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## **CUMULATIVE BASELINE STATUS FOR FLORA AND FAUNA WITH ECOLOGICAL IMPACT ASSESSMENT FOR SAND MINING PROJECTS AT YAMUNA RIVER IN SONEPAT AND BAGHPAT AREA**

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**Abstract:** The area of for the present biological baseline study falls under 25 villages of Sonapat District of Haryana state and 14 villages of Baghpat of Uttar Pradesh State. Most of villages in the study area (Sonapat) are engaged in vegetable cultivation and people are depended on the same, not other crops like wheat and paddy, while other part (Baghpat), the people are engaged in farming of major crop viz. Sugar cane, Wheat and Paddy. Although, some villages near to Yamuna bank, like Kotana, Jagus, etc. are depends only on vegetables and horticultures like water melon, pumpkins, etc. The dominant trees in the study area are *Azadirachta indica* (Limbado), *Mangifera indica* (Aam), *Bombax ceiba* (Semal), *Delonix regia* (Gaulmor). The most commonly spotted bird species of this area were; Cattle Egret, Intermediate Egret, Black-winged Stilt, Red-wattled Lapwing, Rock Pigeon, Eurasian Collared-Dove, Spotted Dove, Chestnut-headed Bee-eater, Bank Myna and Common Myna. Only one Indian Peafowl was observed which is listed as schedule –I as per IWPA, 1972. The village ponds in Murthal, Jainpur, Tikola, Omadgarh and Yamuna River at Kotana Revenue were sampled to document the plankton diversity. Biotic communities of the in an inland water body consist of Phytoplankton (plant plankton) includes minute photosynthetic cells and microscopic unicellular and multi cellular species of several phyla of true algae, which are either solitary or colonial. The plankton study reveals that Yamuna River has no much richness of plankton biodiversity, while village ponds have much diversity of phytoplankton and zooplankton. The mining activity will be done on dry river bed except monsoon season, hence no any impact will envisaged on plankton community of the river Yamuna.

**Keywords:** Conservation; Ecological impact; Flora; Schedule; WPA.

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### **INTRODUCTION**

Floristic and Faunistic pattern of the area was studied based on opportunistic survey (personal observation), inquiries from the local people and forest officials and secondary data. The study area falls under Sonapat (Haryana) and Baghpat (Uttar Pradesh) states due to interstate boundary. The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes. The vast array of interactions among the various components of biodiversity makes the planet habitable for all species, including humans. There is a growing recognition that, biological diversity is a global asset of tremendous value

to present and future generations. At the same time, the threat to species and ecosystems has never been as great as it is today. Species extinction caused by human activities continues at an alarming rate. Protecting biodiversity is in our self-interest. Ecological impact assessment (EclA) is used to predict and evaluate the impacts of development activities on ecosystems and their components, thereby providing the information needed to ensure that ecological issues are given full and proper consideration in development planning. Environmental impact assessment (EIA) has emerged as a key to sustainable development by integrating

social, economic and environmental issues in many countries. EclA has a major part to play as a component of EIA but also has other potential applications in environmental planning and management (Kumar, 2014). Ecological Impact Assessment provides a comprehensive review of the EclA process and summarizes the ecological theories and tools that can be used to understand, explain and evaluate the ecological consequences of development proposals. At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a comprehensive strategy for sustainable development to meet our needs while ensuring that we leave a healthy and viable world for future generations. One of the key agreements adopted at Rio de Janeiro was the Convention on Biological Diversity. Article 14 of Convention on Biodiversity (Impact Assessment and Minimizing Adverse Impacts), stressed the need to Introduce appropriate procedures of environmental impact assessment for proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding

or minimizing such effects. Environmental impact assessments have become an integral part of development projects in India ever since 1994, to formulate policies and guidelines for environmentally sound economic development. Proper assessment of biological environment and compilation of its taxonomical data is essential for the impact prediction (Kumar, 2013; Kumar *et al.*, 2013; Kumar and Aggarwal, 2013a).

