortristis, Wrightia tinctoria, Aegle marmelos and Cassia fistula.













Chauburja was originally built as a mausoleum, but was later converted into a mosque. It was used by the British as an outpost and a Battery to mount guns. During the Revolt, Chauburja witnessed heavy fighting between the British forces and the Indian rebels.

Built in the first part of the nineteenth century

the Guard House was part of the cantonment

area of the armed forces of the British East

India Company. It was a safe place from where

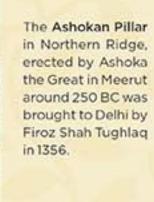
a sentinel or guard may observe the

surrounding area easily. Some canons are also

believed to be fixed there.

Flag Staff Tower, a signal tower of British Officials, was used to send telegraph messages. The structure gained the importance in 1857 when the revolt broke out in Delhi and rebels started killing British and their families. The survivors assembled in the Flag Staff Tower and then fled to Karnal. The capture of Flag staff by rebels and then by the British resulted in massive casualities among belligerents. The dead bodies were dumped in the nearby lake turning the colour of the lake red. The lake was then named as Khooni lake.





Northern Ridge: a Battle Ground of First War of Independence (1857)

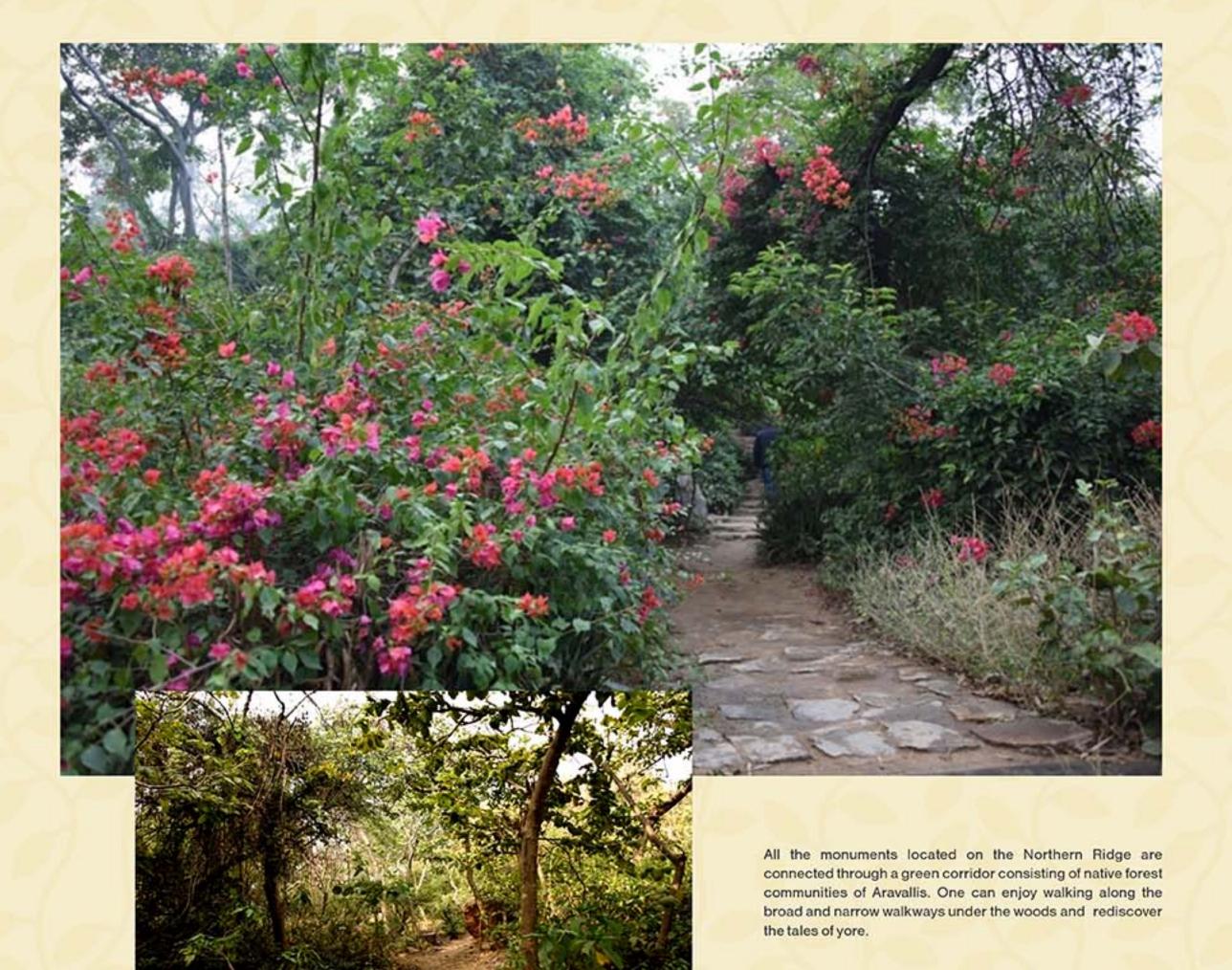
Northern Ridge has witnessed lots of upheaval in the history of Delhi. It was a key location for Delhi Revolt during the First war of Independence in 1857 as most of the artilleries and batteries of the East India Company were stationed in and around the Northern ridge. Indian forces had given a major blow to the colonial rule on the northern ridge itself.

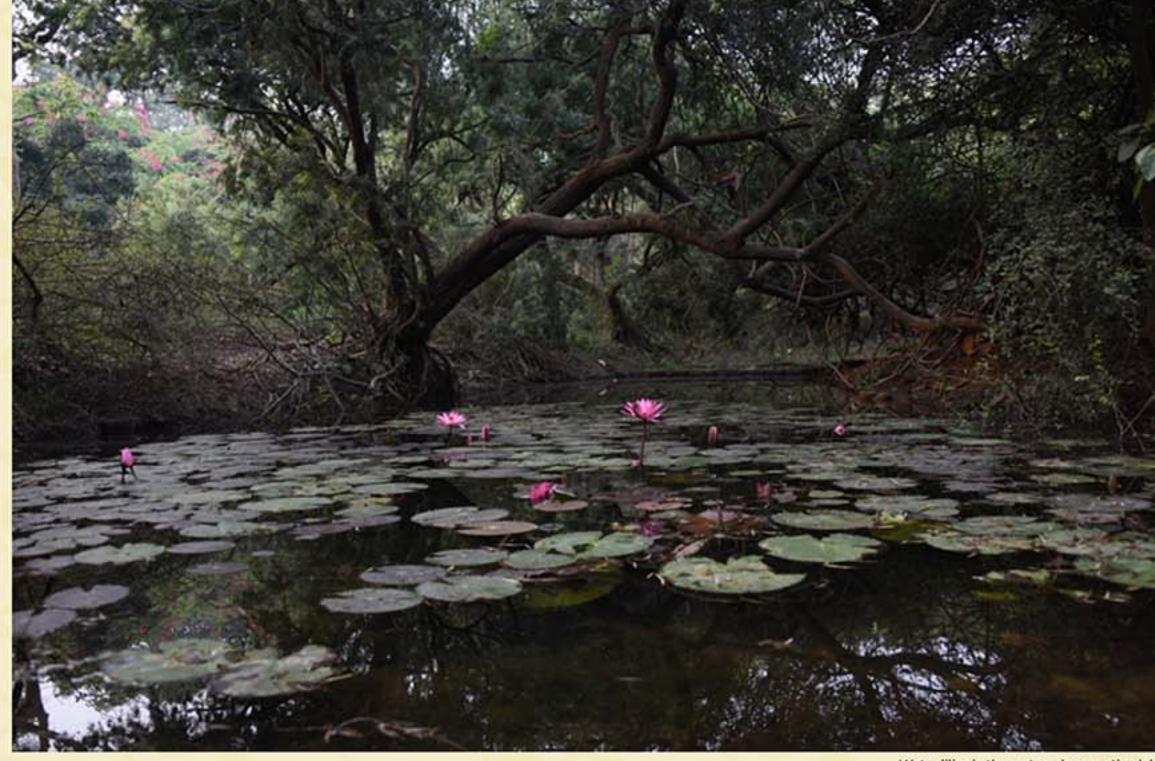


called Mutiny Memorial, on the spot of Taylor's battery (a unit having artilleries positioned during the siege of a city), in the memory of Company Officials who sacrificed their lives in 1857. Later in 1872, Indian Government renamed the monument as 'Alitgarh' and erected a plaque stating that the 'enemy' mentioned on the memorials were immortal martyrs who rose against colonial rule and fought bravely for Indian freedom.

