



MANDALGARH, RAJASTHAN

2017



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WEBSITE: www.fes.org.in EMAIL: ed@fes.org.in

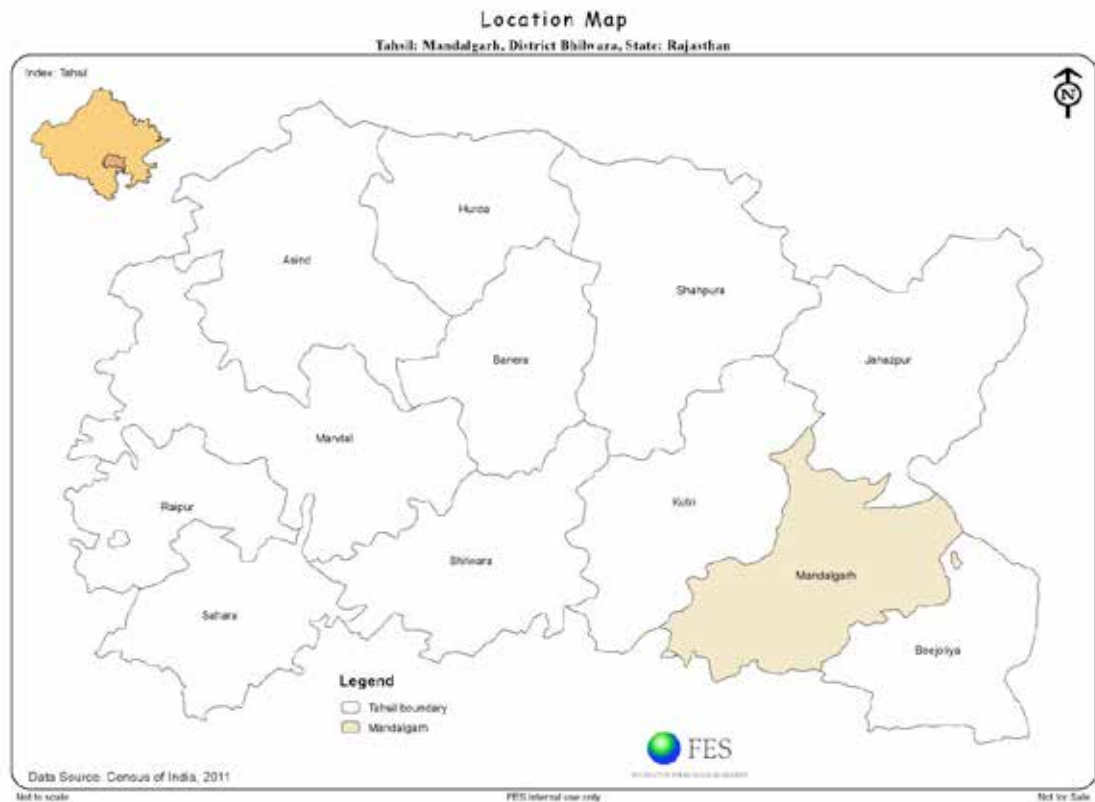
Contents

1.	Geographic and Demographic Features	4
1.1.	Geography	4
1.2.	Demography	5
2.	Climate	6
2.1.	Temperature	6
2.2.	Rainfall	6
2.3.	Relative Humidity	6
3.	Geology	7
3.1.	Geo-morphology	8
4.	Soil	9
5.	Water	
5.1.	Surface water	10
5.2.	Groundwater	10
5.3.	Water Quality	11
5.4.	Irrigation	11
6.	Land Use /Landcover	12
7.	Forest Types	13
8.	Agriculture	14
9.	Livestock	15
10.	Biodiversity	16
10.1.	Wild flora	16
10.2.	Wild Fauna	17
11.	Special Ecological Features of the area	18
11.1.	Kekariya Gorge	18
12.	Conservation Action Plan	19
12.1.	Community involvement	19
12.2.	Multi-Actor Platforms	19
12.3.	Water Conservation	19
12.4.	Restoration of catchments of existing water bodies	20
12.5.	Restoring degraded forests and grasslands	21
12.6.	Increasing fodder availability	21
12.7.	Control on lopping	22
12.8.	Eradication of Invasive species	22
12.9.	Agricultural interventions	22
12.10.	Awareness generation	23
	References	24
	Annexures	25

1. Geographic and Demographic Features

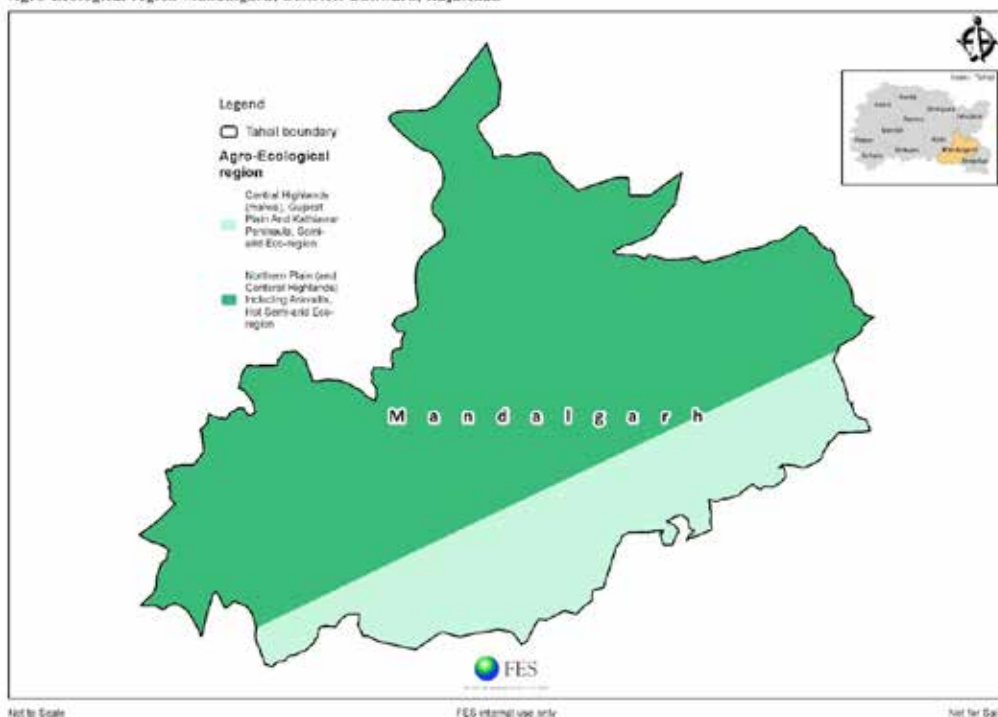
1.1. Geography

Mandalgarh Block is located in Bhilwara District of Rajasthan. It lies between 24°59 '19.86 "N and 74°51'52.98"E and 25°23'07.88"N and 75°20'53.12" E. It is bound by Jahazpur block to the North, Kotri block to the West, Beejoliya block to the East and Begun block of Chittaurgarh District to the South. The elevation of the block ranges between 350 meter to above 550 meter from the mean sea level. Mandalgarh is part of the Mewar region of Rajasthan and is characterized by undulating hills interspersed among plains. The hill range of Aravalli range and Vindhya intersect Bhilwara district at several place more prominently in Mandalgarh.



Mandalgarh is part of two agro-ecological regions namely, 'The Central Highlands (Malwa), Gujarat plains and Kathiawar Peninsula region' which is semi-arid and 'The Northern Plain (and Central Highlands) including Aravallis region' which is hot semi-arid . It is on account of these different agro-ecological conditions that a distinct belt of forests characterizes the extreme southern, south eastern and eastern part of the block, whereas the rest of the block demonstrates plains which are under agricultural cultivation. Another notable feature is the presence of gorges and ravines, formed by various hills and river systems. Forest land, gorges community owned and protected plots are confined to the upper ridges of hill ranges, whereas, pond, lake, reservoir and agricultural ecosystems are prominent in the valleys and low lying flat lands in the area.

Agro-Ecological region Mandalgarh, District: Bhiwara, Rajasthan



The main characteristics of this area are hot semi-arid ecosystem with grey brown and alluvium derived soils and a crop growing period of 90-150 days.

1.2. Demography

Mandalgarh Block comprises 188 villages and one town. The total population is 1,76,703 of which 18.7% belong to the Scheduled Caste category and 11.8% belong to the Scheduled Tribe category. 55.04% of the population is literate. Further, there are 37,662 households of which, 76.53% are permanent households, 18.59% are semi-permanent and 4.66% are temporary (Census 2011).