## EXPERIMENTAL

The baseline study was conducted for the evaluation of the floral and faunal biodiversity of the terrestrial and aquatic environment of the study area (10Km radius from the lease mine area-Refer figure 1) and it comprises of 25 villages in Sonapat District (Haryana) and 14 Villages in Baghpat District (Uttar Pradesh) due to interstate boundary. The baseline study has been conducted on 3<sup>rd</sup> and 4<sup>th</sup> June, 2015. The area comprise of 8 lease mines which are very adjacent to others, hence cumulative study has been carried out and assessed for cumulative ecological impact.

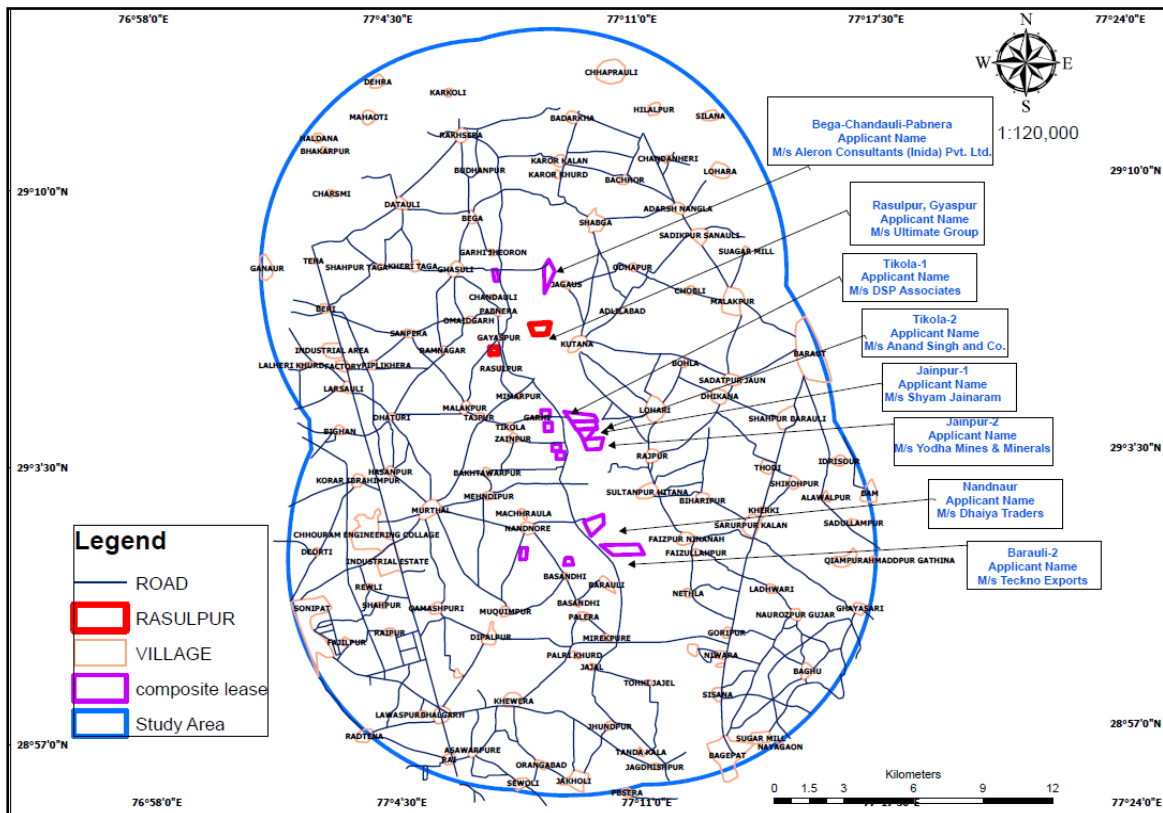


Figure 1. Study area Map (10 Km. Radius)