In 1863, British built a memorial

Kushk-i- shikhar or Pir gayab is 14th century structure built and used by the Emperor Firoj Shah Tuglaq as an observatory and hunting lodge. Later, this structure was used by British for watch and ward. It is also said that one saint meditated at this site and disappeared suddenly and hence the name given was Pir Gayab. Adjacent to this is a Baoli, constructed by Tuglaq to facilitate water supply to his hunting lodge.





Water lilies in the restored serpentine lake

Recharge of Ground Water Aquifers

The existing water bodies have been rejuvenated and the entire surface drainage has been channelized into water bodies. These water bodies not only recharge ground water but also become habitat for a diversity of birds and insects. These inland wetlands also promote recreation and serve as water holes for primates.







Northern Ridge

Rajpur Road, Civil Lines Delhi - 110 007 E-mail: kamlanehruridge@gmail.com

Discover a Different World of Flora & Fauna

Northern Ridge (Kamla Nehru Ridge) is situated in the northern part of the city has six entry gates, and bounded clockwise by University of Delhi, Mall road, Rajpur road, Civil lines, Chaubhurja road and Acharya Sushil Muni marg.

One can approach the Kamla Nehru Ridge by road and by using metro, the nearest metro station is Vidhan sabha which is 200 meters from Gate no 3 Rajpur road, Civil lines and Vishwavidyalaya Metro station, which is around 400 m from Gate no.1.





4 km from ISBT Kashmere Gate



7 km from New Delhi Railway Station



3 km from Guru Tegh Bahadur Nagar Metro Station



19 km from Indira Gandhi International Airport (IGI)



Scan QR Code to reach your destination





Tughlaqabad **Biodiversity Park**

Preserve the ecology with historical legacy



Area 130 Hectares





Plants 163 species



Birds 112 species



Butterfly/moths
44 species



Mammals 9 species

Tughlaqabad Biodiversity Park







Tughlaqabad Biodiversity Park is being developed with an objective to restore the forest communities characteristics of Aravalli hill ranges. This way, the area will not only render ecological goods and services to the city and society but will also restore the surroundings of Tughlaqabad Fort to their unique semi-arid forest ecosystem. This will make it a perfect destination for exploration by naturalists, historians, bird watchers and heritage walkers.

Spread over an area of 130 hectares, the landscape of Tughlaqabad Biodiversity Park represents a gentle eastern slope of Tughlaqabad Fort area (a plateau) along with ridges and valleys. Tughlaqabad Fort is presently a remnant of the massive Tughlaqabad Fort built by Ghiyas-ud-din Tughlaq, the founder of

Tughlaq dynasty, of the Delhi Sultanate of India in 1321. The gigantic battlements and the massive stonework of this fort display the engineering skills of the workers of yore. However, this fort soon faced its decay as Sufi Saint Nizam-ud-din cursed the sultan by saying "Hunuz Dilli dur ast" (Delhi is yet far away) and

the sultan could not reach Delhi alive. Apart from the myth related to the curse, the real problem are degraded forest communities invaded by *Prosopis juliflora* and highly silted and polluted wetlands due to discharge of untreated sewage.

212 BIODIVERSITY PARKS
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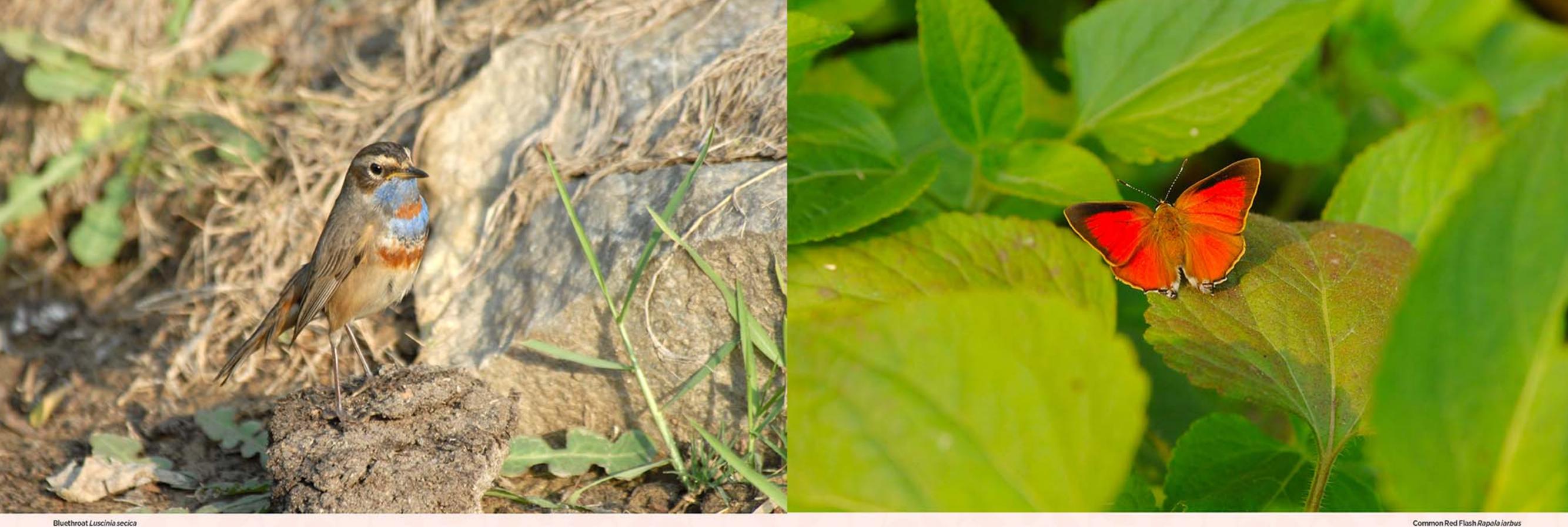
Forest Communities The dry deciduous forests, tropical thorn forest and scrub jungles of the Tughlaqabad are presently in highly degraded states and invaded by *Prosopis juliflora* (Vilaiti Kikkar). Species enrichment with native species like Shami *Prosopis cineraria*, Hingot *Balanities aegyptiaca*, Karel *Capparis decidua* etc has already started and the developed forest

communities harbour rich avian fauna and butterflies serving as seed dispersal agents and pollinators, respectively. As many as 10 forest communities are being developed. These include Cassia fistula - dominated community, Holoptelia dominated community, Butea dominated community, Mitragyna dominated community, Albizia dominated community, Acacia leucophloea dominated community, and Prosopis cineraria dominated community etc.

The fully developed Tughlaqabad Biodiversity Park will not only generate a range of ecological services but have also become a tourist spot.

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Bluethroat Luscinia secica

Bird Diversity

As many as 112 species of birds are identified so far. The most common ones are Black Drongo, Green Bee- eater, Brown-headed Barbet, Barn Owl, Common Hawk Cuckoo, Bluethroat etc.