2. Climate

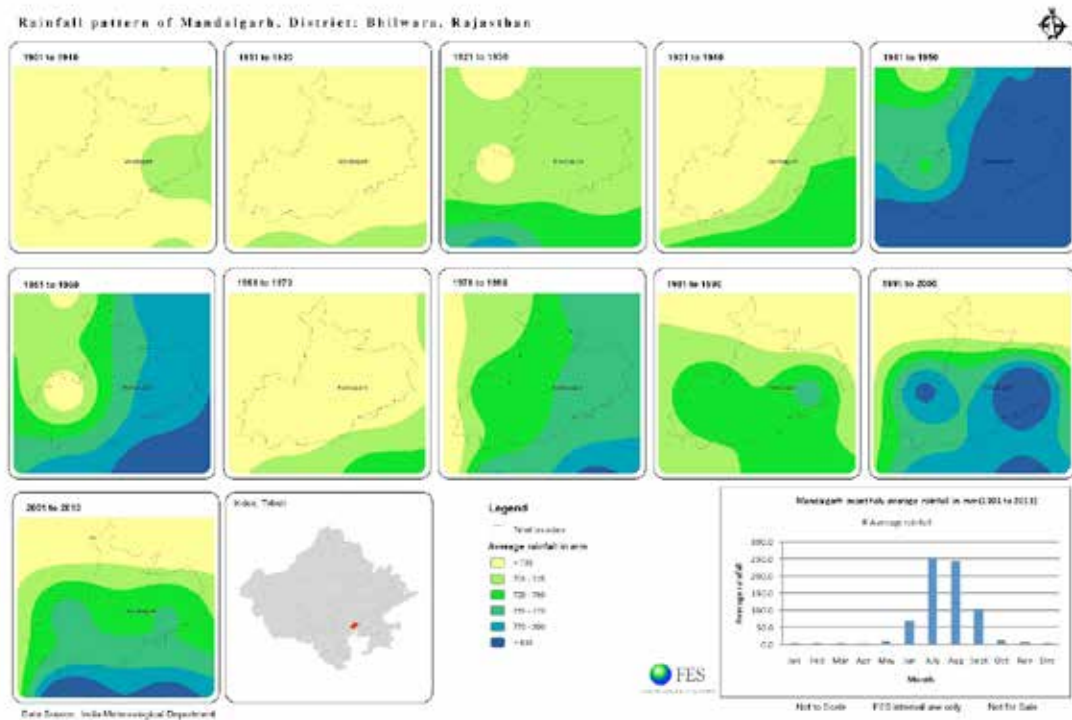
Mandalgarh experiences summer from March to June /Mid –July, this is followed by Monsoon which continues up to mid-September. The post monsoon period from mid-September to end-November is characterized by high temperature. Extreme winter is experienced from December to February.

2.1. Temperature

During summers (March, April, May and June) the temperature ranges between 32°C and 42°C, further the temperature ranges between 29°C and 34°C in the post-monsoon period (October-November), whereas, during winters (December, January and February) the temperature ranges between 4 °C and 13°C.

2.2. Rainfall

The rainfall in the ‘Central (Malwa) Highlands, Gujarat Plains region’ varies between 500-1000 mm and ranges between 500-800mm in the ‘Northern Plain & Central Highlands including parts of Gujarat Plains region’. Highest rainfall is experienced in July and August.



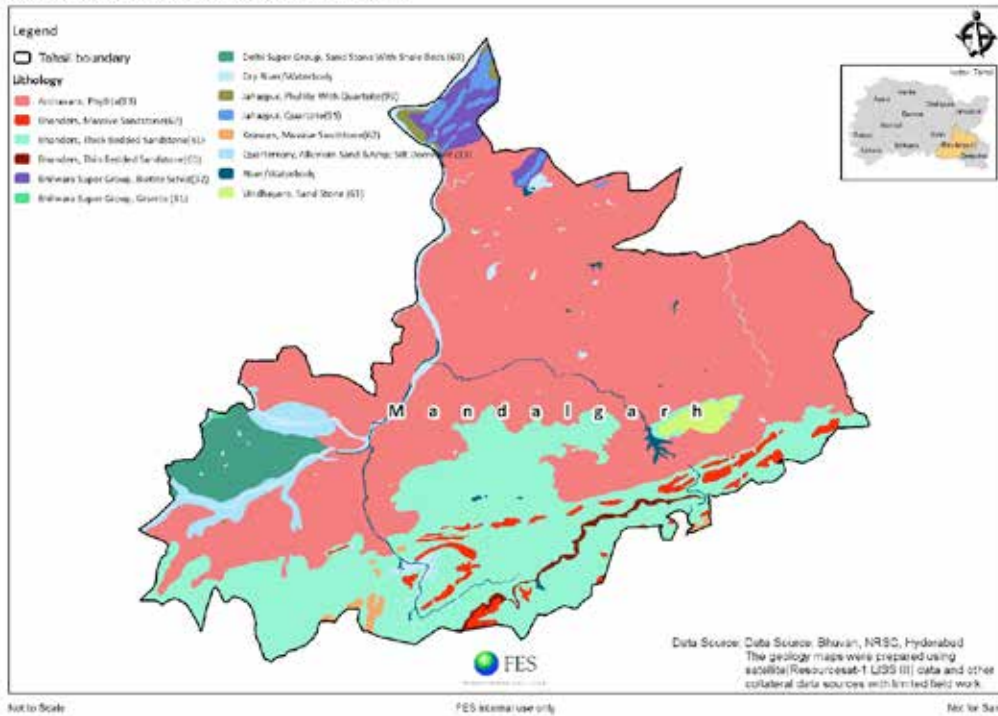
2.3. Relative Humidity

The climate of Mandalgarh is generally dry, however, humidity is experienced during the month of August when the relative humidity is around 60 percent.

3. Geology

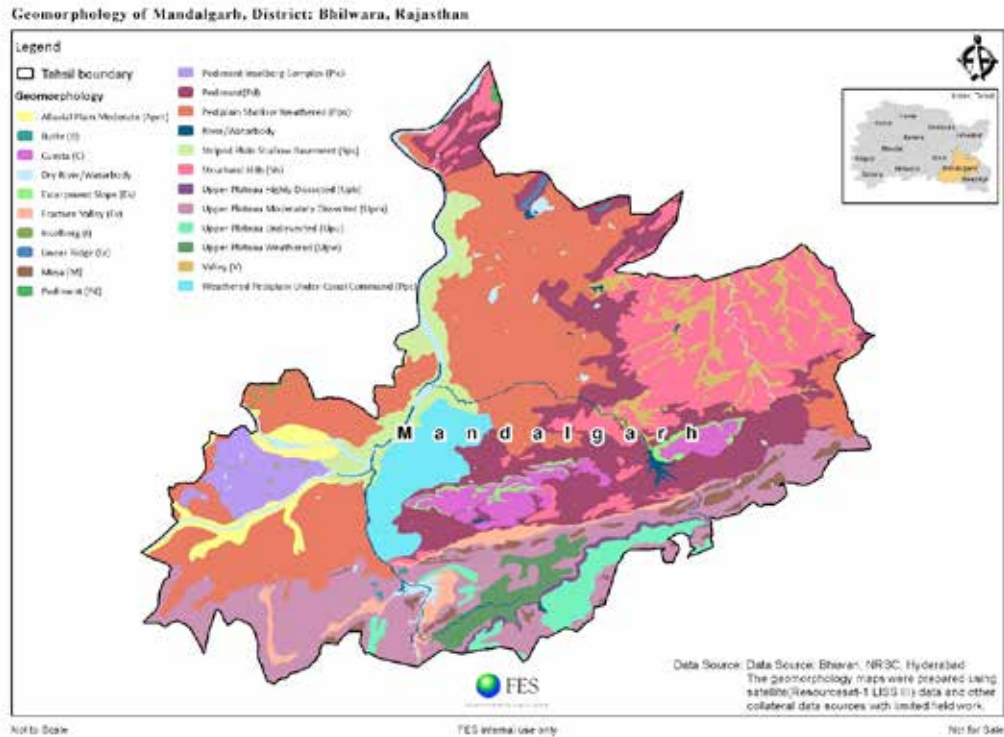
The main rock types have been encountered are Shale, Sandstone, limestone, Phyllite, Slate, Quartzite and Dolerite. Basically these rocks are falling under different group of Vindhyan and Bhilwara Super Group. Bhandar Group which is part of the Upper Vindhyan Supergroup recognized as one of the thickest and largest sedimentary rock formations in the world. Phyllite comprises majority of 'The Central Highlands (Malwa), Gujarat plains and Kathiawar Peninsula region', whereas, the part of the block that falls in 'The Northern Plain (and Central Highlands) including Aravallis region' is characterized by thick bedded sandstone fragmented by massive sandstone and thin bedded sandstone. The extreme North-Western part comprises Biotite Schist interspersed with Quartzite rocks.

Geology of Mandalgarh, District: Bhilwara, Rajasthan



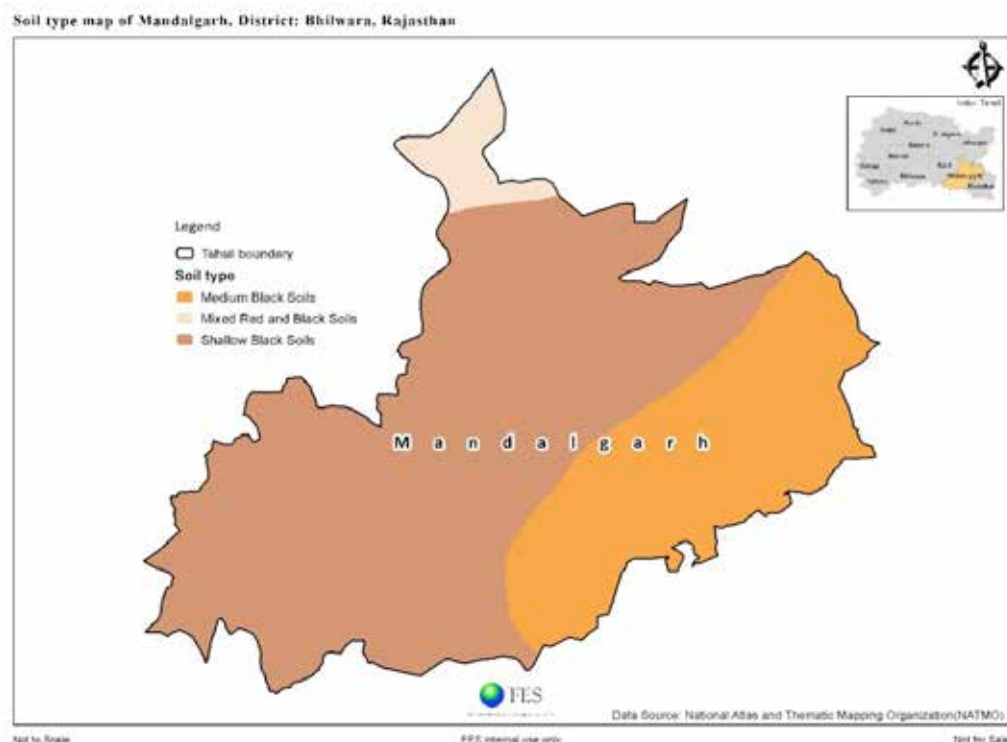
3.1. Geo-morphology:

'The Central Highlands (Malwa), Gujarat plains and Kathiawar Peninsula region' is predominantly characterized by shallow weathered pediplains, whereas, 'The Northern Plain (and Central Highlands) including Aravallis region' is characterized by Upper Plateau moderately dissected geomorphology. There are structural hills and valleys in the North-East, whereas, there are moderate alluvial plains along the path of the Banas River and its tributaries. Other geo-morphological features which are present comprise escarpment slopes, inselbergs and fractured valleys which are fragmented across the landscape of the block.



4. Soil

Soils of Bhilwara comes under two types of soil orders, entisol and alfisol. It ranges from light pale brown and grey to dark brown in colour and sandy loam to clay loam in texture. Majority of Mandalgarh region is characterized by shallow black soil. Mixed Red and Black Soils prevail in the extreme north-western portion of the block, whereas, medium black soils are visible in the south-eastern, eastern and north-eastern parts.

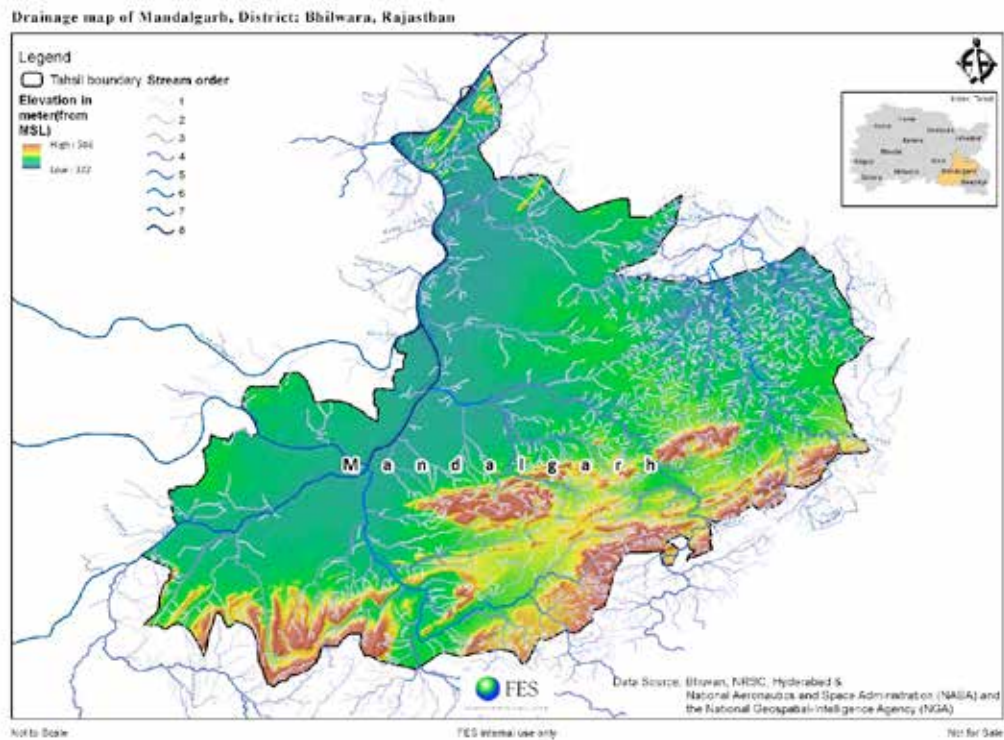


Undulating land with hillocks are characterized by well drained to moderately well drained soils which are loamy with some sand pockets. The river valley dissected soils and pediments are also well drained to moderately well drained in nature and are fine loamy to coarse loamy in nature. The river valley dissected soils are characterized by pockets which have high concentration of calcium carbonate. The dissected hill and range areas are characterized by very shallow to shallow soils which are excessively drained.

5. Water

5.1. Surface water

Mandalgarh Block falls in Banas basin (668.4 sqkm) and in Chambal basin (696.1 sqkm). Banas river and its tributaries are the main source of water in Mandalgarh. Triveni, the trijunction of 3 rivers Menali, Berach and Banas appears in the Mandalgarh block. Mej is one of the main rivers which flows to Chambal originated in Mandalgarh. Beside of these main rivers there are so many small channels of different orders branches out or present as tributary *i.e* Unli river, Kali nadi and Bharak river etc.



5.2. Groundwater

Ground water condition in Mandalgarh is relatively better than the surrounding blocks of Bhilwara. The northern part of the block is mainly composing of hard metamorphic rocks in which ground water occurs in shallow unconfined aquifer. Deeper confined aquifers are not very much evident as only in few patches through some fractures in rocks, localized perched confined / semi confined aquifer at different depth water availability has been seen. But in the southern part of the block, the occurrences of multi-layered aquifer due to sedimentary terrain have been identified. Along the great boundary fault, the suture zone has been developed and water movement up to a certain depth has been identified. Due to this fact, water table shows shallow occurrences of ground water in the northern zone but deeper water table in southern part. Ground water in this southern part is more available. Some pump test has been conducted in previous years which are showing very good potential of aquifer system in this region. Higher storativity and transmissivity have been found during the pump test which indicates the presence of good aquifer system due to sedimentary layers in the region.

5.3. Water Quality

The major factors impacting water in Bhilwara are alkalinity, salinity, nitrate and fluoride content. Even though majority blocks in Bhilwara demonstrate unsuitable water quality, Mandalgarh is one of the few blocks which demonstrates permissible levels of fluoride, nitrate and salinity, rendering it suitable for drinking and other purposes.

5.4 Irrigation

Irrigation in the block is met by a mix of sources like wells, ponds, canals, tube wells etc. Apparently, wells are the most important source of irrigation. The water table being not very deep, wells exist in all parts of the block. They are used both for the drinking water purpose as well as for irrigating the fields.



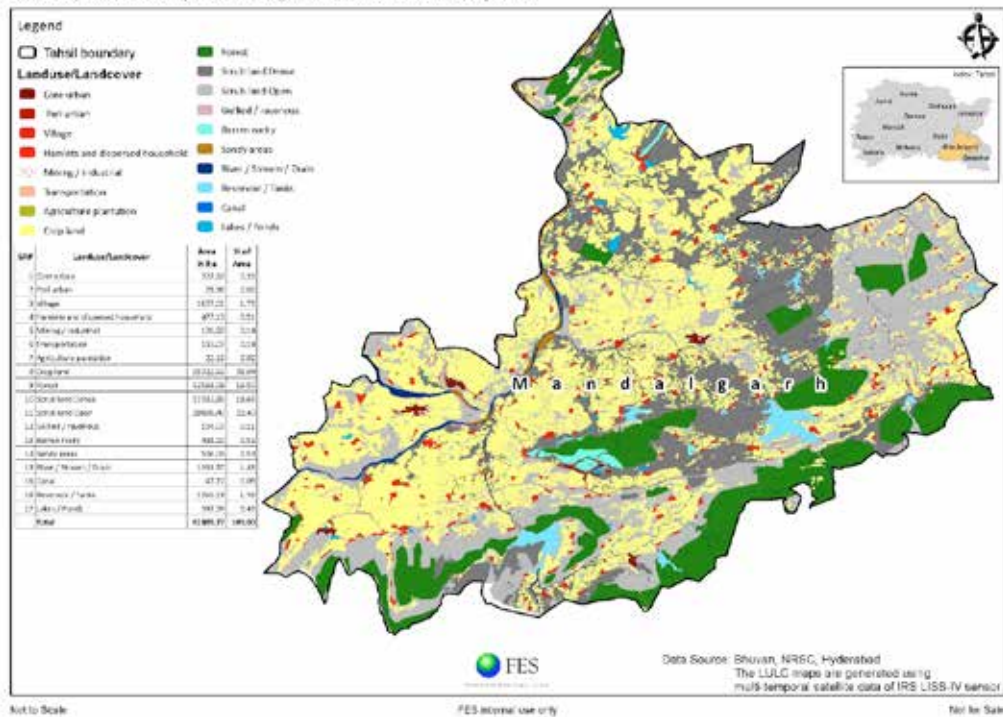
6. Land Use /Landcover

Majority area of the block (38.04%) is under agricultural cultivation. Forests are confined to hill tops and slopes, since, the plain land has been converted for agricultural purposes. 13.50% of the block is under forest land, the part that is located in the 'The Central Highlands (Malwa), Gujarat plains and Kathiawar Peninsula region' has comparatively high forest cover compared to 'The Northern Plain (and Central Highlands) including Aravallis region' of Mandalgarh. Scrubland dominates the north-eastern part of the block. Waterbodies in the form of rivers, streams, drains, reservoirs, tanks, lakes and ponds are fragmented across the landscape.