### Methodology for Terrestrial Ecology

The primary objective of survey was to describe the floral and faunal communities within the study area. The sampling plots for floral inventory were selected randomly in the suitable habitats (Anderson, 1867; Jain and Rao, 1983). The methodology adopted for faunal survey involve random survey, opportunistic observations, diurnal bird observation, active search for reptiles, faunal habitat assessment, active search for scats and foot prints, animal call, and review of previous studies. The aim was to set baselines in order to monitor and identify trends after the commissioning of the mining activity. Emphasis has been placed on presence of endemic species, threatened species if any present in the study area. Desktop literature review was conducted to indentify the representative spectrum of threatened species, population and ecological communities listed by IUCN, WCMC, ZSI, BSI and Indian Wild life Protection Act, 1972 (Bentham and Hooker, 1862-1883; Hunter, 1879; Dixit, 1984; Ghosh *et al.*, 2004; Lushington, 1915; Wilson and Reeder, 1993; BirdLife International, 2000; BirdLife International, 2004a, b; Wilson and Reeder, 2005; BirdLife International, 2010; Kumar and Srivastava, 2012; Kumar, 2013; Kumar *et al.*, 2013; Kumar and Aggarwal, 2013a,b). The status of individual species was assessed using the revised IUCN/SSC category system (WCMC, 1988; IUCN, 1994; WCMC, 2000; IUCN, 2001, 2003, 2008, 2010). The villages covered for baseline study are given in the table 1.

**Table 1. List of Villages for Baseline Study**

S.No.	Village Name	S.No.	Village Name
<b>Sonapat (Haryana)</b>		21	Pabnera
1.	Bahalgarh	22	Paldi
2.	Bakhtavarpur	23	Sewali
3.	Bega	24	Tajpur
4.	Chandauli	25	Tikola
5.	Datauli	<b>Baghpat (Uttar Pradesh)</b>	
6.	Gannour	1.	Niwada
7.	Garhi	2.	Sisana
8.	Gayaspur	3.	Baghpat
9.	Hasanpur	4.	Naurojpur
10.	Jainpur	5.	Gayaspur
11.	Jhakhauli	6.	Sasurpur Kalan
12.	Jhundpur	7.	Tyori

13.	Kamaspur	8.	Baraut
14.	Khewra	9.	Malakpur
15.	Larsauli	10.	Sanauli
16.	Mirkpur	11.	Sadikpur
17.	Murthal	12.	Adliabad
18.	Nagal khurd	13.	Kotana
19.	Omadgarh	14.	Jagus
20.	Ornagabad		-

### Methodology for Inland Water Sampling

The samples for qualitative and quantitative analysis of planktons were collected from the sub surface layer at knee depth. Water samples were filtered through plankton net of 20 $\mu$  mesh size (APHA, 1971). The filtered samples were concentrated by using the centrifuge. By using Lackey's drops method and light microscope (Lackey, 1938), the quantitative analysis was carried out for phytoplankton and zooplankton. The standard flora and other literature were followed for the qualitative evaluation of Plankton (Welch, 1948; Vollenweider, 1969; Edmondson, 1974).

## RESULTS AND DISCUSSION

### Terrestrial Floral and Faunal Components of the Study Area

The area of for the present biological baseline study falls under 25 villages of Sonapat District of Haryana state and 14 villages of Baghpat of Uttar Pradesh State. The study area belongs to almost plain without much undulation, a fallow land; hence not much vegetation cover, except scattered *Prosopis juliflora* shrubs and few trees of *Prosopis cineraria* as dominant vegetation.