The wetlands also receive some migratory birds. Once the wetlands are fully restored and able to receive clean water through Constructed Wetland System and when forest communities are fully developed, the Park will have a rich avian diversity.

Butterfly Diversity

About 44 species of butterflies are recorded from the Park. These include Plain Tiger, Park is also being developed.

Striped Tiger, Yellow Orange Tip, Large Cabbage White, Danaid Eggfly, etc. A Butterfly

218 BIODIVERSITY PARKS BIODIVERSITY PARKS 219



Wetlands

Four interconnected wetlands which used to receive rainwater from the surrounding hills but the storm water carrying drains have now been converted into sewers. The natural wetlands are now highly polluted and filled with raw sewage. These polluted wetlands are being restored by treating sewage with Constructed Wetland Systems.

There are many depressions and nullahs which are being developed into surface waterbodies to recharge the ground water.

Recreational Park

A 8 hectares recreational Park has been developed and the aesthetics of the Park are being improved through landscaping and planting the ornamental trees, shrubs and herbs. The citizens are already utilizing the area.

220 BIODIVERSITY PARKS BIODIVERSITY PARKS 221



Heritage walk

A greenway with heritage walk along the Fort is being developed.

Tughlaqabad Biodiversity Park Maa Aanandmaii Marg, Okhla Phase I, Okhla Industrial Area New Delhi - 110044

E-mail: tughlaqabadbiodiversitypark@gmail.com

Discover a Different World of Flora & Fauna

Tughlaqabad Biodiversity Park is located along the Maa Aanandmaii Marg, opposite to Okhla Industrial area. It can be reached via Mehrauli-Badarpur Road or via Aashram-Mathura road. The most comfortable option to reach Tughlaqabad Biodiversity Park is by violet line of Delhi-metro and get down at Govindpuri Metro Station and then take an auto rickshaw or taxi to Biodiversity Park.







19 km from New Delhi Railway Station



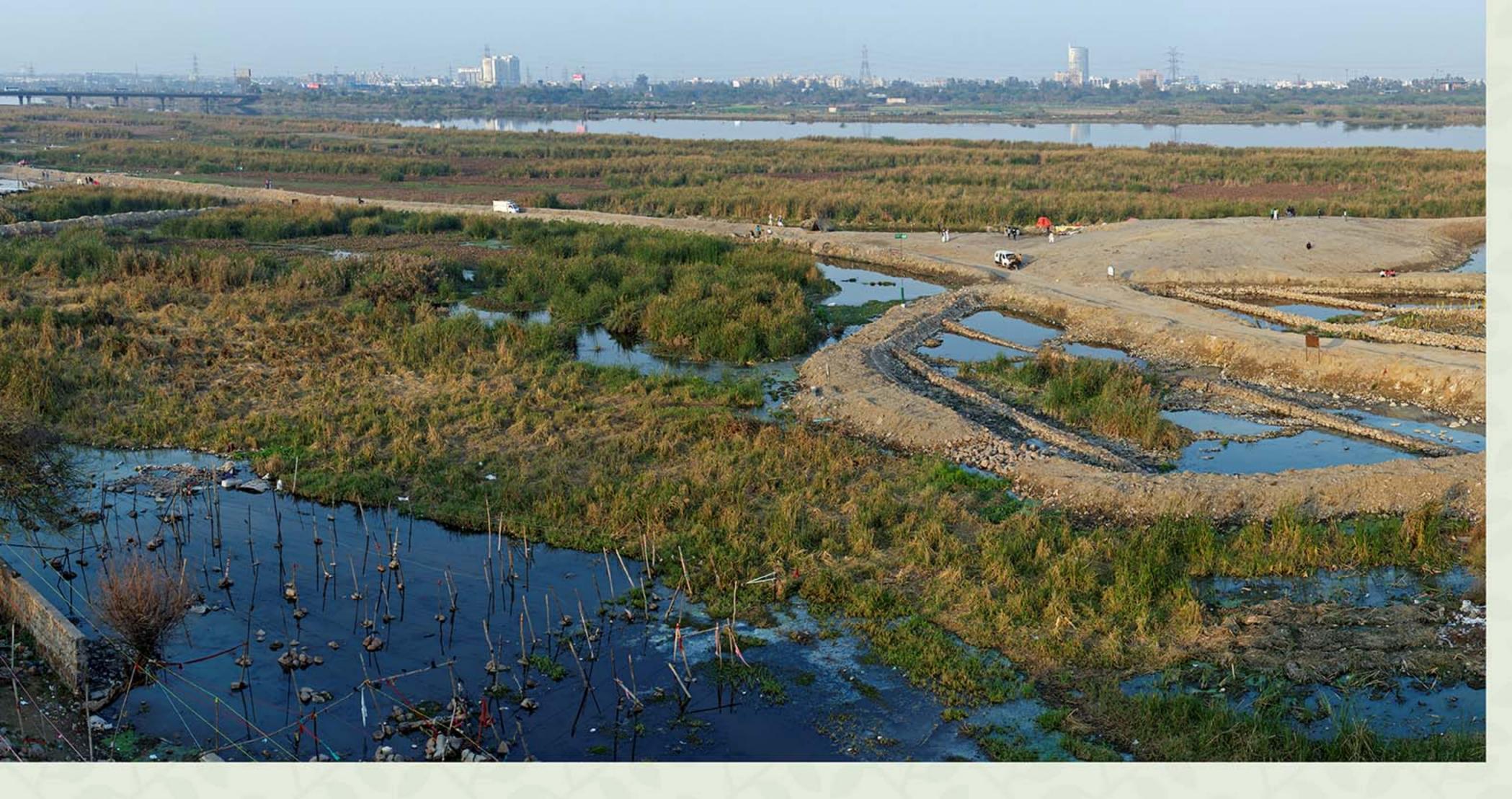
3 km from Govindpuri Metro Station



20 km from Indira Gandhi International Airport (IGI)



Scan QR Code to reach your destination





Kalindi Biodiversity Park

Transforming Floodplains of Yamuna Into Highways of Rich Flora & Fauna



Area 167 Hectares



Plants 47 species



Birds 80 species



Butterfly/moths 25 species



Mammals 2 species

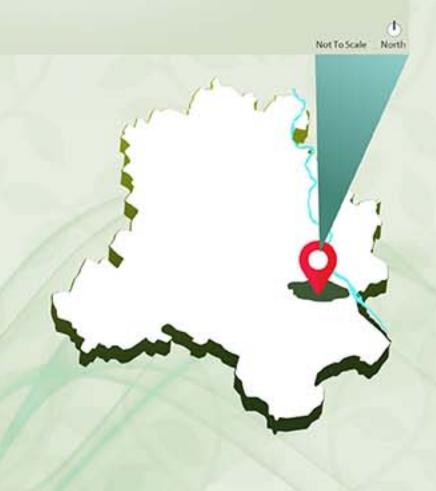
224 BIODIVERSITY PARKS ANTURE RESERVES OF DELIN 225