Table 1 Landuse/landcover of Mandalgarh

1	Landuse/ Landcover	Total Area	% of Area
2	Agriculture		
3	Forest		
4	Common lands other than the forest		
5	Water bodies		
6	Others		
	Total		

Landuse/Landcover map of Mandalgarh, District: Bhilwara, Rajasthan



7. Forest Types

Based on the Champion & Seth (1968) forest classification, the forests in Mandalgarh fall under the Northern tropical dry deciduous forests subgroup of the Tropical Dry Deciduous Forests group. The forests in Mandalgarh demonstrate characteristics of the *Anogeissus pendula* forest (5/E1), *Anogeissus pendula* scrub (5/E1/DS1) and Butea forest (5/E5). The forest type is composed of *Anogeissus pendula*, *Boswellia serrata*, *Acacia nilotica* and *Butea monosperma*.



Anogeissus pendula forest is found in places with shallow soil, it is predominant in highly elevated areas, on account of the capacity of these species to anchor in shallow soil. *Anogeissus pendula* scrub forest occurs in places where the forest is vulnerable to grazing and tree-logging. The trees are reduced to creeping and spreading forms and characterize the last stage of degradation, before the elimination of the species, whereas, Butea forest are found in areas with deep soil, specially near riverbanks which comprise rich alluvial soil.

8. Agriculture

38.04% of Mandalgarh is under agricultural cultivation. Most crops cultivated in the region demonstrate drought tolerance, require semi-arid climatic conditions and grow in loam, sandy loam and black cotton soil as well. Dryland farming is practiced in the region.

Maize (*Zea mays*), soybean (*Glycine max*), pigeon pea (*Cajanus cajan*), groundnut (*Arachis hypogaea*) and sorghum (*Sorghum bicolor*) are cultivated in the Kharif season, whereas, sorghum, mustard (*Brassica juncea*), gram (*Cicer arietinum*), and sunflower (*Helianthus spp.*) are cultivated in the Rabi season. Wheat (*Triticum aestivum*.) is cultivated under irrigated conditions. People have recently started cultivating Cotton, Paddy and Red Gram in the area on a large scale.

Pearl millets (*Pennisetum glaucum*), wheat and pulses are primarily grown in the 'Central (Malwa) Highlands, Gujarat Plains & Kathiawar Peninsula region' on account of the medium and deep black soils present in the region, whereas, pearl millets, wheat, pulses, maize and irrigated cotton are cultivated in the 'Northern Plain & Central Highlands including parts of Gujarat Plains region' with alluvium-derived soils. The growing period is 90-150 days in both the agro-ecological regions.



9. Livestock



Buffaloes, goats (Marwadi, Jamna Pari, Sirohi), cows and sheep are reared in Mandalgarh . Livestock is an important source of livelihood in the region and enables farmers diversify their income sources, they are of important social significance as well. In addition to this, grazing livestock can accelerate transformation of nutrients in crop byproducts to fertilizer, thereby, speeding the process of land recovery between crops.

10. Biodiversity

10.1. Wild flora

Xerophytic species are found in elevated areas, whereas, meso-xerophytic species are found along drainage lines and in low lying areas. The principal species occurring in the forests is *Anogeissus pendula* (Dhokra) common in whole of Rajasthan. The other common species occurring in the forests are *Acacia leucophloea* (Aranja); *Acacia catechu* (only in patches); *Holoptelea integrifolia* (churel/Papdi); *Butea monosperma* (Dhak/Palas) and *Ziziphus nummularia* (Ber) etc. In some valleys clumps of *Dendrocalamus strictus* (Bans) occur while among nallahs *Terminalia arjuna* is common. Trees of *Diospyros melanoxylon* (Tendu) and *Diospyros cordifolia* (Bistendu/Kada tendu) are common in all the forests. On higher plateaus in Mandalgarh range, the forests, forests are of mixed miscellaneous type.

The species comprising the mixed miscellaneous type of flora are: *Anogeissus latifolia* (Dhokra); *Boswellia serrata* (Salar); *Launnea coromandelina* (godal); *Wrightia tinctoria* (Al), *Aegle marmelos* (Bel); and *Embllica officinalis* (Aonla) etc.

The undergrowth consists of *Carissa spinosa* (Jal), *Securinega leucopyrus* (Helpi), *Capparis sepiaria* (Kanthar), *Ziziphus nummularia* (Jharber); and *Nyctanthesarbor tristis* (Harsingar) etc.

The common grasses occurring in the district are: *Aristida adioensisns* (Lapla), *Chloris spp.* (Bamna), *Heteropogon contortus* (Soorwala), *Themeda quadrivalvis* (Ratarra), *Apluda mutica* (Palad) and *Sehima nervosum* and *Dichanthium annulatum* (Karad).

Invasive Species: *Lantana camara* is the dominant invasive species in the southern part of Mandalgarh, whereas, *Prosopis juliflora* is spread throughout the block.



10.2. Wild Fauna

Dragonflies, damselflies and butterflies: Dragonflies, damselflies and butterflies play an important role as pollinators, decomposers and facilitate aeration and infiltration of the soil. Butterfly species prevailing in Mandalgarh comprise the Blue-eyed Darner (*Anax immaculifrons*), Common Emigrant (*Catopsilia pomona*), Grass Jewel (*Chilades trochylus*) and among others. Damselflies in the region include the Coromandel marsh dart (*Ceriagrion coromandelianum*) and the Golden dartlet (*Ischnura aurora*), whereas, dragonfly species comprise the Common picture wing (*Rhyothemis variegata*) and Granite ghost (*Bradinopyga geminata*).

Amphibians and reptiles: Amphibians are found in the vicinity of the various water bodies prevailing in the block, they are important indicators of ecological stress and habitat fragmentation. A few species include the Skittering frog (*Euphlyctis cyanophlyctis*), Ornate Frog (*Microhyla ornata*) and Marbled Toad (*Duttaphrynus stomaticus*) among others. The rocky terrain and presence of small mammals such as rats are suitable for reptiles such as the Saw-scaled viper (*Echis carinatus*) and Common Rat snake (*Ptyas mucosa*). Further the water bodies prevailing in the region are suitable habitat for species such as the Flap-Shell turtle (*Lissemys punctata*).

Mammals:

Most of the mammals found in the block are omnivorous and nocturnal, which helps them survive during periods of food scarcity and extreme weather conditions. Indian Bush Rat (*Golunda ellioti*), Golden Jackal (*Canis aureus*), Indian Fox (*Vulpes bengalensis*), Striped hyena (*Hyaena hyaena*) and Jungle Cat (*Felis chaus*) are few mammalian species found in the region. Further, the prevalence of grasslands is favorable for ungulates such as the Nilgai (*Boselaphus tragocamelus*) and Indian Gazelle (*Gazella bennettii*).

Birds:

Migratory aquatic birds such as the Lesser Flamingo (*Phoeniconaias minor*), Great White pelican (*Pelecanus onocrotalus*) and Eurasian Spoonbill (*Platalea leucorodia*) are found on account of the multiple water bodies prevailing in the region. Other bird species that are found are mentioned in the annexure.



11. Special Ecological Features of the area

11.1. Kekariya Gorge

The riparian vegetation and almost undisturbed ecology of gorges, support a range of faunal habitats on account of the distinct climatic and abiotic factors prevailing in these ecosystems. The 1560 m long Kekariya gorge of the Vindhyan mountain range, takes its name from the village of Kekariya in Mandalgarh block. Many small rivulets and streams flow through the gorge during monsoons. Underground streams flow perennially and the small water-bodies they replenish are a source of water for the gorge throughout the year, thereby, supporting the wildlife in the area. Principal vegetative species in the gorge comprise, *Anogeissus pendula*, *Boswellia serrata*, *Prosopis cineraria*, *Acacia leucophloea*, *Acacia catechu*, *Dalbergia sisso*, *Butea monosperma* and *Ziziphus mauritiana* .

The gorge supports a diversity of bird habitats on account of the burrows, high cliffs, grass patches, thorny vegetation and water bodies. The thick tree trunks are suitable habitat for birds such as the Common Myna (*Acridotheres tristis*), Brahminy Myna (*Sturnia pagodarum*) and Rose-ringed parakeet (*Psittacula krameri*). Occurrence of small invertebrates like molluscs and crabs as well as small fishes attracts birds like herons, egrets, cormorants and kingfishers. The widespread availability of grass and flowering plants which harbor a range of insects attract insectivorous birds.

A notable feature of the gorge is that it houses species such as the Egyptian Vulture (*Neophron percnopterus*) which is 'Endangered' and the Indian vulture/Long-billed vulture (*Gyps indicus*) which is categorized as 'Critically Endangered' by the IUCN.



12. Conservation Action Plan

Mandalgarh was once rich in natural growth on the hills of Avavalis and around the wetlands, but in the recent decades much degradation has been witnessed. Uncontrolled cutting and lopping of trees, overgrazing, soil erosion, low natural regeneration and fodder availability, and water scarcity are the critical threat of the area. The following conservation measures are important to revive the productivity of the area.

12.1. Community involvement

Working with communities in restoration activities, Securing community's tenurial rights on common lands, supporting them in establishing rules and norms for protecting and managing these lands, facilitating building resilient institutions and undertaking capacity-building initiatives is the first step towards initiating conservation activities.



12.2. Multi-Actor Platforms

Involving multiple stakeholders such as community members, government bodies and NGOs associated with a given landscape will strengthen the process of restoration and conservation. When stakeholders come together on a common platform and engage in dialogue with each other, they will gain insights into each other's perspectives which will facilitate informed decision making and action, which will in turn enhance the process of restoration and conservation.

