

Area Development Project of Bharatpur, Rajasthan

3. Biological Environment

3.1. Introduction

Biodiversity reflects the potential of a regional ecosystem. Biota of a particular area is considered as indicators of the environment as they quickly respond not only to one environmental factor but also an interactive group of factors. These communities influence and react sensitively to changes in the balance of environmental stresses.

Biological diversity comprises the variability of genus, species and ecosystems and is very crucial for maintaining the basic processes on which the life depends. On the basis of biological physiology biodiversity broadly can be divided into two category i.e. the floral diversity and faunal diversity. Conservation of the biodiversity is essential for the sustainable development as it not only provides the food, fodder and medicine, but also contributes to improvement of essential environmental attributes like air, water, soil, etc. Before starting any Environmental Impact Assessment study, it is necessary to identify the baseline of relevant environmental parameters which are likely to be affected as a result of the operation of the proposed project. A similar approach has been adopted for conducting the study on Biological Environment for this Project. Both terrestrial and aquatic ecosystems have been studied to understand the biological environment nearby the project site.

The study was conducted in the project area to assess all possible consequences on the biological environment. Flora and fauna surveys and data collection conducted for assessing the biological diversity and its status over a period of time that forms an integral part of Impact Assessment Techniques. The present study is highlighting the various issues pertaining to floristic diversity and the faunal wealth in the core area *i.e.* Are Development Project (Scheme-13), Bharatpur(Rajasthan) and buffer zone *i.e.* area within 10 km radius.

3.1.1. Description of Study Area

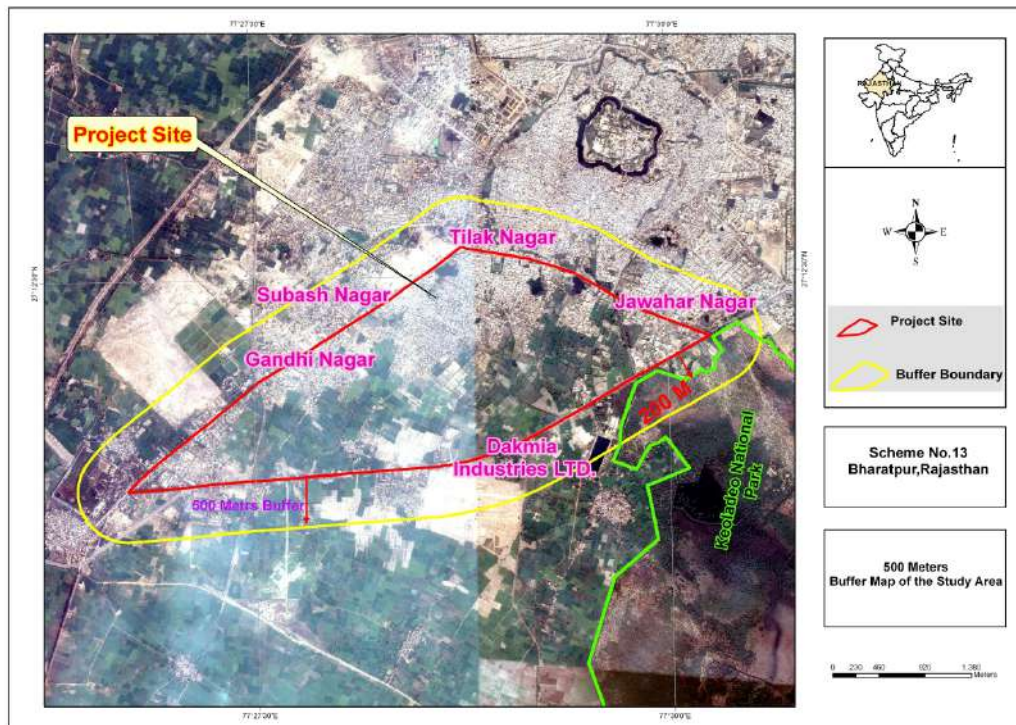
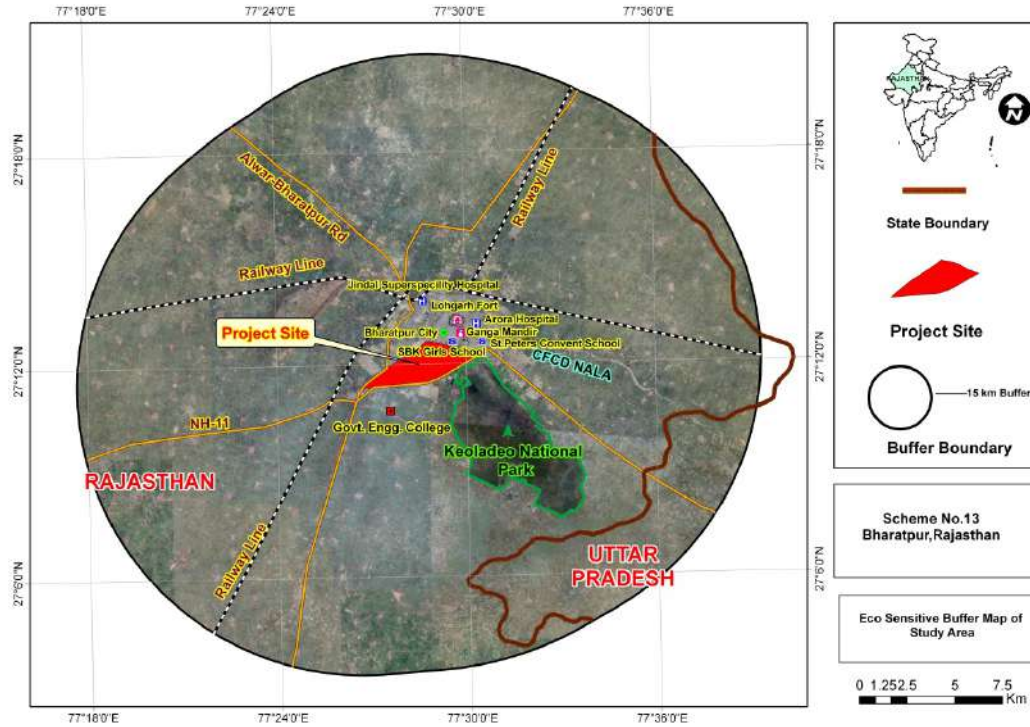
Present study of proposed development project is situated in Subhash Nagar of Bharatpur city (Rajasthan). The coordinates of the project site are 27°11'56.35"N and 77°28'24.67"E.