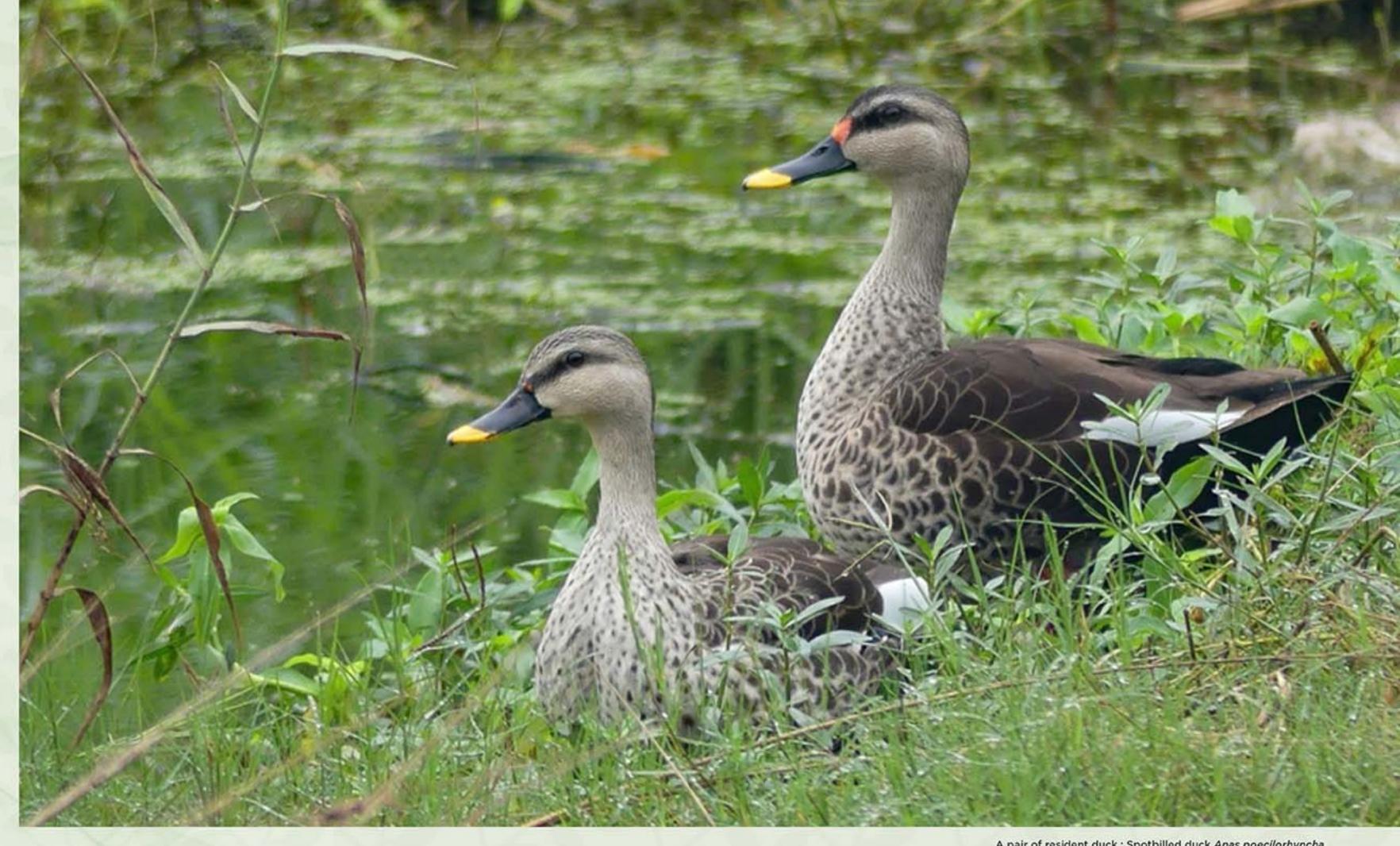
Kalindi Biodiversity Park



Kalindi Biodiversity Park spreads over an area of 167 hectares in the downstream of DND flyway. It includes mostly floodplains and floodplain wetlands on western bank of the river Yamuna, besides uplands and some elevated floodplains located along Ashram Road.

The challenge is to restore the highly degraded and polluted floodplain wetlands and floodplains to make them fully functional river ecosystems that generate ecological services to the city and citizens storage of flood water, recharge ground water, serve as habitat for flora and fauna, buffer local ambient temperature and serve as sink for CO, besides rejuvenation of the river. Constructed Wetland Systems are being developed for 11 drains that discharge raw sewage into floodplain wetlands.



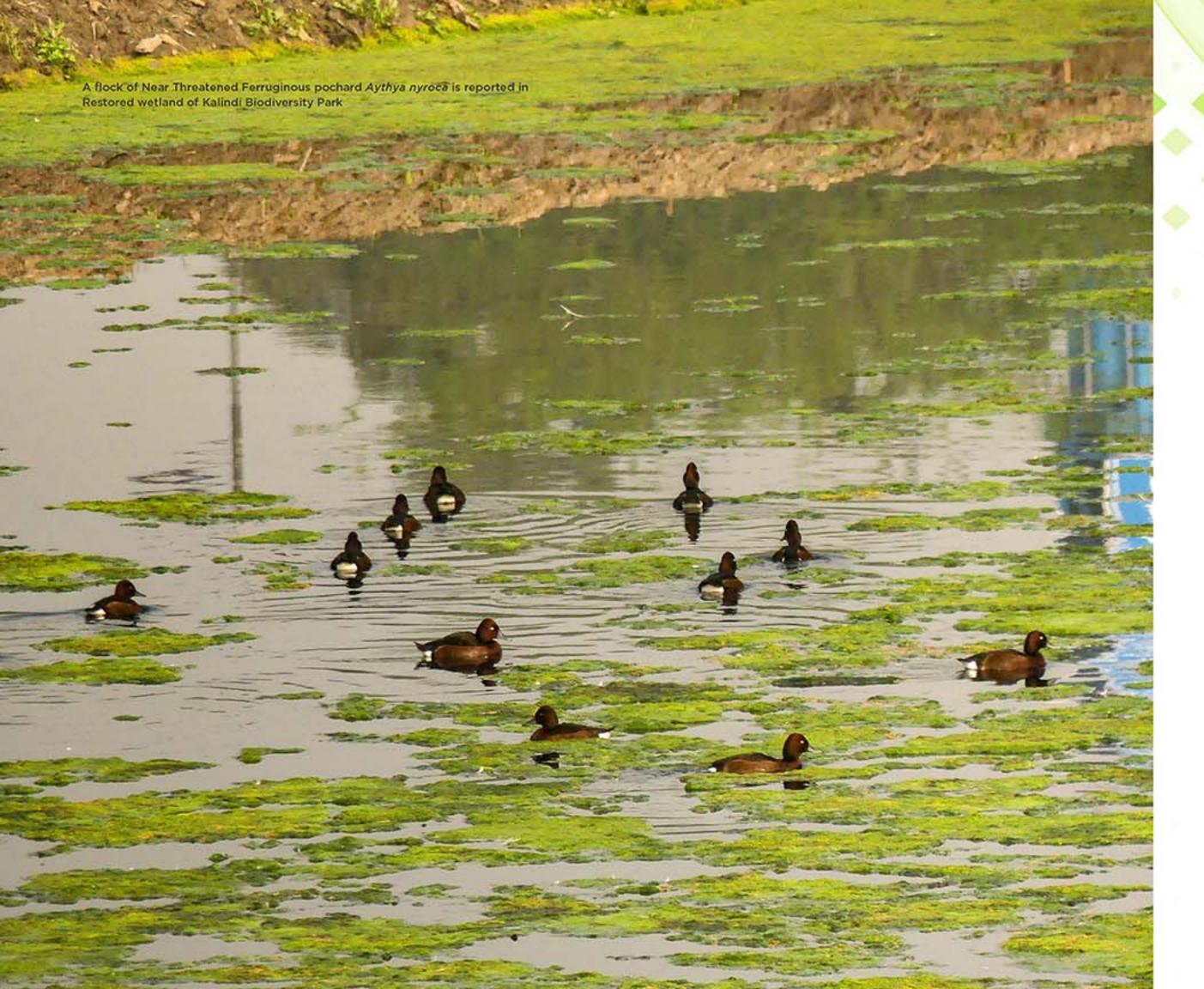


A pair of resident duck : Spotbilled duck Anas poecilorhyncha

226 BIODIVERSITY PARKS









Kalindi Biodiversity Park
Near Sun Rise Hospital, Kalindi Colony, Maharani Bagh
New Delhi - 110065 E-mail: kalindibiodiversitypark@gmail.com

Discover a Different World of Flora & Fauna

Kalindi Biodiversity Park is located on the western side of River Yamuna in the downstream of DND flyway. One can approach to the Kalindi Biodiversity Park either from Ashram Metro Station or through Kilokri village near Maharani Bagh, Delhi.