12.3. Water Conservation

Since ground water draft is high in Mandalgarh, construction and restoration of water harvesting structures such as check-dams, will facilitate increasing the recharge of ground water and improve the water availability for domestic purposes, livestock and agriculture. It will help to improve the moisture regime thereby the vegetation and biodiversity of the area.

12.4. Restoration of catchments of existing water bodies

Planting of grazing hardy species along the catchment of water bodies will prevent degradation on account of grazing. Further, planting perennial species which have good soil holding capacity will enhance the restoration process. While undertaking planting activities it is important to consider the location and time of planting while determining the type of species that are specific to the area.

Table 2 Species suitable along catchment of water bodies

S.N.	Species Name	Habit	Status
1	<i>Acacia nilotica</i>	Tree	Perennial
2	<i>Anogeissus pendula</i>	Tree	Perennial
3	<i>Azadirachata indica</i>	Tree	Perennial
4	<i>Butea monosperma</i>	Tree	Perennial
5	<i>Ziziphus mauritiana</i>	Tree	Perennial
6	<i>Ficus religiosa</i>	Tree	Perennial
7	<i>Mangifera indica</i>	Tree	Perennial
8	<i>Calotropis procera</i>	Shrub	Perennial
9	<i>Capparis sepriaria</i>	Shrub	Perennial
10	<i>Clerodendrum phlomidis</i>	Shrub	Perennial
11	<i>Cocculus hirsutus</i>	Shrub	Perennial
12	<i>Fagonia indica</i>	Shrub	Perennial
13	<i>Leptadenia phyrotechnica</i>	Shrub	Perennial
14	<i>Ziziphus nummularia</i>	Shrub	Perennial
15	<i>Lindernia ciliata</i>	Shrub	Annuals
16	<i>Pergularia daemia</i>	Shrub	Perennial
17	<i>Securinega virosa</i>	Shrub	Perennial
18	<i>Cynodon barberi</i>	Grass	Perennial
19	<i>Cynodon dactylon.</i>	Grass	Perennial
20	<i>Eleusine indica.</i>	Grass	Annuals
21	<i>Melanocenchris jacquemontii</i>	Grass	Annuals
22	<i>Cymbopogon martinii</i>	Grass	Perennial
23	<i>Cyperus rotundus</i>	Sedge	Perennial
24	<i>Fimbristylis ferruginea</i>	Sedge	Perennial
25	<i>Dicoma tomentosa</i>	Herb	Perennial
26	<i>Elytraria acaulis</i>	Herb	Annuals
27	<i>Enicostema axillare</i>	Herb	Perennial
28	<i>Justicia procumbens</i>	Herb	Annuals
29	<i>Justicia simplex</i>	Herb	Annuals
30	<i>Solanum surattense.</i>	Herb	Perennial
31	<i>Tephrosia purpurea</i>	Herb	Perennial

12.5. Restoring degraded forests and grasslands

Improving biomass and ground cover will help in curbing soil erosion and will create conditions for the growth of shrubs and herbs. The grasslands should be managed by practicing rotational and regulated grazing and also by collecting seeds of fodder species. During the rainy season when the upper strata become moist, grass seeds should be sown. Tiller of perennial grasses which become dormant during the winter and summer, start sprouting just after the onset of the monsoon. Grass shows annual flowering behavior hence have a tendency to complete the flowering and fruiting within 3-5 months after this period grasses should be harvested and used by cut and carry system. As Mandalgarh receive rainfall from 500mm to 800 mm, species like *Dichanthium annulatum*, *Heteropogon contortus* *Cenchrus ciliaris*, *Cenchrus setigerus* *Sehima nervosum* and *Dactyloctenium aegyptium* can be easily grown under such conditions. Leguminous species like moong, urad or other wild legumes should be broadcast with the grass seed to ensure nitrogen availability in the grasslands.

Table 3 Important grass and herb species of Mandalgarh

S.N.	Species	Habit	Status	Palatability
1	<i>Alysicarpus vaginalis</i>	Herb	Annuals	Palatable
2	<i>Borreria pusilla</i>	Herb	Annuals	Palatable
3	<i>Cenchrus ciliaris</i>	Grass	Perennial	Palatable
4	<i>Cenchrus setigerus</i>	Grass	Perennial	Palatable
5	<i>Chloris barbata</i>	Grass	Perennial	Palatable
6	<i>Convolvulus prastratus</i>	Herb	Perennial	Palatable
7	<i>Cynodon barberi</i>	Grass	Perennial	Palatable
8	<i>Cynodon dactylon</i>	Grass	Perennial	Palatable
9	<i>Dactyloctenium aegyptium</i>	Grass	Annuals	Palatable
10	<i>Dichanthium annulatum</i>	Grass	Perennial	Palatable
11	<i>Dichanthium caricosum</i>	Grass	Perennial	Palatable
22	<i>Digitaria ciliaris.</i>	Grass	Annuals	Palatable
23	<i>Eragrostis ciliaris.</i>	Grass	Annuals	Palatable
24	<i>Euphorbia hirta</i>	Herb	Annuals	Palatable
25	<i>Evolvulus alsinoids</i>	Herb	Annuals	Palatable
26	<i>Glossocardia bosvallea</i>	Herb	Annuals	Palatable
27	<i>Heteropogon contortus</i>	Grass	Perennial	Palatable
28	<i>Indigofera cordifolia</i>	Herb	Annuals	Palatable
29	<i>Indigofera linnaei</i>	Herb	Annuals	Palatable
30	<i>Kyllinga bulbosa</i>	Sedge	Perennial	Palatable
31	<i>Melanocentris jacquemontii</i>	Grass	Annuals	Palatable
32	<i>Sporobolus coromandelianus</i>	Grass	Annuals	Palatable
33	<i>Sporobolus helvolus</i>	Grass	Perennial	Palatable
34	<i>Stylosanthes hamata</i>	Grass	Perennial	Palatable
35	<i>Tridax procumbens</i>	Herb	Annuals	Palatable

12.6. Increasing fodder availability

Since animal husbandry is an important source of livelihood in the region, it is important to increase the availability of fodder. Suitable tree species that can be planted are mentioned in table 4. The fodder plots should be protected by practicing rotational and regulated grazing and also by collecting seeds of fodder species in order to improve the seed bank of fodder plots.

Table 4 Tree species suitable for planting in Mandalgarh

S.N.	Species Name	Local Name	Habit
1	<i>Acacia catechu</i>	Khair	T
2	<i>Acacia leucophloea</i>	Arunja	T
3	<i>Acacia nilotica</i>	Desi babool	T
4	<i>Azadirachata indica</i>	Neem	T
5	<i>Butea monosperma</i>	Khakra	T
6	<i>Prosopis cineraria</i>	Khejri	T

12.7. Control on lopping

Extensive lopping is done by goat rearers round the year. "All season" or "Repeated lopping" causes severe harm to trees. There is a need to check this and allow lopping only during winters (as plant is in dormant stage in winter, so less harm to tree). "All twig lopping pattern" is not good. Systematic lopping should be adopted to avoid starvation in the trees.

12.8. Eradication of Invasive species

Both *Prosopis juliflora* and *Lantana camara* species is present in the area. Every year during rainy season, new seedlings of these species should be eradicated. This should be repeated for next three-four year after planting. After this, every fifth year a fresh round of eradication is suggested during rainy season. Rainy season is the best time to eradicate invasive species because root digging is easy during this period. Since it is a wide spread species, hence landscape eradication approach is desirable.

12.9. Agricultural interventions

In situ Soil and Moisture Conservation- Soil and Moisture Conservation can be facilitated by early ploughing, sowing across the slope, practicing inter cultivation, constructing farm bunds and conservative furrows.

Soil Fertility up-gradation- Application of compost, bio-fertilizers and silt from ponds and dams will help maintain the fertility of agricultural lands. Practicing crop rotation and planting legumes as inter, border and trap crops will be beneficial as well.

Good Crop Management Practices-Using improved and good quality seeds, micro irrigation practices such as drip and sprinkle irrigation and using optimum amounts of chemical fertilizers will benefit agricultural productivity.

Agro-forestry- Agro forestry with suitable tree species facilitate maintaining the moisture content in the soil, along with preventing soil erosion. It also provides habitat for natural pollinators and pest-controllers who are important agents facilitating agricultural productivity.

Table 5 Tree species suitable for agroforestry systems

S.N.	Species Name	Local Name	Habit
1	<i>Acacia catechu</i>	Khair	T
2	<i>Acacia leucophloea</i>	Arunja	T
3	<i>Acacia nilotica</i>	Desi babool	T
4	<i>Anogeissus pendula</i>	Dhokra	T
5	<i>Azadirachata indica</i>	Neem	T
6	<i>Butea monosperma</i>	Khakra	T
7	<i>Prosopis cineraria</i>	Khejri	T
9	<i>Ziziphus mauritiana</i>	Ber	T
10	<i>Mangifera indica</i>	Aam	T

12.10. Awareness generation

A systematic and regular awareness programs and education for different age groups in these villages should be taken up mainly on the aspects of sustainable use of the resources, sharing it equally, managing it and above all about the significance of restoration and its related issues like what, when, where and how to restore.