District Bharatpur lies on eastern part of Rajasthan located between 26°.22'to 27°.50' northern latitude and 76°.53'to 78°.17' eastern longitudes. According to national resource dots the district has a total land area of 5066 Sq.km which is 1.48% of the total area of Rajasthan State. All around boundaries of the district are as in north it is connected in the district Gurugram of Haryana; in the east with district Mathura and Agra of Utter Pradesh; and in the state it is connected with Dholpur and west Alwar and SwaiMadhopur district.

Bharatpur district is situated under the Seismic Zone-III as per IS-1893 (part-1)-2002. The district has a hot semi-arid tropical climate. The district has maximum agricultural land out of its total geographical area. The district is not enriched with forest. The forest of the district comprises of tropical deciduous

vegetation due to high temperature and humidity.

Keoladeo National Park (formerly known as the Bharatpur Bird Sanctuary) is situated at the distance of 0.2 km in East to South East direction of the project site. Besides this, any other eco-sensitive zone is not present in buffer 10 km buffer area. Location of the project (10 km & 500 buffer area) is shown in **Fig. 1** and **Fig. 2**.



3.1.2. Rainfall & Climate

The Bharatpur district has a dry climate except in the monsoon seasons. It becomes extremely hot during summer and extremely cold during winter. The cold season is from December to February and is followed by summer from March to June. Period from mid of September to end of November constitute post monsoon season. Average annual rainfall (2011) of the district is 605.3 mm. The rainfall has decreased over the years. The district experiences either mild or normal drought once in two years(Report of Central Ground Water Board, 2013).

3.1.3. Soil

The soil of the Bharatpur district is characterized by deep, medium and black shallow alluvium soils. These soils ranges in depth from shallow to very deep with lime concretion or lime encrusted gravels at varying depths. The soils in general are clay loam to clay in texture and moderately to less permeable and developing cracks in dry season (Report of Central Ground Water Board, 2013)

3.1.4. Drainage

Bharatpur is situated in the Yamuna River basin. On the other hand, Bharatpur district falls in parts of three different tributaries of River Yamuna such as River Ruparel, River Banganga and River Gambhiri River (Report of Central Ground Water Board, 2013)

3.2. Methodology

3.2.1. Period of Sampling

The ecological survey has been conducted during Post monsoon season for the collection of primary data of flora-fauna, vegetation, soil and other environmental observations. The details are given as below:

Post-monsoon: October to December

Core zone : At the project site

Buffer zone : Around 10 km radius of the project site

3.2.2. Mode of Data Collection

Detailed survey was conducted to evaluate floral and faunal composition of the study area. Primary data on floral and faunal composition was recorded during site visit and secondary data was collected from the Forest Department and published relevant literature. Inventory of flora and fauna has been prepared on the basis of collected data. The mode of data and parameters considered during field investigations is given in Table 3.1.

Table 3.1: Mode of Data Collection & Parameters Considered During the Survey

Aspect	Data	Mode of data collection	Parameters Monitored
Terrestrial Ecology	Primary data collection	By field survey	Floral and Faunal diversity
	Secondary data collection	* Department of Forest Rajasthan * Department of Agriculture, Rajasthan *Keoladeo National Park, Bharatpur	Floral and Faunal diversity, Types of vegetation, forest type, Importance etc.

3.3. Component of Biological Environment of Core Zone

Core zone of present proposed project is comprised of buildup area, agricultural land, aquatic habitats and private jungle-jhari land. Biological components of core zone can be divided into following categories: -

- A. Terrestrial Flora of Core Zone
- B. Terrestrial Fauna of Core Zone
- C. Aquatic Flora of Core Zone
- D. Aquatic Flora of Core Zone

A. Terrestrial Flora of Core Zone

Core zone of proposed development project has some major trees, shrubs, herbs and seasonal grasses. Some common trees recorded nearby human settlements and other open areas of in the core zone were as Jamun (*Syzygium cumini*) and Khair (*Acacia catechu*), Beal (*Aegle marmelos*), Shami (*Prosopis cineraria*), *Acacia leucophloea*, Ber (*Zizyphus mauritiana*) Aam (*Mangifera indica*) *Albizia lebbeck* (Kala Siris), Neem (*Azadirachta indica*), Dhola or Palas (*Butea monosperma*), Bad (*Ficus bengalensis*), Pipal (*Ficus religiosa*), Gular (*Ficus racemosa*) were observed in the core zone. Some common flora/vegetation observed in the core zone of present project is given in **Table 3.2**.