New Delhi Railway Station



2 km from Ashram Metro Station



18 km from Indira Gandhi International Airport (IGI)



Scan QR Code to reach your destination



Biodiversity Profile

Species enrichment through scientific intervention and natural process of ecological succession led to development of self-sustainable ecosystems in different Biodiversity Parks.

Initial stages of ecological restoration with pioneers (grasses and legumes) followed by early and then late colonizers and subsequent introduction of top, middle story and understory plant species not only promoted animal succession but also led to colonization by several native plant species and self-regeneration of established species. These ecological processes indicate that ecosystems developed in Biodiversity Parks are self-sustainable.

Species Groups	Yamuna Biodiversity Park		Aravalli Biodiversity Park		Neela Hauz		Tilpath Valley Biodiversity Park		Northern Ridge		Tughlaqabad Biodiversity Park		Kalindi Biodiversity Park
	2002	2020	2005	2020	2016	2020	2015	2020	2015	2020	2016	2020	2020
Terrestrial Plants	90	915	150	950	90	115	156	481	87	415	30	155	38
Aquatic Plants	0	101	0	31	20	20	0	3	4	20	0	8	9
Avifauna	37	203	42	209	100	131	81	125	64	71	112	112	80
Butterflies	11	82	13	113	15	40	21	55	31	46	35	44	25
Herpetofauna	3	18	8	31	6	7	14	15	8	11	18	28	4
Mammals	4	22	5	19	3	4	5	7	7	7	9	9	2
Fishes	0	18	0	0	0	5	0		0	5	0	0	2



























Glorious Milestones of Ecosystem

- Biodiversity Parks: Savior of Humankind
- Rise of Biodiversity Parks as Conservation Models





Biodiversity Park: Savior of the humankind

Medicinal Plant Wealth of Biodiversity Parks of Delhi

Some plants synthesize a wide variety of compounds that are used to perform important biological functions, and to defend against attack from predators such as insects, fungi and herbivorous mammals. Many of these phytochemicals have beneficial effects on health when consumed by humans, and can be used to effectively treat humans with multiple ailments. These plants are commonly called Herbal plants, and have been used in traditional systems of medicines like Ayurveda, Unani, Siddha and Homeopathy since ages.

The Delhi Institute of Pharmaceutical Service and Research has been collaborating with Biodiversity Parks for phytochemical screening of plants with a view to developing products of therapeutic value. About 12 species have already been selected.

Brahmi buti, Bacopa monnieri; whole plant is used as memory booster, pain reliever, treatment of fever and to treat epilepsy.

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Herbal Plants of commercial value

The rich plant wealth of Biodiversity Parks of Delhi with more than 2000 species are valuable resources that can be bioprospected for new and novel drugs of potential therapeutic value including for the COVID-19 pandemic. In fact some of the plants like *Solanum nigrum*, *S. nudiflora* complex has been used in the treatment of HIV infections and now been utilised for the treatment of COVID-19. Similarly *Boswellia serrata* is now used for drug development against arthritis. *Cannabis sativa* is also used for the development of pain killer drug and also for the drug used in the treatment of pediatric epilepsy.





Cannabis sativa Boswellia serrata

Isabgol Plantago ovata; husk has digestive and laxative properties Hathjod Cissus quadrangularis; used as joint and bone healer

242 BIODIVERSITY PARKS ANTURE RESERVES OF DELINE RESERVES OF DELINE RESERVES OF DELINE





Tulsi: the wonder drug of India

Tulsi Ocimum sanctum (Holy basil) or Vrinda is a sacred plant in Hindu belief and is regarded as the avatar of Lakshmi. Tulsi is also called "the Incomparable One," "Elixir of Life," or "Queen of the Herbs".

Tulsi is used to lower inflammation and the risk of heart disease, rheumatoid arthritis and inflammatory bowel conditions. Chewing of Tulsi leaves soothes fever, headache, sore throat, cold, cough and flu.

There are eight different species of Ocimum in Biodiversity Parks.









Rare plants found in Biodiversity Parks

Some plants are on the verge of local extinction due to habitat destruction or over exploitation. Some of the rare species are now secured in Biodiversity Parks.

Sterculia urens Rhus mysorensis Mimosa hamata

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Pollination Services in Biodiversity Parks

Could you imagine your life without pollination, a process that leads to formation of fruit and subsequently seed? Pollination is crucial for establishment of new plants, regeneration of forest communities and therefore impacts the survival of all the animals, including human beings. Seeds of three grasses (wheat, rice and maize) constitute 90% of world's food supply, and human survival depends on their production for which the pollination is a must.

Pollination can be brought out by wind (anemophily) water (hydrophily), insects (entomophily) and birds and other mammals (Zoophily). Pollination is also brought out by ants and snails and other invertebrates. Most of these pollinators are threatened in natural ecosystems due to pollution, use of insecticides and fragmentation of habitat. Some of the pollinators are secured in Biodiversity Parks.

Some of the pollinators found in Biodiversity Parks are butterflies, wild bees, ants, birds, beetles, mammals etc.



Common Silverline Cigaritis valcanus





Purple sunbird taking nectar from Woodfordia fruticosa flowers











Facts

The economic value of pollination of crops by honey bees, Bumble bees and other bees is worth \$ several billion a year. We may lose all the plants that bees pollinate, all of the animals that eat those plants and other components of the food chain. This means a world without bees could struggle to sustain the global human population of 7 billion.

Butterflies, birds, bees, beetles, ants, bats, wasps and even flies are important in the pollination process.

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Birds as Keystone species and farmers' friends

Many bird species are known to regulate key ecological processes such as pollination, seed dispersal and regulation of populations of pests particularly insects and animals that cause heavy losses to crops in farmers' fields. Many bird species perform these roles in ecosystems of Biodiversity Parks.



Ibises eat up to 1000s insects per day.

These include grasshoppers and locusts which are agricultural pests. Ibis provide insect pest control to many hectares of crop-land worth of \$ several million per year.

Rodents are favored prey of raptors (owls, hawks, etc.), and rodents themselves feed extensively on various crops. Over its lifetime, a barn owl eats approximately 1000s of mice that would consume sevaral tons of crop produce. With an average lifespan of 4 years, the owl's annual intake take is about 3000 mice per year.