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Annexures

Annexure 1. Floral diversity of Mandalgarh

Family	Species	Local Name	Habit
Acanthaceae	<i>Elytraria acaulis</i>	Pathar - Chatta	Herb
	<i>Justicia procumbens</i>		Herb
	<i>Justicia simplex</i>	Kagner	Herb
	<i>Lepidagathis cristata</i>	Aewal Kangio	Herb
	<i>Blepharis maderaspatensis</i>		Herb
	<i>Elytraria acaulis</i>		Herb
	<i>Lepidagathis trinervis</i>		Herb
Anacardiaceae	<i>Mangifera indica</i>	Aam	Tree
Annonaceae	<i>Annona squamosa</i>		Tree
Apocynaceae	<i>Holarrhena pubescens</i>		Tree
	<i>Carissa carandas</i>	Karunda	Shrub
Arecaceae	<i>Phoenix sylvestris</i>	Khajoor	Tree
Asclepiadaceae	<i>Pergularia daemia</i>	Gadaria ki bel	Climber
	<i>Calotropis procera</i>	Akdo	Shrub
	<i>Leptadenia pyrotechnica</i>	Khimp, Khimparlo,	Shrub
Asteraceae	<i>Dicoma tomentosa</i>	Vajradanti	Herb
	<i>Glossocardia bosvallea</i>	Chiria ka chugga	Herb
	<i>Tridax procumbens</i>	Kali mendhi	Herb
	<i>Xanthium strumarium</i>	Chirchita	Herb
	<i>Ageratum houstonianum</i>		Herb
	<i>Echinops echinatus</i>		Herb
	<i>Elephantopus scaber</i>		Herb
	<i>Launaea nudicaulis</i>		Herb
Balanitaceae	<i>Balanites aegyptiaca</i>	Hingotia/Hagona/Haguran	Tree
Bignoniaceae	<i>Millingtonia hortensis</i>	Neem Chameli	Tree
Bombacaceae	<i>Bombax ceiba</i>	Simala	Tree
Boraginaceae	<i>Cordia myxa</i>	Gundi	Tree
Burseraceae	<i>Boswellia serrata</i>	Salar	Tree
Caesalpiniaceae	<i>Bauhinia racemosa</i>	Seta, Jhira/Jinja	Tree
Capparaceae	<i>Capparis decidua</i>	Ker	Shrub
	<i>Capparis sepiaria</i>	Jal, Chhail/Kanthar	Shrub
Celastraceae	<i>Maytenus emarginata</i>	Serun	Shrub
	<i>Gymnosporia montana</i>	Bekal	Tree

Family	Species	Local Name	Habit
Combretaceae	<i>Anogeissus latifolia</i>	Dhola/safed dhawada	Tree
	<i>Anogeissus pendula</i>	Dhokda	Tree
	<i>Anogeissus sericea</i>	Andrukh	Tree
	<i>Terminalia arjuna</i>		Tree
	<i>Terminalia bellirica</i>		Tree
Convolvulaceae	<i>Convolvulus prastratus</i>	Santari,Santar	Herb
	<i>Evolvulus alsinoids</i>	Kalishankhawali	Herb
	<i>Convolvulus prostratus</i>		Herb
	<i>Evolvulus nummularius</i>		Herb
	<i>Merremia tridentata</i>		Herb
	<i>Rivea hypocrateriformis</i>	Phang	Climber
Cyperaceae	<i>Cyperus species</i>		Sedge
	<i>Cyperus rotundus</i>		Sedge
	<i>Fimbristylis ferruginea</i>		Sedge
	<i>Kyllinga bulbosa</i>		Sedge
Ebenaceae	<i>Diospyros melanoxylon</i>		Tree
Euphorbiaceae	<i>Euphorbia hirta</i>	Dudhi	Herb
	<i>Euphorbia microphylla</i>		Herb
	<i>Euphorbia serpens</i>		Herb
	<i>Euphorbia nivulia</i>	Ghota-thor	Shrub
	<i>Securinega virosa</i>		Shrub
	<i>Jatropha curcas</i>	Ratanjot	Shrub
	<i>Ricinus communis</i>	Arandiyo	Tree

Family	Species	Local Name	Habit
Fabaceae	<i>Cassia tora</i>	Puadia	Herb
	<i>Indigofera cordifolia</i>	Meh-phuli	Herb
	<i>Indigofera linnaei</i>		Herb
	<i>Stylosanthes hamata</i>	Stylohamata	Herb
	<i>Tephrosia purpurea</i>		Herb
	<i>Alysicarpus longifolius</i>		Herb
	<i>Alysicarpus monilifer</i>		Herb
	<i>Alysicarpus ovalifolius</i>		Herb
	<i>Alysicarpus vaginalis</i>		Herb
	<i>Cassia mimosifolia</i>		Herb
	<i>Crotalaria sagittalis</i>		Herb
	<i>Indigofera linifolia</i>		Herb
	<i>Zornia gibbosa</i>		Herb
	<i>Prosopis juliflora</i>	Angreji babul	Shrub
	<i>Acacia catechu</i>	Kher/Kheriya	Tree
	<i>Acacia leucophloea</i>	Jhinja/Khejadi	Tree
	<i>Acacia nilotica</i>	Desi Bawalia	Tree
	<i>Acacia raddiana</i>		Tree
	<i>Acacia senegal</i>	Kumatiyo, Kumbat	Tree
	<i>Albizia lebbek</i>		Tree
	<i>Albizia procera</i>		Tree
	<i>Butea monosperma</i>	Khakhara/Palash	Tree
	<i>Cassia fistula</i>		Tree
	<i>Dichrostachys cinerea</i>	Kunali	Tree
<i>Pterocarpus marsupium</i>	Jinja	Tree	
<i>Tamarindus indica</i>	Amali/Imlali	Tree	
<i>Dalbergia sissoo</i>	Sisham	Tree	
<i>Delonix regia</i>	Gulmor	Tree	
Gentianaceae	<i>Enicostema axillare</i>	Nawri	Herb
Lamiaceae	<i>Leucas aspera</i>		Herb
	<i>Leucas cephalotes</i>		Herb
	<i>Leucas species</i>		Herb
	<i>Gmelina arborea</i>	Gurad	Tree
Malvaceae	<i>Sida cordata</i>		Herb
Meliaceae	<i>Azadirachata indica</i>	Neem	Tree
Menispermaceae	<i>Tinospora cordifolia</i>	Neem-Gilol	Climber
	<i>Cocculus hirsutus</i>	Chhireta, Bajar-bel	Shrub
Molluginaceae	<i>Glinus lotoides</i>		Herb
	<i>Mollugo cerviana</i>		Herb
	<i>Mollugo species</i>		Herb
Moraceae	<i>Ficus benghalensis</i>		Tree
	<i>Ficus racemosa</i>		Tree
	<i>Ficus religiosa</i>		Tree

Family	Species	Local Name	Habit	
Moringaceae	<i>Moringa oleifera</i>		Tree	
Myrtaceae	<i>Syzygium cumini</i>		Tree	
	<i>Eucalyptus spp.</i>	Safeda	Tree	
Nyctaginaceae	<i>Boerhavia diffusa</i>		Herb	
Oleaceae	<i>Nyctanthes arbor-tristis</i>		Tree	
Poaceae	<i>Apluda mutica</i>		Grass	
	<i>Aristida adscensionis</i>	Lamp, Lampro.	Grass	
	<i>Aristida funiculata</i>	Lampi	Grass	
	<i>Bulbostylis barbata</i>		Grass	
	<i>Cenchrus ciliaris</i>	Dhaman	Grass	
	<i>Cenchrus setigerus</i>	Dhaman	Grass	
	<i>Chloris virgata</i>		Grass	
	<i>Cymbopogon martinii</i>		Grass	
	<i>Cynodon barberi</i>		Grass	
	<i>Cynodon dactylon</i>	Dub	Grass	
	<i>Dactyloctenium aegyptium</i>		Grass	
	<i>Dichanthium annulatum</i>		Grass	
	<i>Dichanthium caricosum</i>		Grass	
	<i>Digitaria ciliaris</i>		Grass	
	<i>Dimeria ornithopoda</i>		Grass	
	<i>Echinochloa colonum</i>		Grass	
	<i>Echinochloa species</i>		Grass	
	<i>Eleusine indica</i>		Grass	
	<i>Eragrostis bifaria</i>		Grass	
	<i>Eragrostis ciliaris</i>		Grass	
	<i>Eremopogon foveolatus</i>		Grass	
	<i>Heteropogon contortus</i>	Soorwala	Grass	
	<i>Melanocenchris jacquemontii</i>		Grass	
	<i>Oropetium thomaeum</i>		Grass	
	<i>Sehima nervosum</i>		Grass	
	<i>Setaria species</i>		Grass	
	<i>Sporobolus coromandelianus</i>		Grass	
	<i>Sporobolus helvolus</i>		Grass	
	<i>Themeda quadrivalvis</i>		Grass	
	<i>Themeda triandra</i>		Grass	
	<i>Dendrocalamus strictus</i>	Bans	Grass	
	Polygalaceae	<i>Polygala chinensis</i>		Herb
	Rhamnaceae	<i>Ziziphus nummularia</i>	Jhar bor, Bordi, Pala bor	Shrub
<i>Ziziphus mauritiana</i>		Bor, Bara bor, Pemji bor	Tree	