Table 3.2: Common Vegetation of the Core Zone

Sl. No.	Botanical Name	Family	Local Name
Trees			
1	<i>Acacia catechu</i>	Mimosaceae	Khair
2	<i>Aegle marmelos</i>	Rutaceae	Bael
3	<i>Albizia lebbeck</i>	Mimosaceae	Siris (Kala)
4	<i>Azadirachta indica</i>	Meliaceae	Neem
5	<i>Cassia fistula</i>	Caesalpiniaceae	Amaltas
6	<i>Emblica officinalis</i>	Euphorbiaceae	Amla
7	<i>Ficus bengalensis</i>	Moraceae	Bad
8	<i>Ficus religiosa</i>	Moraceae	Pipal
9	<i>Mangifera indica</i>	Anacardiaceae	Aam
10	<i>Prosopis cineraria</i>	Fabaceae	Shami
11	<i>Syzygium cumini</i>	Sterculiaceae	Jamun
12	<i>Tamarindus indica</i>	Caesalpiniaceae	Imli
13	<i>Zizyphus mauritiana</i>	Rhamnaceae	Ber
14	<i>Zizyphus xylocarpa</i>	Rhamnaceae	Ghat ber
Shrubs and herbs			
1			
2	<i>Cassia auriculata</i>	Fabaceae	Anwal
3	<i>Cassia tora</i>	Fabaceae	Panwar
4	<i>Euphorbia hirta</i>	Euphorbiaceae	Dudhi
5	<i>Ipomoea fistula</i>	Apocynaceae	Besharam
6	<i>Lantana camera</i>	Lamiaceae	Jhurhari
7	<i>Tamarix</i> sp.	Tamaricaceae	Jhan
8	<i>Zizyphus mumuleria</i>	Rhamnaceae	Jhasber

Climbers			
1	<i>Abrus precatorius</i>	Fabaceae	Chirmu
2	<i>Asparagus dumosus</i>	Liliaceae	Narkanta
3	<i>Ichnocarpus frutescens</i>	Asteraceae	Dudhi
4	<i>Momordica charantia</i>	Cucurbitaceae	Kakoda
Grasses			
1	<i>Apluda mutica</i>	Poaceae	Polda
2	<i>Aristida setacea</i>	Poaceae	Garra
3	<i>Cenchrus setigerus</i>	Poaceae	Bharut
4	<i>Chrysopogon fulvus</i>	Poaceae	Seran
5	<i>Dactyloctenium aegyptium</i>	Poaceae	Makra
6	<i>Dichanthium annulafum</i>	Poaceae	Karad
7	<i>Eremopogon foreolatus</i>	Poaceae	Buhari
Source: GRC survey data supported by Department of Forest			

B. Terrestrial Fauna of Core Zone

Core zone of present proposed project is comprised of buildup area, agricultural land, aquatic habitats and private jungle-jhari land. Domesticated mammal species are reported from core zone during the field survey. Common grazing animals like Cow, Goat and Buffalo etc. were noticed in the core zone. Inquiry from local people regarding wild animals reveals that monkey, fruits bat, Indian Fox etc. are often seen in the area. On the other hand, bird's nest in the core zone was not observed due to the lack suitable habitats and full of human settlements. List of Mammals/Birds/Amphibians and Reptile's present in core zone is given in **Table 3.3. and Table 3.4.**

Table 3.3. List of Mammals/Birds/Amphibians and Reptile's found in the Core zone

SL. No	English Name	Scientific Name	Schedule Status (WPA,1972)	IUCN Status
Mammals				
1	Golden Jackal	<i>Canis aureus</i>	II	LC
2	Grey Musk Shrew	<i>Suncus murinus</i>	-	LC
3	Indian Field Mouse	<i>Mus booduga</i>	V	LC
4	Indian Flying Fox Bat	<i>Pteropus giganteus</i>	V	LC
5	Indian Grey Mongoose	<i>Herpestes edwardsii</i>	IV	LC
6	Jungle cat	<i>Felis chaus</i>	II	LC
Reptiles (Snakes)				
1	Common Krait	<i>Bungarus caeruleus</i>	IV	LC
2	Banded Krait	<i>Bungarus fasciatus</i>	IV	LC
4	Indian Cobra	<i>Naja naja</i>	II	LC
5	Rat Snake	<i>Ptyas mucosus</i>	II	NA
Lizards				
1	Rock Lizard	<i>Agama buberulatus</i>	-	LC
2	Indian House Gecko	<i>Hemidactylus flaviviridis</i>	-	LC
3	Monitor Lizard	<i>Varanus indicus</i>	II	LC
Source: GRC Survey Data supported by Department of Forest, Rajasthan				
IUCN: LC: Least Concern, NA: Not Assessed.				

Table 3.4. List of Avian species found in the Core zone

S.No.	Scientific Name	English Name	WPA (1972)	IUCN
1	<i>Acridotheres tristis</i>	Common Myna	IV	LC
2	<i>Apus nipalensis</i>	House Swift	IV	LC
3	<i>Columba livia</i>	Rock Pigeon	IV	LC
4	<i>Corvus macrorhynchos</i>	Jungle Crow	IV	LC
5	<i>Corvus splendens</i>	House Crow	IV	LC
6	<i>Coturnix coturnix</i>	Common Quail	IV	LC
7	<i>Dicrurus macrocercus</i>	Black Drongo	IV	LC
8	<i>Motacilla alba</i>	White Wagtail	IV	LC
9	<i>Passer domesticus</i>	House Sparrow	IV	LC
10	<i>Psittacula krameri</i>	Rose-ringed Parakeet	IV	LC
11	<i>Turdoides caudata</i>	Common Babbler	IV	LC
12	<i>Upupa epops</i>	Common Hoopoe	IV	LC
Source : GRC Survey Data supported by Data of Department of Forest Rajasthan				
Note: LC: Least Concern.				

C.Aquatic Flora of Core Zone

In general, flora account of any aquatic system or water bodies can be divided into two categories *i.e.*, (i) Phytoplankton and (ii) Macrophytes. The details of aquatic vegetation collected and identified from the water bodies situated in the core zone are given in **Tables 3.5** and **Table 3.6**.