Most of villages in the study area (Sonapat) are engaged in vegetable cultivation and people are depended on the same, not other crops like wheat and paddy, while other part (Baghpat), the people are engaged in farming of major crop viz. Sugar cane, Wheat and Paddy. Although, some villages near to Yamuna bank, like Kotana, Jagus, etc. are depends only on vegetables and horticultures like water melon, pumpkins, etc. Villages are scattered in between the large patches of agriculture lands. The tree cover in the study area is scanty restricted only in the habituated areas of the village and few along the boundary of the agricultural fields and road sides. It was

observed that most of the villages in the study area are with large village talabs used in rain water harvesting. The study area is also characterized by many water logged regions occupied by hydrophytes. Some people are engaged in poultry farming while many people are engaged in domestic animal for milk production like Buffalo and cows. Almost entire western part of the study area is occupied by Yamuna estuary and the famers are practicing the vegetable crops and some part is occupied by small patches of *Prosopus juliflora* and it

falls in Sonapat District of Haryana State while eastern bank of the Yamuna near Kotana village is occupied by the small patches of scrub land with sparse population of cactus (*Cereus peruvianus*) and Munja (*Saccharum munja*) and it falls in Baghpat district of Uttar Pradesh Sate. The tree species, herbs and shrubs and major crops, were documented during this base line study. The list of floral species documented in the study area is enlisted in table 2-6.



Figure 2. Aquatic Habitat of the Study area





**Figure 3. Terrestrial Habitat of the Study area**



**Figure 4. Agriculture land of Study area**



**Figure 5. Non agriculture land of study area**



**Figure 6. River Bed area for sand mining**



**Figure 7. Scrub Area**

## Floral Diversity of the Study Area

The objective this floral inventory of the study area, is to provide necessary information on floristic structure in the study area for formulating effective management and conservation measures. The climatic, edaphic and biotic variations with their complex interrelationship and composition of species, which are adapted to these variations, have resulted in different vegetation cover, characteristic of each region (Ohasi, 1975). The tree species, herbs, shrubs, climbers and major crops, were documented during this base line study (Jain, 1968; 1991). The list of floral species documented in the study area is enlisted in table 2-5. The tree species observed in the study area is enlisted in the table 2. The undergrowth during this summer season was almost in dry state. The shrubs observed in the study are documented in the Table 3. Herbs and climbers in the study area are represented in Table 4 and Table 5 respectively.

**Trees:** The dominant trees in the study area are *Azadirachta indica* (Limbad), *Mangifera indica* (Aam), *Bombax ceiba* (Semal), *Delonix regia* (Gaulmor). Total 32 species of trees belong to 16 families are enumerated from the study area.

**Table 2. Trees in the Study area**

S.No.	Family and Scientific Name	Vernacular Name
<b>1</b>	<b>Anacardiaceae</b>	
1/1	<i>Mangifera indica</i> L.	Aam
<b>2</b>	<b>Apocynaceae</b>	
2/1	<i>Plumeria rubra</i> L.	Champa
<b>3</b>	<b>Bombacaceae</b>	
3/1	<i>Bombax ceiba</i>	Semal
<b>4</b>	<b>Caesalpiniaceae</b>	
4/1	<i>Delonix regia</i> (Boj.)	Gaulmor
5/2	<i>Delonix elata</i> (L.)	Sandsro
6/3	<i>Cassia fistula</i> L.	Golden Shower
7/4	<i>Cassia siamea</i> Lam.	Amaltas
8/5	<i>Peltophorum pterocarpum</i>	Sonmukhi
9/6	<i>Tamarindus indicum</i> L.	Amali
<b>5</b>	<b>Caricaceae</b>	
10/1	<i>Carica papaya</i> L.	Papaya
<b>6</b>	<b>Combretaceae</b>	
11/1	<i>Terminalia arjuna</i>	Arjun
<b>7</b>	<b>Fabaceae</b>	
12/1	<i>Saraca asoca</i>	Asoka