Family	Species	Local Name	Habit
Rubiaceae	<i>Borreria articularis</i>		Herb
	<i>Borreria pusilla</i>		Herb
	<i>Borreria stricta</i>		Herb
	<i>Mitragyna parvifolia</i>	Kulam	Tree
	<i>Mitragyna parvifolia</i>		Tree
Rutaceae	<i>Aegle marmelos</i>	Billa/bel	Tree
	<i>Limonia acidissima</i>		Tree
	<i>Citrus limon</i>	Limboo	Tree
Salvadoraceae	<i>Salvadora oleoides</i>	Jaal	Tree
Sapotaceae	<i>Madhuca indica</i>	Mahua	Tree
Scrophulariaceae	<i>Lindernia ciliata</i>		Herb
	<i>Lindenbergia indica</i>		Herb
	<i>Ludwigia species</i>		Herb
Simaroubaceae	<i>Ailanthus excelsa</i>		Tree
Solanaceae	<i>Solanum virginianum</i>	Dhaturi	Herb
	<i>Physalis angulata</i>		Herb
Tiliaceae	<i>Corchorus aestuans</i>		Herb
	<i>Corchorus depressus</i>		Herb
	<i>Grewia tiliifolia</i>	Moti daman	Tree
Ulmaceae	<i>Holoptelia intergrifolia</i>	Churil. Kanji/chhal	Tree
Verbenaceae	<i>Clerodendrum phlomidis</i>	Arni	Shrub
Verbenaceae	<i>Lantana camara</i>	Rukhadi	Shrub
Zygophyllaceae	<i>Fagonia cretica</i>		Herb
	<i>Fagonia indica</i>	Dhamasa	Shrub

Annexure 2. Avifauna of Mandalgarh

Family	Scientific name	Common name
Accipitridae	<i>Milvus migrans</i>	Black Kite
	<i>Elanus caeruleus</i>	Black-winged Kite
	<i>Spilornis cheela</i>	Crested Serpent Eagle
	<i>Accipiter nisus</i>	Eurasian Sparrowhawk
	<i>Accipiter badius</i>	Shikra
	<i>Circaetus gallicus</i>	Short-toed Snake-Eagle
Aegithinidae	<i>Aegithina tiphia</i>	Common Iora
Alaudidae	<i>Eremopterix grisea</i>	Ashy-crowned Sparrow-lark
	<i>Melanocorypha bimaculata</i>	Bimaculated Lark
	<i>Galerida cristata</i>	Crested Lark
	<i>Calandrella brachydactyla</i>	Greater Short-toed Lark
	<i>Mirafra erythroptera</i>	Indian Bushlark
	<i>Mirafra affinis</i>	Jerdon's bushlark
	<i>Calandrella rufescens</i>	Lesser Short-toed Lark
	<i>Alauda gulgula</i>	Oriental skylark
	<i>Ammomanes phoenicura</i>	Rufous-tailed Lark
	<i>Mirafra cantillans</i>	Singing Bushlark

Family	Scientific name	Common name
Alcedinidae	<i>Alcedo atthis</i>	Common Kingfisher
	<i>Ceryle rudis</i>	Pied Kingfisher
	<i>Halcyon gularis</i>	White-Throated Kingfisher
Anatidae	<i>Anas poecilorhyncha</i>	Indian Spot-billed Duck
	<i>Spatula clypeata</i>	Northern Shoveler
	<i>Tadorna ferruginea</i>	Ruddy Shelduck
Anhingidae	<i>Anhinga melanogaster</i>	Oriental Darter
Apodidae	<i>Apus affinis</i>	Little Swift
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret
	<i>Ardea cinerea</i>	Grey Heron
	<i>Ardeola grayii</i>	Indian pond-heron
	<i>Ardea intermedia</i>	Intermediate Egret
	<i>Egretta garzetta</i>	Little Egret
	<i>Ardea purpurea</i>	Purple Heron
Bucerotidae	<i>Ocyrceros birostris</i>	Indian Grey Hornbill
Burhinidae	<i>Esacus recurvirostris</i>	Great Thick-knee
	<i>Burhinus indicus</i>	Indian thick-knee
Campephagidae	<i>Tephrodornis pondicerianus</i>	Common Wood-shrike
	<i>Pericrocotus cinnamomeus</i>	Small Minivet
Caprimulgidae	<i>Caprimulgus affinis</i>	Savana Nightjar
Charadriidae	<i>Charadrius dubius</i>	Little Ringed Plover
	<i>Vanellus indicus</i>	Red-wattled Lapwing
	<i>Vanellus duvaucelii</i>	River Lapwing
	<i>Vanellus leucurus</i>	White-tailed Lapwing
	<i>Vanellus malabaricus</i>	Yellow-wattled Lapwing
Ciconiidae	<i>Anastomus oscitans</i>	Asian Openbill
	<i>Ciconia episcopus</i>	Asian Woollyneck
	<i>Ciconia nigra</i>	Black Stork
	<i>Mycteria leucocephala</i>	Painted Stork
Cisticolidae	<i>Prinia socialis</i>	Ashy Prinia
	<i>Orthotomus sutorius</i>	Common Tailorbird
	<i>Prinia hodgsonii</i>	Grey-breasted Prinia
	<i>Prinia inornata</i>	Plain Prinia
	<i>Prinia buchanani</i>	Rufous-fronted Prinia
Columbidae	<i>Streptopelia decaocto</i>	Eurasian Collared Dove
	<i>Streptopelia senegalensis</i>	Laughing Dove
	<i>Streptopelia tranquebarica</i>	Red Turtle-dove
	<i>Columba livia</i>	Rock Pigeon
	<i>Spilopelia suratensis</i>	Western Spotted Dove
	<i>Treron phoenicopterus</i>	Yellow-footed Green-pigeon
Coraciidae	<i>Coracias benghalensis</i>	Indian Roller

Family	Scientific name	Common name
Corvidae	<i>Corvus splendens</i>	House Crow
	<i>Corvus macrorhynchos</i>	Large-billed Crow
	<i>Dendrocitta vagabunda</i>	Rufous Treepie
Cuculidae	<i>Cuculus canorus</i>	Common Cuckoo
	<i>Centropus sinensis</i>	Greater Coucal
	<i>Taccocua leschenaultii</i>	Sirkeer Malkoha
	<i>Eudynamys scolopaceus</i>	Western Koel
Dicruridae	<i>Dicrurus macrocercus</i>	Black Drongo
Emberizidae	<i>Emberiza buchanani</i>	Grey-necked Bunting
Estrildidae	<i>Lonchura malabarica</i>	Indian Silverbill
Falconidae	<i>Falco chicquera</i>	Red-headed Falcon
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow
	<i>Hirundo daurica</i>	Red-rumped Swallow
	<i>Hirundo smithii</i>	Wire-tailed Swallow
Laniidae	<i>Lanius vittatus</i>	Bay-backed Shrike
	<i>Lanius schach</i>	Long-tailed Shrike
	<i>Lanius meridionalis</i>	Southern Grey Shrike
Laridae	<i>Sterna aurantia</i>	River Tern
Megalaimidae	<i>Psilopogon haemacephalus</i>	Coppersmith Barbet
Meropidae	<i>Merops orientalis</i>	Green Bee-eater
	<i>Merops persicus</i>	Blue-cheeked Bee-eater
Motacillidae	<i>Anthus campestris</i>	Tawny Pipit
	<i>Anthus trivialis</i>	Tree Pipit
	<i>Motacilla alba</i>	White Wagtail
	<i>Motacilla flava</i>	Yellow Wagtail
Muscicapidae	<i>Ficedula parva</i>	Red Breasted Flycatcher
Nectariniidae	<i>Nectarinia asiatica</i>	Purple Sunbird
	<i>Leptocoma zeylonica</i>	Purple-rumped Sunbird
Oriolidae	<i>Oriolus oriolus</i>	Eurasian Golden Oriole
Passeridae	<i>Gymnoris xanthocollis</i>	Chestnut-shouldered Petronia
	<i>Passer domesticus</i>	House Sparrow
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant
	<i>Microcarbo niger</i>	Little Cormorant
Phasianidae	<i>Francolinus pondicerisnus</i>	Grey Francolin
	<i>Pavo cristatus</i>	Indian Peafowl
	<i>Perdica asiatica</i>	Jungle Bush-quail
	<i>Coturnix coromandelica</i>	Rain Quail
Picidae	<i>Dinopium benghalense</i>	Black-rump Flameback Woodpecker
	<i>Dendropicus obsoletus</i>	Brown-backed Woodpecker
	<i>Chrysocolaptes festivus</i>	White-naped Woodpecker
	<i>Leiopicus mahrattensis</i>	Yellow-crowned Woodpecker
Ploceidae	<i>Ploceus philippinus</i>	Baya Weaver