Table 3.5: Phytoplankton Species recorded from different Aquatic Habitats of Core zone

Sl. No.	Name of the Taxa	Sl. No.	Name of the Taxa
	Chlorophyceae	11	<i>Navicula cuspidata</i>
1	<i>Ankistrodesmus</i> sp.	12	<i>Nitzschia palea</i>
2	<i>Ankistrodesmus falcatus</i>	13	<i>Surirella ovalis</i>
3	<i>Ankistrodesmus convolutus</i>	14	<i>Synedraacus</i>
4	<i>Chlorella</i> sp.		Cyanophyceae
5	<i>Chlorella vulgaris</i>	1	<i>Anabaena</i> sp.
6	<i>Chlorococcum</i> sp.	2	<i>Anabaena constricta</i>
7	<i>Closterium</i> sp.	3	<i>Anabaena naviculoides</i>
8	<i>Closterium acutum</i>	4	<i>Chroococcus</i> sp.
9	<i>Cosmarium granatum</i>	5	<i>Chroococcus varians</i>
10	<i>Cosmarium tenue</i>	6	<i>Chroococcus granosa</i>
11	<i>Cosmarium</i> sp.	7	<i>Lyngbyasp.</i>
12	<i>Desmidium</i> sp.	8	<i>Lyngbyaventricosa</i>
13	<i>Pediastrum duplex</i>	9	<i>Merismopedia punctata</i>
14	<i>Pediastrum simplex</i>	10	<i>Microcystis aeruginosa</i>
15	<i>Pediastrum tetras</i>	11	<i>Nostoc</i> sp.
16	<i>Scenedesmus quadricauda</i>	12	<i>Oscillatoria</i> sp.
17	<i>Scenedesmus dimorphus</i>	13	<i>Oscillatoria amphibia</i>
18	<i>Scenedesmus armatus</i>	14	<i>Oscillatoria subbrevis</i>
19	<i>Tetraedron</i> sp.	15	<i>Phormidium</i> sp.
20	<i>Tetraedron minimum</i>	16	<i>Spirulina laxa</i>

	Bacillariophyceae	17	<i>Spirulina major</i>
1	<i>Amphora ovalis</i>	18	<i>Synechocystis</i> sp.
2	<i>Amphora minutissima</i>		Euglenophyceae
3	<i>Cocconeis</i> sp.	1	<i>Euglena</i> sp.
4	<i>Cymbella placenula</i>	2	<i>Euglena acus</i>
5	<i>Cymbella tumida</i>	3	<i>Phacus</i> sp.
6	<i>Fragillaria</i> sp.	4	<i>Trachelomonas</i> sp.
7	<i>Gomphonema</i> sp.		Dinophyceae
8	<i>Gomphonema gracile</i>	1	<i>Ceratium</i> sp.
9	<i>Gomphonema olivaceum</i>	2	<i>Peridinium</i> sp.
10	<i>Melosira</i> sp.		
Source: GRC Survey data			

Table 3.6: Aquatic Macrophytes recorded from different Aquatic Habitats of Core zone

Sl. No.	Name of the Taxa		
1	<i>Azolla pinnata</i>	10	<i>Ludwigia</i> sp.
2	<i>Ceratophyllum demersum</i>	11	<i>Myriophyllum spicatum</i>
3	<i>Cyperus alopecuroides</i>	12	<i>Najas graminea</i>
4	<i>Eichhornia crassipes</i>	13	<i>Ottelia alismoids</i>
5	<i>Hydrilla verticillata</i>	14	<i>Phragmites karka</i>
6	<i>Ipomoea aquatica</i>	15	<i>Polygonum barbatum</i>
7	<i>Lemna aequinoctialis</i>	16	<i>Polygonum glabrum</i>
8	<i>Lemna minor</i>	17	<i>Potamogeton nodosus</i>
9	<i>Limnophila indica</i>	18	<i>Typha angustata</i>
Source: GRC Survey Data			

D. Aquatic Fauna of Core Zone:

In general, faunal account of any aquatic system or water bodies can be divided into following categories:

i. Zooplankton

ii. Macro-invertebrates

iii. Amphibians

iv Reptiles

v. Fishes

The details of aquatic flora collected and identified from different water bodies situated in the core zone are given in **Tables 3.7 to Table 3.9.**

Table: 3.7: Zooplankton Species Recorded from different Aquatic Habitats of Buffer zone of Present mine

Name of the Taxa			
Sl. No.	Protozoa	Sl. No.	Copepoda
1	<i>Arcella</i> sp.	1	<i>Cyclops</i> sp.
2	<i>Centropyxis</i> sp.	2	<i>Mesocyclops</i> sp.
3	<i>Diffugia</i> sp.	3	<i>Thermocyclops</i> sp.
4	<i>Paramoecium</i> sp.	4	<i>Diaptomus</i> sp.
	Rotifera	5	Nauplius larvae

1	<i>Asplanchna brightwelli</i>		Cladocera
2	<i>Brachionus angularis</i>	1	<i>Alona intermedia</i>
3	<i>Brachionus calciflorus</i>	2	<i>Bosmina</i> sp.
4	<i>Brachionus falcatus</i>	3	<i>Bosmina longirostris</i>
5	<i>Brachionus</i> sp.	4	<i>Chydorus</i> sp.
6	<i>Cephalodella gibba</i>	5	<i>Daphnia</i> sp.
7	<i>Filinia longiseta</i>	6	<i>Daphnia pulex</i>
8	<i>Keratella cochlearis</i>	7	<i>Diaphanosoma excisum</i>
9	<i>Keratella tropica</i>		Ostracoda
10	<i>Lecane closterocera</i>	1	<i>Cypris</i> sp.
11	<i>Lecane luna</i>	2	<i>Stenocypris</i> sp.
Source: GRC Survey Data			

Table: 3.8: Macro-invertebrates Species recorded from different Aquatic Habitats of Core zone