13/2	<i>Tamarindus indica</i>	Imli
<b>8</b>	<b>Malvaceae</b>	
14/1	<i>Thespesia populnea</i> (L.)	Paras pipal
<b>9</b>	<b>Meliaceae</b>	
15/1	<i>Azadirachta indica</i>	Neem
16/2	<i>Melia azadirachta</i> L.	Bakain
<b>10</b>	<b>Mimosaceae</b>	
17/1	<i>Acacia nilotica</i>	Babool
18/2	<i>Leucaena leucocephala</i>	Pardesi Baval
19/3	<i>Albizia lebbek</i> (L.)	Siris
20/4	<i>Albizia procera</i> (Roxb.)	Kala siris
21/5	<i>Pithecellobium dulce</i>	Jungle jalebi
22/6	<i>Prosopis cineraria</i> (L.)	Jand
<b>11</b>	<b>Moraceae</b>	
23/1	<i>Ficus benghalensis</i> L.	Bargad
24/2	<i>Ficus religiosa</i> L.	Pipal
<b>12</b>	<b>Myrtaceae</b>	
25/1	<i>Eucalyptus</i> sp.	Nilgari
26/2	<i>Syzygium cumini</i> (L.)	Jamun
<b>13</b>	<b>Papilionaceae</b>	
27/1	<i>Pongamia pinnata</i> (L.)	Karanj
<b>14</b>	<b>Salicaceae</b>	
28/1	<i>Populus deltoides</i>	Popular
<b>15</b>	<b>Simaroubaceae</b>	
29/1	<i>Ailanthus excelsa</i> Roxb.	Heaven tree
<b>16</b>	<b>Rhamnaceae</b>	
30/1	<i>Zizyphus glabrata</i>	Ber
31/2	<i>Zizyphus vulgaris</i>	Ber
32/3	<i>Zizyphus xylopyrus</i>	Jugle Ber

**Shrubs:** Shrubs encountered during the present survey are given in the Table 3. Total 25 shrub species belong to 17 families are enumerated from the study area. The dominant shrub community in this area was represented by Kaner (*Thevetia peruviana*), *Prosopis juliflora* (Bilayati babool), *Calotropis procera*, *C. gigantea* (Akoda), *Ipomoea fistulosa* and *Abutilon indicum*, etc. The shrubs observed in the study area are given in the table 3.

**Table 3. Lists of Shrubs in the Study Area**

S.No.	Family and Scientific Name	Vernacular Name
<b>1</b>	<b>Apocynaceae</b>	
1/1	<i>Nerium indicum</i>	Lal Kaner
2/2	<i>Thevetia peruviana</i>	Pili Kaner
<b>2</b>	<b>Asclepiadaceae</b>	
3/1	<i>Calotropis gigantea</i> (L.)	Akoda
4/2	<i>Calotropis procera</i>	Akoda

	(Ait.)	
<b>3</b>	<b>Balanitaceae</b>	
5/1	<i>Balanites aegyptiaca</i> (L.)	Ingorio
<b>4</b>	<b>Bignoniaceae</b>	
6/1	<i>Tecoma stans</i> (L.)	Peilafol
<b>5</b>	<b>Cactaceae</b>	
7/1	<i>Cereus peruvianus</i>	Cactus
<b>5</b>	<b>Caesalpinaceae</b>	
8/1	<i>Cassia auriculata</i> L.	-
<b>6</b>	<b>Capparaceae</b>	
9/1	<i>Capparis decidua</i> (Forsk.)	Kerdo
<b>7</b>	<b>Compositae</b>	
10/1	<i>Xanthium strumarium</i> L.	Gokhru
<b>8</b>	<b>Convolvulaceae</b>	
11/1	<i>Ipomoea fistulosa</i>	Besharm
<b>9</b>	<b>Euphorbiaceae</b>	
12/1	<i>Euphorbia nerifolia</i> L.	Thor
13/2	<i>Jatropha curcas</i> L.	Ratanjot
14/3	<i>Ricinus communis</i> L.	Arand
<b>10</b>	<b>Lythraceae</b>	
15/1	<i>Decodon verticillatus</i>	Water willow
<b>11</b>	<b>Malvaceae</b>	
16/1	<i>Abelmoschus manihot</i> (L.)	Jagali bhindi
17/2	<i>Abutilon indicum</i> (L.) Sw.	Khapat
18/3	<i>Hibiscus rosasinensis</i>	Gurhal
<b>12</b>	<b>Musaceae</b>	
19/1	<i>Musa paradisiaca</i> L.	Kela
<b>13</b>	<b>Mimosaceae</b>	
20/1	<i>Prosopis juliflora</i> DC	Bilayati babool
<b>14</b>	<b>Nyctaginaceae</b>	
21/1	<i>Bougainvillea spectabilis</i>	Bougainvelia
<b>15</b>	<b>Papilionaceae</b>	
22/1	<i>Sesbania sesban</i> (L.)	Sesban
<b>16</b>	<b>Rhamnaceae</b>	
23/1	<i>Zizyphus nummularia</i>	Jharbera
<b>17</b>	<b>Solanaceae</b>	
24/1	<i>Datura metel</i> L.	Datura
25/2	<i>Solanum incanum</i> L.	Junglee baigan