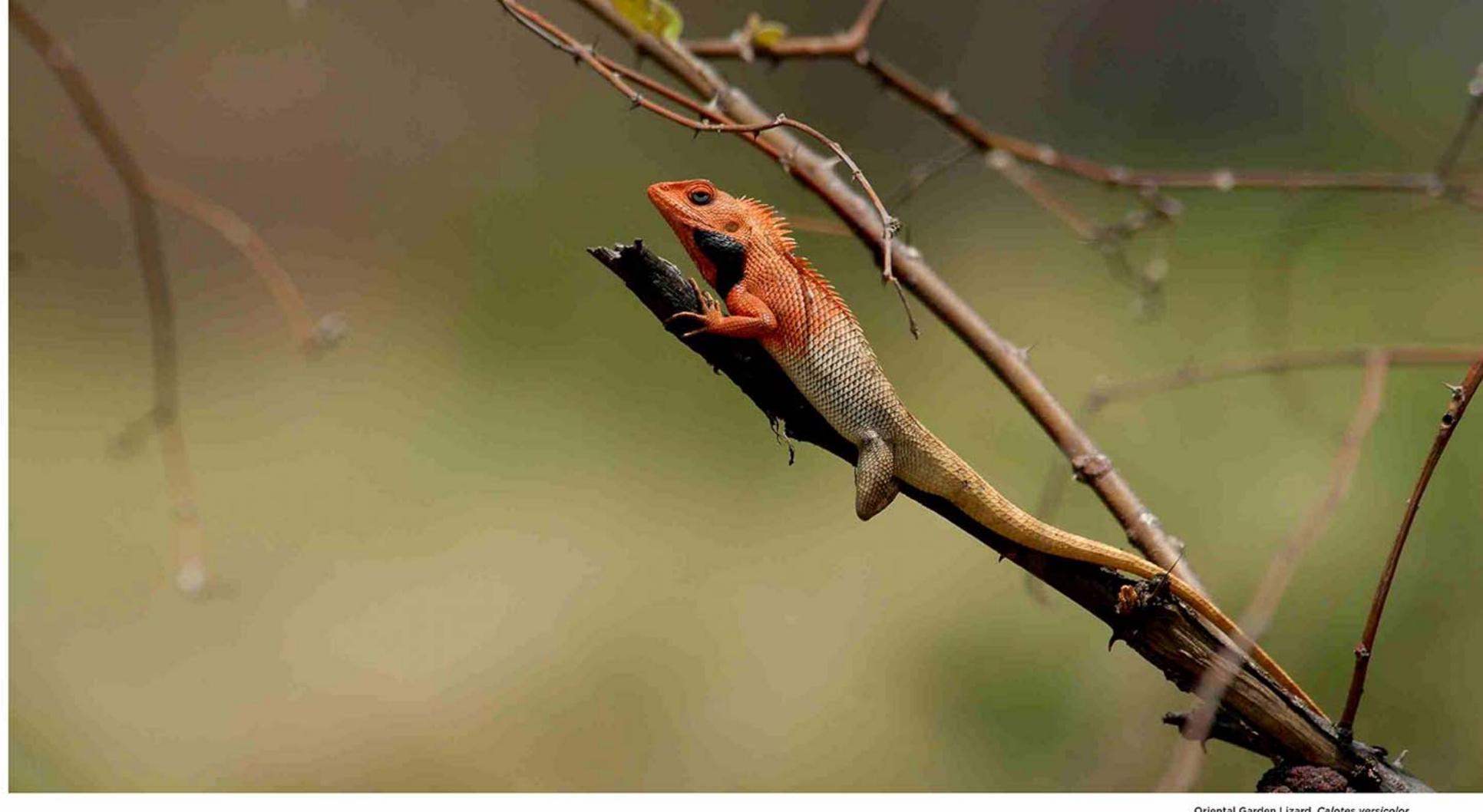
Reptiles for ecosystem balance in **Biodiversity Parks:**

Reptiles play an important role in the balance of an ecosystem. In most ecosystems, reptiles are the vital part of food chain and they play a huge role both as the prey species and the predators in ecosystems.

Reptiles evolved from their amphibian ancestors over some 320 million years ago. With due course of time many of their prominent lineages such as Dinosaurs, Pterosaurs, Plesiosaurs and Mosasaurs became extinct. The extant reptiles of India may be classified as Turtles & Tortoises, Crocodiles, Lizards and Snakes. In India they occupy several diversified aquatic and terrestrial ecosystems such as marine and brackish water, mangroves, marshes, lakes and rivers, tropical evergreen or semi evergreen forest, tropical dry deciduous and thorny forest, scrublands, grasslands and deserts.

In comparison to other taxa such as birds and mammals, reptiles have received less attention because of their cryptic nature, occurrence in low density and temporal activity. Thermoregulation pattern in reptiles being Ectothermic (cold blooded animals than gain heats from external environment) and poikilotherms (cold blooded animals that adjust body temperature according to environment) makes them typical indicator species for assessing global climatic changes. Temperature governs the behavioral patterns such as distribution, physiology & metabolic growth rate, lifetime fitness and even sex ratio of many hatchling reptiles. Being positioned at different trophic levels makes them fit for forming a complex food web in a food chain. Ecological communities with higher biodiversity form a more complex trophic path.

A total of 29 species have been reported till date from various Biodiversity Parks. There are 2 species of aquatic turtles, 10 species of lizards and 17 species of snakes. The restored and recreated riparian and wetland ecosystems of Yamuna Biodiversity Park is now home for Turtles, Lizards and habitat specific aquatic snakes such as Checkered Keelback Xenochrophis piscator and Sibold's water snake Ferania sieboldii, which has been reported after 60 years in Delhi and now has a breeding (viable) population here.



Oriental Garden Lizard, Calotes versicolor

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Ecological assemblages of native species of plants in the form of different forest communities over vast areas of land with various habitat mosaics is being recreated and maintained in Tilpath Valley Biodiversity Park and Aralli Biodiversity Park. These nature reserves with diverse habitat and niche have given space for specialist or generalist species to survive. For example, both TvBP and ABP are homes for: Asian Leopard Gecko Eublepharis macularius, Fan Throated Lizard Sitana sp. and Snake Eyed Lacerta Ophisops jerdonii which are typical rock dwellers (Saxicolous), Black Headed Royal Rat Snake Spalerosophis atriceps which is a cave dweller (Troglodyte), and Striped Grass Skinks Eutropis dissimilis which is a perfect example of edge species as it prefer forest floor where grassland and forest forms ecotone. The Ribbon Snake Psammophis leithii which has been reported after 1996 from TvBP is largely found in scrubland and thorny forest.

Biodiversity Parks are preserving the reptilian diversity of Delhi.