Name of the Groups	Name of the Taxa
Mollusca	<i>Corbicula</i> sp.
	<i>Corbicula striata</i>
	<i>Gyraulus</i> sp.
	<i>Lamellidens</i> sp.
	<i>Melanoides scabra</i>
	<i>Thira tuberculata</i>
Diptera	<i>Chironomus</i> sp.
	<i>Chironomus plumosus</i>
	<i>Tendipes kiefferulus</i>
Oligochaete	<i>Dero dagitata</i>
	<i>Pheretima</i> sp.
	<i>Tubifex tubifex</i>
Crustacea	<i>Gammarus pulex</i>
	<i>Palemone</i> sp.
Trichoptera	<i>Glossosoma</i> sp.
	<i>Hydropsyche</i> sp.
Ephemeroptera	<i>Baetis nymph</i>
	<i>Caenis runlorum</i>
Source: GRC Survey Data	

Table 3.9: Amphibianspecies found in the Core Zone of Study Area

SL. No	English Name	Scientific Name	Schedule Status (WPA-1972)	IUCN Status
Amphibian				
1	Common Indian toad	<i>Duttaphrynus melanostictus</i>	IV	LC
2	Indian skipper frog	<i>Euphlyctis cyanophlyctis</i>	IV	LC
3	Indian bull frog	<i>Hoplobatrachus tigerinus</i>	IV	LC
Source: GRC Survey Data and Data supported by Department of Forest, Rajasthan				
IUCN: LC: Least concern.				

Table 3.10: Fish species found in different water bodies of Core Zone

Classification	Scientific Name	Hindi Name	IUCN Status
Order- Beloniformes			
Family: Belonidae	<i>Xenentodon</i> sp.	Kakila	LC
Order-Cyprinidontiforms			
Family: Cyprinidae	<i>Catla catla</i>	Catla	LC
	<i>Labeo rohita</i>	Rohu	LC
	<i>Puntius chola</i>	Pothia	LC
	<i>Puntius sarana</i>	Pothia	LC
	<i>Puntius ticto</i>	Pothia	LC
Order- Perciformes			
Family: Channidae	<i>Channa punctatus</i>	Shauli/ Garai	LC
	<i>Channa striatus</i>	Garai	LC
Order- Siluriformes			
Family:Heteropneustidae	<i>Heteropneustes fossilis</i>	Singhi	LC
Family: Bagridae	<i>Mystus cavasius</i>	Tengra	LC
IUCN Status=LC: Least Concern, NE: Not Evaluated, EN: Endangered, NT: Near Threatened			

3.4. Biological Component of Buffer Zone

3.4.1. Flora of the Buffer Zone

3.4.1.1. Forests

The present study on the floral assessment for the proposed project activity is based on extensive field survey of the area. The plant species were identified with the help of taxonomists of related fields and nearby Institutions. Besides the collection of plant species, information was also collected with vernacular names of plant species made by local inhabitants. In this process the whole study area was divided into different sections to get the maximum diversity of plant species. The sampling sites were selected based on land use pattern, topography and floristic composition of the study area. The other relevant data on biodiversity, like economically important plant species and medicinal plant, Rare and endangered species in the study area have been collected from secondary sources like forest and wildlife departments.

Bharatpur district has dry deciduous forest and total forest is 236. Sq.km.Keoladeo National Park is situated adjacent to the proposed project site in East to South East direction which is declared and protected under “Wildlife (Protection) Act-1972”.

The most dominant tree species in both the study area are *Albizia lebeck*, *Azadirachta indica*, *Acacia* sp., *Cassia fistula*, *Emblica officinalis* and *Mangifera indica*, *Madhuca indica*, *Zizyphus nummularia*, *Acacia chundra*, *Diospyros melanoxylon*, *Aegle marmelos*, *Dichrostachys cinerea*, *Bauhinia racemosa* and *Mitragyna* sp. whereas, among shrubs, *Antigonum leptopus*, *Ricinus communis*, *Lantana camara*, *Jatropha gossipifolia* and *Cassia auriculata* etc. are found in the buffer area. The details of forest cover in Bharatpur district are given in **Table 3.11**.

Table 3.11: Forest Cover Area in Bharatpur District, Rajasthan (Area in Sq.km)

Geographical Area	Very dense forest	Mod. Dense forest	Open forest	Total	% of G.A.	Change*	Scrub
5,066	0	34	202	236	4.66	0	90

Source: Indian State Forest report, Rajasthan, 2009.

3.4.1.2. Vegetation in and around Human Settlement

Vegetation pattern in and surrounding areas are slightly different from the rest of the areas in the buffer zone of present development project. The common species grown near settlements are mostly edible or useful plants such as *Acacia chundra*, *Acacia nilotica*, *Aegle marmelos*, *Azadirachta indica*, *Bauhinia racemosa*, *Butea monosperma*, *Diospyros melanoxylon*, *Diospyros melanoxylon*, *Dichrostachys cinerea*, *Madhuca indica*, *Zizyphusnummularia*, *Mangifera indica*, *Emblica officinalis* and *Mitragyna sp.*

3.4.1.3. Terrestrial Flora of the Buffer Zone

Buffer zone of the present study area is mainly agricultural land, human settlements, jungle jhari land. On the other hand, Keoladeo National Park is also situated in the buffer zone. During the present investigation of buffer zone several trees/plants were recorded. Common plant species such as Sagavan, Salan, Khair, Bael, Kadam, Amaltas, Bahera, Mahuwa, Salar, Shisham, Gular, Jamun, Neem, Pipal and Aam were recorded from the buffer zone. Plant species comes under the RET (Rare, Endangered and Threatened) category were not observed in the buffer core as well as buffer zone. A list of flora of Buffer zone is given in **Table 3.12.**