**Herbs:** The herbaceous cover observed in this region is given in the table 4. The most of the undergrowth was dried up, except near water logged regions and along the periphery of the village ponds. Total 33 species belongs to 18 family were recorded from the study area.

**Table 4. List of Herbaceous species observed in the study area**

S.No.	Family and Scientific Name	Vernacular Name
<b>1</b>	<b>Acanthaceae</b>	
1/1	<i>Hygrophila auriculata</i>	Kokilaksha

	(Schum.)	
<b>2</b>	<b>Asteraceae</b>	
2/1	<i>Blumea</i> sps.	-
3/2	<i>Eclipta prostrata</i> (L.) L.	Bhangro
4/3	<i>Echinops echinatus</i> Roxb	Shulia
5/4	<i>Tridax procumbens</i> L.	Pardesi bhanga
<b>3</b>	<b>Boraginaceae</b>	
6/1	<i>Trichodesma indicum</i> l.	Undha fuli
<b>4</b>	<b>Chenopodiaceae</b>	
7/1	<i>Suaeda nudiflora</i> (willd) Moq.	Moras
8/2	<i>S. fruticosa</i> L.	-
<b>5</b>	<b>Cyperaceae</b>	
9/1	<i>Cyperus bulbosus</i> Vahl.	-
10/2	<i>Cyperus difformis</i> L.	-
11/3	<i>Cyperus stoloniferus</i> Retz.	-
12/4	<i>Cyperus rotundus</i> L.	-
<b>6</b>	<b>Lamiaceae ( Labiatae)</b>	
13/1	<i>Ocimum basilicum</i> L.	Damaro
14/2	<i>Ocimum sanctum</i> L.	Tuli
<b>7</b>	<b>Liliaceae</b>	
15/1	<i>Aloe barbadensis</i> Mill.	Kunvarpato
<b>8</b>	<b>Nymphaeaceae</b>	
16/1	<i>Nymphaea pubescens</i> Willd	Kamal
17/2	<i>Nymphaea stellata</i>	-
<b>9</b>	<b>Nyctaginaceae</b>	
18/1	<i>Boerhavia diffusa</i> L.	-
19/2	<i>Boerhavia chinensis</i> Druce	-
<b>10</b>	<b>Papaveraceae</b>	
20/1	<i>Argemone mexicana</i> L.	Darudi
<b>11</b>	<b>Papilionaceae</b>	
21/1	<i>Cortalaria medicaginea</i> Lam	Ran methi
22/2	<i>Indigofera oblongifolia</i> Forks.	-
<b>12</b>	<b>Poaceae (Gramineae)</b>	
23/1	<i>Phragmites karaka</i> Steud	-
24/2	<i>Aeluropus lagopoides</i> Trin	-
25/3	<i>Cynodon dactylon</i> Pers.	-
26/4	<i>Pennisetum typhoides</i> (Burm.)	Bajri
<b>13</b>	<b>Poligonaceae</b>	
27/1	<i>Polygonum</i> sp.	-
<b>14</b>	<b>Pontederiaceae</b>	
28/1	<i>Eichhornia crassipes</i> (Mart.)	Jalkumbhi
<b>15</b>	<b>Potamogetonaceae</b>	
29/1	<i>Potamogeton</i> sp.	-
<b>16</b>	<b>Solanaceae</b>	
30/1	<i>Solanum surattense</i> Burm.	Bhoringini
31/2	<i>Datura metel</i>	Dhatura