Indian Flatshell Turtle Lissemys punctata



Asian Leopard Gecko Eublepharis macularius

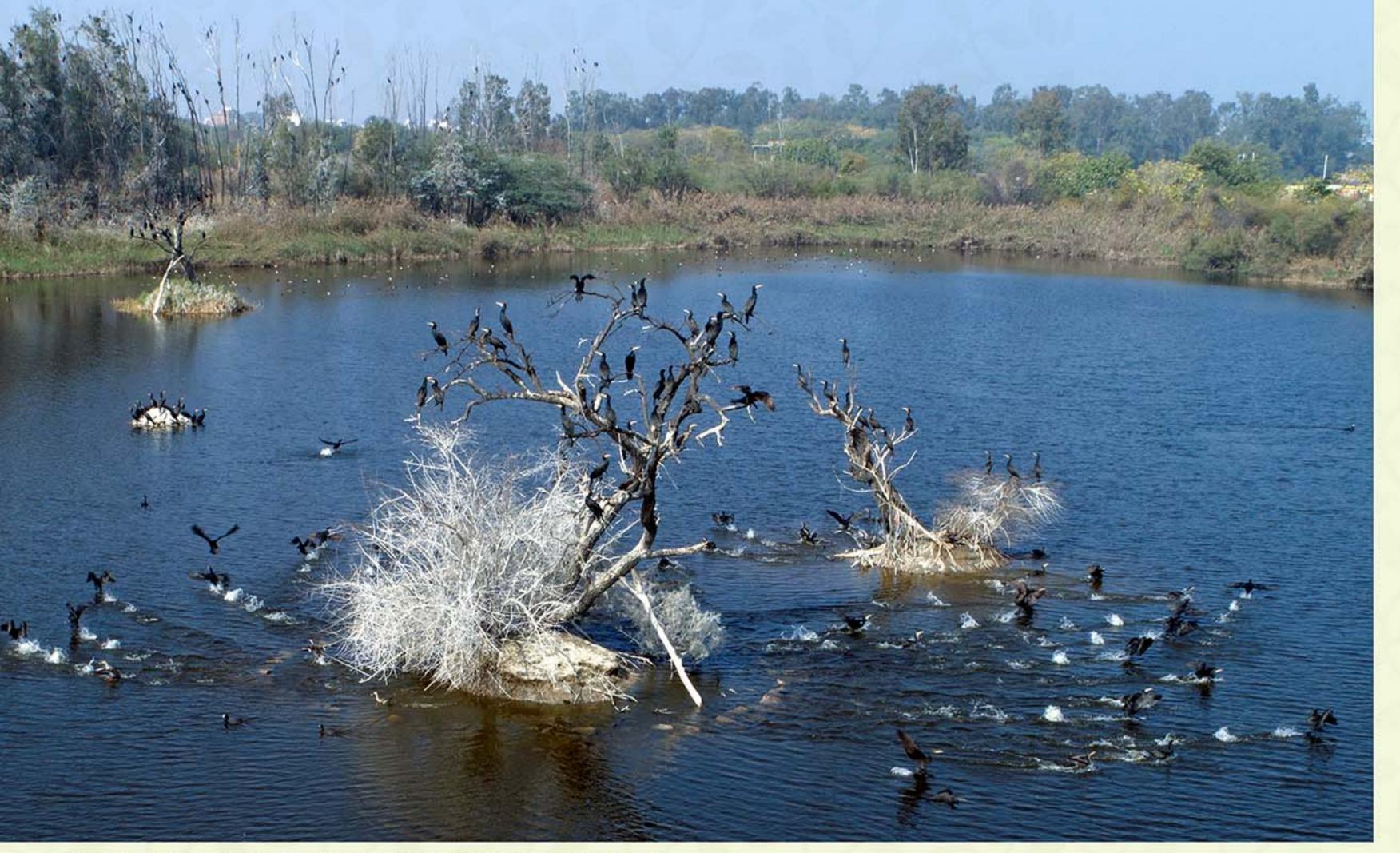


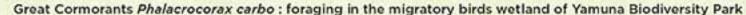
Seibold Snake Ferania sieboldii

Striped Grass Skink Eutropis dissimilis

256 BIODIVERSITY PARKS









Rise of Biodiversity Parks of Delhi as Conservation Models

Urbanization along with habitat fragmentation and land use change is causing complex changes in the local and regional biodiversity, ecosystem services, and green cover. As a result, vital habitat is either completely destroyed and reduced to fragments, or is too small to support complex ecological communities. In cities, several species have become endangered or even locally extinct as areas that were previously wilderness have been swallowed up by ever-increasing urbanization.

Therefore, there is an urgent need for safeguarding natural resources and biodiversity of the urban/semi-urban environment, including the air, water, flora and fauna of ecosystems for the benefits of the present and future generations through careful planning and management. In deference to the principles of the Stockholm Declarations adopted by the International Conference on Human Environment, the Government of India, by the Constitution 42nd Amendment Act, 1976 made the provision for the protection and promotion of the environment, by the introduction of Article 48-A and 51-A (g) which forms part of the Directive Principles of State Policy and the Fundamental Duties respectively. The Constitution of India explicitly makes environmental conservation a fundamental duty.

Keeping in mind the need for conservation of Biodiversity particularly in urban landscapes, the concept of Biodiversity Park was evolved and implemented for the first time in India by DDA in collaboration with CEMDE, University of Delhi. During the development of these parks, no major obstacles were encountered. On the other hand each visitor from every walk of life was ready to work for the betterment of Biodiversity in his/her own capacity.

Based on the successful outcome of the DDA Biodiversity Parks of Delhi, the Ministry of Environment, Forest & Climate Change (MoEF& CC), Govt. of India has come up with a new scheme of 'Conservation of Natural Heritage and Enhancement of Quality of Urban Environment' through establishment of 'Biodiversity Parks' in States and Union Territories of the country. In fact, Ministry has already issued letters to the Chief Ministers of different states to establish Biodiversity Parks in State capitals and District headquarters. In recent orders passed by the National Green Tribunal for actions to be taken by authorities for the rejuvenation of rivers in India, the creation of biodiversity parks has been referenced, with the Yamuna Biodiversity Park as a model.

For long term management and sustenance of Biodiversity Parks, a publicly funded organization is critical anywhere in the country and the world. Keeping this in view, the present Lt. Governor of Delhi- the begetter of Biodiversity parks of Delhias the Chairman DDA has addressed a longstanding issue of Management and sustenance of Biodiversity Parks by creating a Delhi Biodiversity Society

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- Reminiscence
- Scripting Stories of Success



Students, public, trainees of professional courses from India and abroad, environmentalists, naturalists and birdwatchers and NGOs do regularly visit Biodiversity Parks. Many eminent personalities, representatives including elected leaders from the Government, top administrators, academicians, judiciary and army generals and foreign embassy staff, who are involved in taking policy decisions on the environmental protection and conservation of biodiversity also visit Delhi Biodiversity Parks. Many of them give their impressions on their visits. These impressions reflect on the values of Biodiversity Parks in conservation of our natural heritage. Reminiscences of some of the eminent personalities who visited Biodiversity Parks are reproduced below.

> Justice Rohinton Fali Nariman 3rd February, 2018

Absolutely delightful to be in the middle of the Aravali Jngle in the middle of the city!

May there be many more all over India.

he has had a wonderful broney Park The a real contribution to the city We have had a wonderful visit to the Yamuna Biodiversity Park, This is a with a briefy development real contribution to the city with a I shillow and deep wetters, terrific development of shallow and It don that we un deep wetlands, it shows that we can preserve our urban environment if we poseure our whom really try. Congratulation to all. environment of ar rully arguellan h Montek S. Ahluwalia Deputy Chairman, Planning Commission New Delhi Mare a Allene 12" January, 2014

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It is my pleasure to visit Yamuna Biodiversity Park which is prominent centre for preservation of environment and understanding its importance. The way Park has been preserved at the heart of the capital city is appreciable. Environment is home for mankind and well being of environment directly relates to well being of human being and other species, Preserving environment is most important and essential work, we need to do for our upcoming generations. I congratulate Yamuna Biodiversity Park's great effort in developing the Park.

> Mrs. Bidya Devi Bhandari President of Nepal 18" April, 2017

It is my pleasure to ulsit Yanuna Birdiversity Park which is prominent centre for preservation of environment and understanding its imputance . The way part has down preserved at the heart of the capital city is appreciable investment is have for mankind and well-bring of the environment directly related to the well-being of horan being and other species. Reserving stateoning is most important and reconstial we we need to do for our speaning. generations I angestulate Yourung Janua Biodiversity Park's orest with in diveliping the Juk Grantmer TT

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I was delighted to re-visit the Yamuna Biodiversity Park after a gap of 13 years. Deeply impressed by the evolution of this project in such a short time. Re-creation of Yamuna ecology in the heart of a metro-town is indeed a rare achievement. Rejuvenation of in numerable species of plants and animals is seen to be believed. It's a true reflection of the commitment, dedication and hard-work of Prof. Babu and his team. My compliments and salutations to all. Keep it up.

> Anil Baijal Lt. Governor of Delhi 4" February 2017

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16-1-2020 brita Mittal

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Odesceve every encouragement for the hinge efforts. My congratulations to him work that they are doing.

and his team for the fixed too which is making ruch as invaluable contribution to ecology, in bethe Dr Foryage & his liam (8)

Have been associated with Parks and waterbodies in Delhi as Counsel for DDA. It has been so inspiring and learning to have finally got the opportunity to visit Prof. Babu's huge efforts.. My congratulations to him and his team for this unique creation which is making such an invaluable contribution to ecology in Delhi. Dr. Faiyaz and his team deserve every encouragement for the work that they are doing.