Table 3.12: List of Terrestrial Flora of Study Area, Bharatpur

Sl. No.	Botanical Name	Family	Local Name
Trees			
1	<i>Acacia catechu</i>	Mimosaceae	Khair
2	<i>Acacia leucophloea</i>	Mimosaceae	Rojjh
3	<i>Adina cordifolia</i>	Rubiaceae	Haldu
4	<i>Aegle marmelos</i>	Rutaceae	Billi
5	<i>Albizia lebeck</i>	Mimosaceae	Siris (Kala)
6	<i>Albizia procera</i>	Mimosaceae	Khadi (Safed Siris)
7	<i>Anogeissus latifolia</i>	Combretaceae	Dhaura
8	<i>Anogeissus pendula</i>	Combretaceae	Dhokra
9	<i>Azadirachta indica</i>	Meliaceae	Neem
10	<i>Balanites aegyptiaca</i>	Asclepiadiaceae	Hingoca
11	<i>Bauhinia racemosa</i>	Caesalpiaceae	Jhingha
12	<i>Bombax ceiba</i>	Bombacaceae	Semal
13	<i>Boswellia serrata</i>	Burseraceae	Salar
14	<i>Butea monosperma</i>	Fabaceae	Dhola
15	<i>Cassia fistula</i>	Caesalpiaceae	Amaltas
16	<i>Cassia fistula</i>	Fabaceae	Mokua
17	<i>Dichrostachys cinerea</i>	Cyperaceae	Goya Khair
18	<i>Diospyros melanoxylon</i>	Ebnaceae	Tendu
19	<i>Emblica officinalis</i>	Euphorbiaceae	Amla
20	<i>Ficus bengalensis</i>	Moraceae	Bad

21	<i>Ficus cordifolia</i>	Moraceae	Paras papal
22	<i>Ficus racemosa</i>	Moraceae	Gular
23	<i>Ficus religiosa</i>	Moraceae	Pipal
24	<i>Flacourtia indica</i>	Flacourtiaceae	Kakon
25	<i>Holoptelea integrifolia</i>	Moraceae	Churel
26	<i>Lannea coromandelica</i>	Lamiaceae	Gurjan
27	<i>Madhuca indica</i>	Sapotaceae	Mahua
28	<i>Mangifera indica</i>	Anacardiaceae	Aam
29	<i>Mallotus philippinensis</i>	Euphorbiaceae	Umbia
30	<i>Mitragyna parvifolia</i>	Rubiaceae	Kada
31	<i>Moringa oleifera</i>	Moringaceae	Serjna
32	<i>Pterocarpus marsupium</i>	Fabaceae	Bija
33	<i>Soymida febrifuga</i>	Meliaceae	Rohan
34	<i>Sterculia urens</i>	Sterculiaceae	Karaya
35	<i>Syzygium cumini</i>	Sterculiaceae	Jamun
36	<i>Tamarindus indica</i>	Caesalpinaceae	Imli
37	<i>Terminalia arjuna</i>	Combretaceae	Kohra
38	<i>Terminalia bellerica</i>	Combretaceae	Bahera
39	<i>Terminalia tomentosa</i>	Combretaceae	Sadera
40	<i>Wrightia tinctoria</i>	Apocynaceae	Khirmi
41	<i>Zizyphus mauritiana</i>	Rhamnaceae	Bor
42	<i>Zizyphus xylocarpa</i>	Rhamnaceae	Ghat ber
Shrubs and herbs			
1	<i>Carissa spinarum</i>	Apocyanaceae	Karonda
2	<i>Cassia auriculata</i>	Fabaceae	Anwal
3	<i>Cassia tora</i>	Fabaceae	Panwar
4	<i>Cuculigoorchioides</i>	Hypoxidaceae	Dholimusli
5	<i>Dendrocalamus strictus</i>	Poaceae	Bans
6	<i>Euphorbia hirta</i>	Euphorbiaceae	Dudhi
7	<i>Ipomoea fistula</i>	Apocyanaceae	Besharam
8	<i>Lantana camera</i>	Lamiaceae	Jhurhari
9	<i>Olerodendron viscorun</i>	Asteraceae	Amia
10	<i>Scilla spinarum</i>	Liliaceae	KoliKandi
11	<i>Tamarix dioica</i>	Tamaricaceae	Jhan
12	<i>Zizyphus mumuleria</i>	Rhamnaceae	Jhasber
Climbers			
1	<i>Abrus precatorius</i>	Fabaceae	Chirmu
2	<i>Asparagus dumosus</i>	Liliaceae	Narkanta
3	<i>Butea superba</i>	Fabaceae	Palasbel
4	<i>Crotolaria orisensis</i>	Fabaceae	Aonlbel
5	<i>Cryptolepis buchani</i>	Periplocaceae	Bichhubel
6	<i>Ichnocarpus frutescens</i>	Asteraceae	Dudhi
7	<i>Momordica charantia</i>	Cucurbitaceae	Kakoda
8	<i>Mucuna prarita</i>	Fabaceae	Kenwach
9	<i>Tinospora cordifolia</i>	Tiliaceae	Neemgiloy
Grasses			
1	<i>Apluda mutica</i>	Poaceae	Polda

2	<i>Aristida depressa</i>	Poaceae	Lampals
3	<i>Aristida setacea</i>	Poaceae	Garra
4	<i>Aseilema laseum</i>	Poaceae	Gandel
5	<i>Cenchrus setigerus</i>	Poaceae	Bharut
6	<i>Chrysopogon fulvus</i>	Poaceae	Seran
7	<i>Dactyloctenium aglypticum</i>	Poaceae	Makra
8	<i>Dichanthium annulafum</i>	Poaceae	Karad
9	<i>Eremopogon foreolatus</i>	Poaceae	Buhari
10	<i>Heteropogon contortus</i>	Poaceae	Surwala
11	<i>Imperata cylindrica</i>	Poaceae	Dab
12	<i>Sorghum habepensa</i>	Poaceae	Baru
13	<i>Themeda quadrivalvis</i>	Poaceae	Ratda
Source: GRC survey data supported by Department of Forest Rajasthan			

3.4.1.4. Aquatic Flora of the Buffer Zone

Aquatic plants are plants that have adapted to living in aquatic environments. They are also referred to as macrophytes (Hydrophytes). Aquatic plants can only grow in water or in soil that is permanently saturated with water. During the present investigation some macrophytic vegetation were identified growing in and around the aquatic habitats in the buffer zone are listed in **Table 3.13**.