Family	Scientific name	Common name
Psittacidae	<i>Psittacula eupatria</i>	Alaxandrine Parakeet
	<i>Psittacula cyanocephala</i>	Plum-headed Parakeet
	<i>Psittacula krameri</i>	Rose-ringed Parakeet
Pteroclididae	<i>Pterocles exustus</i>	Chestnut-bellied Sandgrouse
	<i>Pterocles indicus</i>	Painted Sandgrouse
Pycnonotidae	<i>Pycnonotus cafer</i>	Red-vented Bulbul
Rallidae	<i>Fulica atra</i>	Common Coot
	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt
Rhipiduridae	<i>Rhipidura aureola</i>	White-browed Fantail
Scolopacidae	<i>Tringa totanus</i>	Common Redshank
	<i>Actitis hypoleucos</i>	Common Sandpiper
	<i>Calidris temminckii</i>	Temminck's Stint
	<i>Tringa glareola</i>	Wood Sandpiper
Strigidae	<i>Bubo bubo</i>	Eurasian Eagle-owl
	<i>Athene brama</i>	Spotted Owlet
Sturnidae	<i>Sturnus contra</i>	Asian Pied Starling
	<i>Acridotheres ginginianus</i>	Bank Myna
	<i>Sturnus pagodarum</i>	Brahminy Starling
	<i>Acridotheres tristis</i>	Common Myna
Sylviidae	<i>Phylloscopus collybita</i>	Common Chiffchaff
	<i>Phylloscopus trochiloides</i>	Greenish Warbler
	<i>Sylvia althaea</i>	Hume's Whitethroat
	<i>Sylvia curruca</i>	Lesser Whitethroat
Threskiornithidae	<i>Threskiornis melanocephalus</i>	Black-headed Ibis
	<i>Platalea leucorodia</i>	Eurasian Spoonbill
	<i>Pseudibis papillosa</i>	Red-naped Ibis
Timaliidae	<i>Turdoides striata</i>	Jungle Babbler
	<i>Turdoides malcolmi</i>	Large Grey Babbler
	<i>Chrysomma sinense</i>	Yellow eyed babbler
Turdidae	<i>Phoenicurus ochruros</i>	Black Redstart
	<i>Saxicola torquatus</i>	Common Stone Chat
	<i>Saxicoloides fulicata</i>	Indian Robin
	<i>Copsychus saularis</i>	Oriental Magpie-robin
	<i>Saxicola caprata</i>	Pied Bushchat
	<i>Saxicola sp.</i>	Stonechat sp.
	<i>Oenanthe picata</i>	Variable Wheatear
Turnicidae	<i>Turnix suscitator</i>	Barred Button-Quail
Tytonidae	<i>Tyto alba</i>	Common Barn Owl
Upupidae	<i>Upupa epops</i>	Common Hoopoe

Annexure 3. Herpatofaunal Diversity of Mandalgarh

Family	Common name	Scientific name
Frogs and Toad		
Bufonidae	Common Asian Toad	<i>Duttaphrynus melanostictus</i>
	Marbled Toad	<i>Duttaphrynus stomaticus</i>
	Ferguson's Toad	<i>Duttaphrynus scaber</i>
Dicroglossidae	Indian Skipping Frog	<i>Euphlyctis cyanophlyctis</i>
	Indian Bull Frog	<i>Hoplobatrachus tigerinus</i>
	Short-headed Burrowing Frog	<i>Sphaerotheca breviceps</i>
	Cricket Frog	<i>Fejervarya limnocharis</i>
Microhylidae	Ornate Narrow-mouthed Frog	<i>Microhyla ornata</i>
Turtle and Tortoise		
Trionychidae	Indian Flap shell turtle	<i>Lissemys punctata punctata</i>
Testudinidae	Indian Star Tortoise	<i>Geochelone elegans</i>
Lizard		
Agamidae	Indian Garden Lizard	<i>Calotes versicolor</i>
	Fan Throated lizard	<i>Sitana spinaecephalus</i>
Gekkonidae	Brook's House Gecko	<i>Hemidactylus brookii</i>
	Yellow-Green House Gecko	<i>Hemidactylus flaviviridis</i>
Lacertidae	Leschenault's snake eye	<i>Ophisops leschenaultii</i>
Scincidae	Common keeled Grass Skink	<i>Eutropis carinata</i>
Varanidae	Bengal Monitor	<i>Varanus bengalensis</i>
Snake		
Boidae	Red Sand Boa	<i>Eryx johnii</i>
	Common Sand Boa	<i>Gongylophis conicus</i>
Colubridae	Common Indian Cat Snake	<i>Boiga trigonata</i>
	Checked keelback	<i>Xenochrophis piscator</i>
	Indian Rat Snake	<i>Ptyas mucosa</i>
Elapidae	Spectacled Cobra	<i>Naja naja</i>
Viperidae	Indian Saw-scaled Viper	<i>Echis carinatus</i>

Annexure 4. Dragonflies and damselflies of Mandalgarh

Family	Common name	Scientific Name
Damselfly		
Lestidae	Brown spread wing	<i>Lestes umbrinus</i>
	Spred wing spp.	<i>Lestes sp.</i>
Coenagrionidae	Coromandel marsh dart	<i>Ceriagrion coromandelianum</i>
	Golden dartlet	<i>Ischnura aurora</i>
	Senegal golden dartlet	<i>Ischnura senegalensis</i>
	Pygmy dartlate	<i>Agriocnemis pygmaea</i>
	Saffron faced blue dart	<i>Pseudagrion rubriceps</i>
	Three lined dart	<i>Pseudagrion decorum</i>
	Violet-striped Blue Dart	<i>Pseudagrion indicum</i>
Dragonfly		
Aeshnidae	Blue darner	<i>Anax immaculifrons</i>
Gomphidae	Common hooktail	<i>Paragomphus lineatus</i>
	Common clubtail	<i>Ictinogomphus rapax</i>
Libellulidae	Trumpet tail	<i>Acisoma panorpoides</i>
	Little blue marsh hawk	<i>Brachydiplax sobrina</i>
	Ditch jewel	<i>Brachythemis contaminata</i>
	Granite ghost	<i>Bradinopyga geminata</i>
	Scarlet Skimmer	<i>Crocothemis servilia</i>
	Black ground skimmer	<i>Diplacodes lefebvrei</i>
	Green marsh hawk	<i>Orthetrum sabina</i>
	Taeniolate marsh hawk	<i>Orthetrum taeniolatum</i>
	Wandering glider	<i>Pantala flavescens</i>
	Rufous Marsh Glider	<i>Rhodothemis rufa</i>
	Common picture wing	<i>Rhyothemis variegata</i>
	Red marsh trotter	<i>Tramea basilaris</i>
	Black marsh trotter	<i>Tramea limbata</i>
	Crimson marsh glider	<i>Trithemis aurora</i>
	Scarlet rock glider	<i>Trithemis kirbyi</i>
Long-legged marsh glider	<i>Trithemis pallidinervis</i>	

Annexure 5. Butterflies of Mandalgarh

Family	Common name	Scientific name
Nymphalidae	Yellow Pansy	<i>Junonia hierta</i>
	Blue Pansy	<i>Junonia orithya</i>
	Lemon Pansy	<i>Junonia lemonias</i>
	Chocolate Soldier	<i>Junonia iphita</i>
	Peacock Pansy	<i>Junonia almana</i>
	Plain Tiger	<i>Danaus chrysippus</i>
Papilionidae	Lime butterfly	<i>Papilio demoleus</i>
Pieridae	Pioneer	<i>Belenois aurota</i>
	Common Emigrant	<i>Catopsilia pomona</i>
	Common Gull	<i>Cepora nerissa</i>
	Small Salmon Arab	<i>Colotis amata</i>
	Crimson Tip	<i>Colotis danae</i>
	Little Orange-tip	<i>Colotis etrida etrida</i>
	One-spot Grass Yellow	<i>Eurema andersoni</i>
	Small Grass Yellow	<i>Eurema brigitta</i>
	Common Grass Yellow	<i>Eurema hecabe</i>
	Oriental Great Orange-tip	<i>Hebomoia glaucippe</i>
	Yellow Orange-tip	<i>Ixias pyrene</i>
Hesperiidae	Indian Grizzled Skipper	<i>Spialia galba</i>
	Common Small Flat	<i>Sarangesa dasahara</i>
Lycaenidae	Pointed Ciliat Blue	<i>Anthene lycaenina</i>
	African Babul Blue	<i>Azonus jesus</i>
	Oriental Plain Cupid	<i>Chilades pandava</i>
	Gram Blue	<i>Euchrysops cnejus</i>
	Oriental Grass Jewel	<i>Freyeria putli</i>
	Common Cerulean	<i>Jamides celeno</i>
	Striped Pierrot	<i>Tarucus nara</i>
	Dark Grass Blue	<i>Zizeeria karsandra</i>
	Tiny Grass Blue	<i>Zizula hylax</i>

Annexure 6. Mammals of Mandalgarh

Family	Scientific name	Common name
Leporidae	<i>Lepus nigricollis</i>	Indian Hare
Erinaceidae	<i>Hemiechinus collaris</i>	Collared Hedgehog
Sciuridae	<i>Funambulus pennantii</i>	Five-striped Palm Squirrel
Muridae	<i>Golunda ellioti</i>	Indian Bush Rat
	<i>Mus booduga</i>	Little Indian Field Mouse
	<i>Rattus rattus</i>	Black Rat
	<i>Bandicota bengalensis</i>	Lesser Bandicoot-rat
	<i>Tatera indica</i>	Indian Gerbil
Viverridae	<i>Paradoxurus hermaphroditus</i>	Asian palm civet
Canidae	<i>Canis aureus</i>	Golden Jackal
	<i>Vulpes bengalensis</i>	Bengal Fox
Hyaenidae	<i>Hyaena hyaena</i>	Striped hyena
Herpestidae	<i>Herpestes edwardsii</i>	Indian Grey Mongoose
Felidae	<i>Felis chaus</i>	Jungle Cat
Bovidae	<i>Boselaphus tragocamelus</i>	Nilgai or Blue bull
Pteropodidae	<i>Pteropus giganteus</i>	Indian Flying Fox
Cercopithecidae	<i>Semnopithecus dussumieri</i>	Southern plains gray langur

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FOUNDATION FOR ECOLOGICAL SECURITY

PB No. 29, Anand – 388001, Gujarat, INDIA.
Phone: +91 (2692) 261402, 261238, 261239
Fax: +91 (2692) 262087
Email: ed@fes.org.in
www.fes.org.in