Justice Gita Mittal

Chief Justice of High Court of Jammu & Kashmir

16" January, 2020

5/12/2017 ASHILD KOLAS 9650132804 ASHILD DPRID, NO THIS biodiversity park
PLACE RESEARCH INSTITUTE OSLO
PUBLIC RESEARCH INST

This biodiversity park really inspired me, and to spend on entire day here was a fantastic experience! Hope to have a chance to return and hope that all the great work done here will be known all over planet. Thanks!

Åshild Kolås, Norway Social anthropologist and Research Professor at PRIO 5th December, 2017

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Clean Yamuna: Biodiversity Para Gets 1st Of 12 Artificial Wetlands

Facilities Under DND Flyway To Stop Flow Of 2,000 MLD Raw Sewage Into River

अरावली बायोडायवर्सिटी पार्क में विकसित हुई बोगनविलिया पौधे की 28 प्रजातियां

बोननथिलिया की 28 प्रजातियों देखी वा सकती हैं। यहां बोगनविश्लेरियम का डीडीए उपाध्यक्ष अरुण गोयल ने सोमवार को उदाटन किया।

अरावली की पहाडी पर वसंत में फैले अरावली बायोडायर्जसिंटी में 30 तरह की बोग-विदेशिया फूलों (अख्राहम लिकन, इको, बल् मून,

म फल अठक्ता बाबहायकसरा म 30 तरह का बाग-बावरण पूरता (अज्ञाहन राजन, उत्तर, ज्यू पूर पार्क में अनेक खूबसुरत प्राकृतिक को प्रजाति विकसित की गई हैं। यहां एफिल टॉवर आहसवर्ग, सोमर, दूरम अप देख सकते हैं। यहां पर चेरी ब्लॉसम, लैंसबैस ब्यूटी, रोजा कश्मीर, सुपरस्टार, जेम्बा इत्यादि) अरावाली की पहाड़ी पर पाए जाने विस्ताहर, सुबा, मेरी पाल्मर स्पेशाल, के अलावा अनेक तरह के देसी पीध

और सामधारी और सरीसूप की 25 से ज्यादा प्रजारियां है। डीडीए से इस पार्क को विलयी विश्वविद्यालय के सहयोग कुंज स्थित लगभग 700 एकड क्षेत्र सेंटर है। मेनिक्योर्ड रिकिएरान गार्डन गुलाब की 28 हाइसिंड प्रजाति

वाले देखी पीधे, पेड़, औक्सीय पीधे, विशासा, महारा ग्रेजियले सक्रित 28 और सजावटी पीधे विकसित किए बटरफ्लाई पार्क, नेचर इंटर्राप्रेटेशन प्रजातियां विकसित हैं। इसके अलावा गए हैं।

बायोडायवर्सिटी पार्क ने बदली फिजा, लौटने लगे पशु–पक्षी

कर वृत् सं दिन्ती : मेंड में उपलब्धेत अरल विक्रमें करणे सं स्वता के अर्थकान में दिलने में शुरू किए गई क तर वर्षक्रमानिते पर्व का अगर नजर तर वर्षक्रमानिते पर्व का अगर नजर

का। शक्तरते अरुत स्थाप क्यांच है। समझ और शक्तरता कार्य क्यांच प्रदेशर्थान्द हैं, फैक्कर स्टूटल हमें प्रमूशि से मुद्दी सा अद्धार क्रिया।

कारणब र १४ राज्याण प्रत्याण वर्ष वर्ष अर्थन्त कारणवास्त्र कर आहे. वर्ष वर्ष अर्थन्त कारणवास्त्र अर्थन जीव समय, जीवने सुन्त, कीवन्य, १९०० प्रत्युचे सुन्न किया नया जानमणे अर्थने कारणवास्त्र अर्थने वर्ष कारण किया न

वर्त के जाने लगे और अब निर्माण में मुख्य मुख्य हुआ है तो ये लौटने भी लगे हैं। उन्होंने बना कि व्यूट्ट और आपकारी के

विकार, तेट्रांड, प्रश्नाव होतर, भीक देशर, प्रदेशकार, कांगूर, विकार, हिरिया रिएए. प्रदेशकार, कांगूर, विकार, हिरिया रिएए. प्रदेशकार प्रदेशकार प्रदेशकार केंद्र प्रश्नाव की अन्य को जात आहे. विकार कुछ स्थानी के स्वेतन विकार किया की अन्य को जात आहे. विकार कुछ स्थानी के स्वेतन विकार केंद्र अन्य की अन्य को अन्य कांग्रिक की की अन्य कांग्रिक की अन्य की अन्य कांग्रिक की अन प्रभाग प्रथमित प्राप्तकार (जापर) जान प्रथम रहा जा भागत । भार पार प्रथम भाग करण पार जा में रे वर्ष २००२ में पहुंच और अरावनी रेट में बुध और प्रजीति के जीव थी पानाजेंग्रे, पीवर्ष और प्रितिति की बार्ष पार केट की प्रथम की श्रीति जाने की की। प्रथम की श्रीति को में प्रथम की की प्रथम की श्रीति जाने की की। प्रथम की श्रीति को में स्थाप की की प्रथम की श्रीति की जाने की की। प्रथम की स्थाप की की प्रथम की श्रीति की जाने की की। प्रथम की स्थाप की की प्रथम की स्थाप की

THE TIMES OF INDIA, NEW DELHI THURSDAY, NOVEMBER 8, 2012

TIMES CITY

4 biodiversity parks planned in capital

New Delhi: The city will soon have a special committee on biodiversity for 10,000 hectares designated for the purpose. In a meeting held recently, LG Tejendra Khanna announced the creation of the Delhi Biodiversity Foundation Society that will function Delhi Development Authority Officials said that four blodi-



The land is on Haryana border and will provide a direct corridor for the wildlife of both states, said Prof CR Babu, project in-charge of the BDPs

Yamuna and Aravalli BDPs will be developed.

Of these, Tilpat Valley, which is contiguous to the Asola and Bhatti sanctuaries, will be used for compensatory plantation to be carried out by the DMRC. "The land is on Haryana border and will provide a direct corridor for the wildlife of both states. Plantation by DMRC will not be in the usual order of 10 trees to one but will be in keeping with the local biodiversity" said

work is on to develop the Aravalli BDP as a nature reserve. In a few years, the Aravalli BDP will welcome visitors to a specially designated zone that will function as a park within the park. The 70-acre area will have over 200 species of threatened plants and trees native to as a registered body under the the Aravalli areas of Delhi, Haryana and Rajasthan. The remaining park will be designated a nature reserve.

Scientist in-charge of the park, M Shah Hussain, said plantation on the identified site, entry to which would be from Nelson Mandela Marg. has begun with species that can no longer be found in Delhi. So far visits to the park are restricted with only education trips and groups of more than 30 permitted in guided tours. "Plant species like Kullu, Karaya Gum, Salai, Dhaba, Palash and Gurjan are being

planted at present," he said. The biodiversity park is being planted with native spocies, though even now about 30% of the park is covered with a dense growth of Prosopis juliflora or the vilayati kitar, a plant that was introduced by the British and which did not allow any other species to prosper. "We started with 85% coverage of Prosopis juliflora, but in the past 5 years we have re-introduced

native species," said Hussain. The park, being developed by DU's Centre for Environment Management and Degraded Ecosystem, will be divided into 4 zones eventually. The major part will be occupied by the nature reserve while the other three sections will include the visitor's area. Prof. CR Babu, project in- a nature educational zone and





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