Table 3.13: List of Macrophytes recorded from Buffer Zone

Sl. No.	Name of the Taxa
1	<i>Azolla pinnata</i>
2	<i>Ceratophyllum demersum</i>
3	<i>Cyperus alopecuroides</i>
4	<i>Eichhornia crassipes</i>
5	<i>Hydrilla verticillata</i>
6	<i>Ipomoea aquatica</i>
7	<i>Lemna aequinoctialis</i>
8	<i>Limnophila indica</i>
9	<i>Ludwigia</i> sp.
10	<i>Myriophyllum spicatum</i>
11	<i>Najas graminea</i>
12	<i>Ottelia alismoids</i>
13	<i>Phragmites karka</i>
14	<i>Polygonum barbatum</i>
15	<i>Polygonum glabrum</i>
16	<i>Potamogeton nodosus</i>
17	<i>Spirodela polyrhiza</i>
18	<i>Typha angustata</i>
19	<i>Utricularia aurea</i>
Source: GRC Survey Data	

3.4.2. Fauna of the Buffer zone

The major parts of buffer area lies under agriculture field and human settlements. Whereas, Keoladeo National Park is situated adjacent to the project site in East to South east direction. Except the flora and

fauna of Keoladeo National Park, buffer zone of the present project is devoid of any rare, endangered and threatened plant and animal's species which are protected under Wildlife (Protection) Act, 1972. A list of animals of the study area has been prepared on the basis of inquiry from local people and from the available published literatures. The animals thus recorded were cross checked with Wildlife (Protection) Act, 1972 for their schedule status. The animals present in the Keoladeo National Park are already conserve and protected the concern authority. So, there is no need to prepare a conservation Plan for the fauna of Keoladeo National Park. The fauna of study area can be grouped in to aquatic and terrestrial as the area mostly comprises of aquatic fauna and the buffer area provides shelter to the terrestrial animals.

3.4.2.1. Terrestrial Fauna of buffer Zone

➤ Mammals

Bharatpur district has several mammal species. As per present survey and inquiry from local people, movement of schedule-I category animals have not been seen in the buffer zone. On the basis of local survey and inquiry some domesticated animals such as Cow, Goat, and Buffalo were recorded from the buffer zone. List of Mammal, Amphibian and Reptile animals (**including Fauna of Keoladeo National Park**) is given in **Table 3.14**.

Table 3.14: List of Mammal, Amphibian and Reptile animals of Buffer Zone

SL. No	English Name	Scientific Name	Schedule Status (WPA,1972)	IUCN Status
1	Bandicoot Rat	<i>Bandicota indica</i>	V	LC
2	Barking deer	<i>Muntiacus muntjac</i>	III	LC
3	Golden Jackal	<i>Canis aureus</i>	II	LC
4	Grey Musk Shrew	<i>Suncus murinus</i>	-	LC
5	Indian Field Mouse	<i>Mus booduga</i>	V	LC
6	Indian Flying Fox Bat	<i>Pteropus giganteus</i>	V	LC
7	Indian Grey Mongoose	<i>Herpestes edwardsii</i>	IV	LC
8	Indian Hare	<i>Lepus nigricollis</i>	IV	LC
9	Indian langur	<i>Semnopithecus entellus</i>	-	-
10	Indian porcupine	<i>Hystrix indica</i>	IV	LC
11	Indian Wild Boar	<i>Sus scrofa</i>	III	LC
12	Jungle cat	<i>Felis chaus</i>	II	LC
13	Sambar	<i>Cervus unicolor</i>	III	VU
14	Wild boar	<i>Sus scrofa</i>	III	LC
Reptiles (Snakes)				
1	Common Krait	<i>Bungarus caeruleus</i>	IV	NA
2	Banded Krait	<i>Bungarus fasciatus</i>	IV	NA
4	Indian Cobra	<i>Naja naja</i>	II	LC
5	Rat Snake	<i>Ptyas mucosus</i>	II	NA
6	Indian Python	<i>Python molurus</i>	I	NT
Lizards				
1	Rock Lizard	<i>Agama buberculatus</i>	-	DD
2	Indian House Gecko	<i>Hemidactylus flaviviridis</i>	-	DD

3	Monitor Lizard	<i>Varanus indicus</i>	II	LC
Turtle				
1	Elongated tortoise	<i>Indotestudoelongata</i>	IV	LC
Avian Fauna (Birds)				
1	<i>Acridotheres fuscus</i>	Jungle Myna	IV	LC
2	<i>Acridotheres tristis</i>	Common Myna	IV	LC
3	<i>Alcedo atthis</i>	Common Kingfisher	IV	LC
4	<i>Apus nipalensis</i>	House Swift	IV	LC
5	<i>Artamus fuscus</i>	Ashy Wood swallow	IV	LC
6	<i>Athene brama</i>	Spotted Owlet	IV	LC
7	<i>Cinnyris asiaticus</i>	Purple Sunbird	IV	LC
8	<i>Columba livia</i>	Rock Pigeon	IV	LC
9	<i>Corvus macrorhynchos</i>	Jungle Crow	IV	LC
10	<i>Corvus splendens</i>	House Crow	IV	LC
11	<i>Coturnix coturnix</i>	Common Quail	IV	LC
12	<i>Cuculus canorus</i>	Common Cuckoo	IV	LC
13	<i>Cuculus micropterus</i>	Indian Cuckoo	IV	LC
14	<i>Dicrurus macrocercus</i>	Black Drongo	IV	LC
15	<i>Gallus gallus</i>	Red Jungle fowl	IV	LC
16	<i>Megalaima virens</i>	Great Barbet	IV	LC
17	<i>Motacilla alba</i>	White Wagtail	IV	LC
18	<i>Passer domesticus</i>	House Sparrow	IV	LC
19	<i>Pavo cristatus</i>	Peafowl	I	LC
20	<i>Perdica asiatica</i>	Jungle Bush Quail	IV	LC
21	<i>Psittacula krameri</i>	Rose-ringed Parakeet	IV	LC
22	<i>Pycnonotus cafer</i>	Red-vented Bulbul	IV	LC
23	<i>Saroglossa spiloptera</i>	Spot-winged Starling	IV	LC
24	<i>Saxicola ferreus</i>	Grey Bushchat	IV	LC
25	<i>Streptopelia orientalis</i>	Oriental Turtle Dove	IV	LC
26	<i>Turdoides caudata</i>	Common Babbler	IV	LC
27	<i>Turdoides striata</i>	Jungle Babbler	IV	LC
28	<i>Upupa epops</i>	Common Hoopoe	IV	LC
Source: GRC Survey Data supported by Data of Department of Forest Rajasthan and Official website of Keoladeo national Park				
IUCN: DD: Data Deficient, LC: Least Concern, VU: Vulnerable, NE: Not Evaluated, EN: Endangered, NT: Near Threatened.				

3.4.2.2. Aquatic Fauna of buffer Zone

Aquatic animals found in the different habitat in the study area are given in **Table 3.15 to Table 3.18**

Table: 3.15: Zooplankton Species Recorded from Buffer Zone

Name of the Groups	Name of the Taxa
Protozoa	<i>Arcella</i> sp.
	<i>Centropyxis</i> sp.
	<i>Diffugia</i> sp.
	<i>Paramoecium</i> sp.
Rotifera	<i>Asplanchna brightwelli</i>

	<i>Brachionus angularis</i>
	<i>Brachionus calciflorus</i>
	<i>Brachionus falcatus</i>
	<i>Brachionus</i> sp.
	<i>Cephalodella gibba</i>
	<i>Filinia longiseta</i>
	<i>Keratella cochlearis</i>
	<i>Keratella tropica</i>
	<i>Lecane closterocera</i>
	<i>Lecane luna</i>
Copepoda	<i>Cyclops</i> sp.
	<i>Mesocyclops</i> sp.
	<i>Thermocyclops</i> sp.
	<i>Diaptomus</i> sp.
	Nauplius larvae
Cladocera	<i>Alona intermedia</i>
	<i>Bosmina</i> sp.
	<i>Bosmina longirostris</i>
	<i>Chydorus</i> sp.
	<i>Daphnia</i> sp.
	<i>Daphnia pulex</i>
	<i>Diaphanosoma excisum</i>
Ostracoda	<i>Cypris</i> sp.
	<i>Stenocypris</i> sp.
Source: GRC Survey Data	

Table: 3.16: Macro-invertebrates Species Recorded from Buffer Zone

Name of the Groups	Name of the Taxa
Mollusca	<i>Corbicula</i> sp.
	<i>Corbicula striata</i>
	<i>Gyraulus</i> sp.
	<i>Lamellidens</i> sp.
	<i>Melanoides scabra</i>
	<i>Thira tuberculata</i>
Diptera	<i>Chironomus</i> sp.
	<i>Chironomus plumosus</i>
	<i>Tendipes kiefferulus</i>
Oligochaete	<i>Dero dagitata</i>
	<i>Pheretima</i> sp.
	<i>Tubifex tubifex</i>
Crustacea	<i>Gammarus pulex</i>
	<i>Palemone</i> sp.
Trichoptera	<i>Glossosoma</i> sp.
	<i>Hydropsyche</i> sp.
Ephemeroptera	<i>Baetis nymph</i>
	<i>Caenis runlorum</i>
Source: GRC Survey Data	

Table: 3.17: Amphibian Species Recorded from Buffer Zone of Study area-1 and 2

Sl. No.	Common name	Scientific name	Schedule / WPA,1972	IUCN Status
1	Common Indian toad	<i>Duttaphrynus melanostictus</i>	IV	NA
2	Indian skipper frog	<i>Euphlyctis cyanophlyctis</i>	IV	NA
3	Indian bull frog	<i>Hoplobatrachus tigerinus</i>	IV	NA

Source:GRC Survey Data supported by Department of Forest, Rajasthan

Table-3.17:Fish Species Found in the Buffer Zone

Classification	Scientific Name	Hindi Name	IUCN Status
Order-Cyprinidontiforms			
Family: Cyprinidae	<i>Catla catla</i>	Catla	LC
	<i>Labeo rohita</i>	Rohu	LC
	<i>Puntius chola</i>	Pothia	LC
	<i>Puntius sarana</i>	Pothia	LC
	<i>Puntius ticto</i>	Pothia	LC
Order- Siluriformes			
Family:Heteropneustidae	<i>Heteropneustes fossilis</i>	Singhi	LC
Family: Bagridae	<i>Mystus cavasius</i>	Tengra	LC
Order- Perciformes			
Family: Channidae	<i>Channa punctatus</i>	Shauli/ Garai	LC
	<i>Channa striatus</i>	Garai	LC
Order- Beloniformes			
Family: Belonidae	<i>Xenentodon sp.</i>	Kakila	LC

3.5. Occurrence of Schedule-I and Rare, Endangered and Threatened (RET) Species

During the present investigation of buffer zone, plant species which comes under the RET category has not been observed. Among schedule-I species, **Peafowl** and **Indian Python** were recorded from the buffer zone and for them conservation plan has been prepared and attaches with the reports. The animals present in the Keoladeo National Park are already conserve and protected the concern authority. So, there is no need to prepare a conservation Plan for the fauna of Keoladeo National Park. However, all care will be taken for protection of others flora & fauna also, if any in the lease hold area.