17	<b>Typhaceae</b>	
32/1	<i>Typha angustata</i> Bory and Chaub	-
18	<b>Zygophyllaceae</b>	
33/1	<i>Tribulus terrestris</i> L	Gokhru

**Climbers and Twiners:** The climbers and twiners observed along the agricultural hedges and road side hedges of the study area are given in the table 5. Total 6 species of climbers/ twiners belongs to 3 families are recorded from the area.

**Table 5. List of Climbers Observed in the Study Area**

S.No.	Family and Scientific Name	Vernacular Name
<b>1.</b>	<b>Convolvulaceae</b>	
1/1	<i>Ipomoea pes-caprae</i>	Dariani vel
2/2	<i>Ipomoea obscura</i> (L.)	Vad fudardi
<b>2.</b>	<b>Cucurbitaceae</b>	
3/1	<i>Citrulus colocynthis</i> (L)	Indravarna
4/2	<i>Coccinia grandis</i> (L.) Voigt	Ghiloda
5/3	<i>Luffa cylindrica</i> (L.)	Galku
<b>3.</b>	<b>Cuscutaceae</b>	
6/1	<i>Cuscuta chinensis</i> Lam.	Amarval

### Cultivated Plants in the Study Area

The prevalent cropping systems of this area are the cumulative results of past and present decisions by individuals; these decisions are usually based on experience, tradition, expected profit, personal preferences and resources, and so on. The crop occupying the highest percentage of the sown area of this region is taken as the major crop and all other possible alternative crops which are sown in this region either as substitutes of the base crop in the same season or as the crops which fit in the rotation in the subsequent season, are considered as minor crop.

**a. Major Crops:** Mainly people of Sonapat area was dependent on Vegetable corps while Baghpat Area, the people are depend on Sugar cane. Major crops in the study area are Sugar cane (*Saccharum officinarum*), Wheat (*Triticum aestivum*), Paddy (*Oryza sativa*), Maize (*Zea mays*) and Barley (*Hordeum vulgare*). Mainly people of this area are depends on vegetable crops and sugar cane.

**b. Minor crops:** The minor crops of this region are Mustard (*Brassica campestris* var.), Green gram (*Vigna radiate*), Sesamum (*Sesamum*

*indicum*), Pigeon Pea (*Punica granatum*) Jowar (*Sorghum bicolor*) and Black Gram (*Vigna mungo*).

**c. Major horticultural crops:** Aam (*Mangifera indica* L.), Papaya (*Carica papaya* L.), Banana (*Musa Paradisiaca* L.), Lime (*Citrus aurantifolia*), Guava (*Psidium guajava*), Jack-fruit (*Artocarpus heterophyllus*), Jujube (*Ziziphus mauritiana*), Myriobalan (*Phyllanthus emblica*) and Palmgranate (*Punica granatum*).

**d. Major Vegetable corps:** The major vegetables grown in the study area were:

1. Amari: *Hibiscus subderifa*.
2. Bitter gourd: *Momordica charantia*.
3. Bottle gourd: *Lagenaria siceraria*.
4. Brinjal: *Solanum melongena*.
5. Cabbage: *Brassica oleracea*.
6. Carrot: *Daucus carota*.
7. Cauliflower: *Brassica oleracea*.
8. Chilli: *Capsicum annuum*.
9. Colocasia: *Colocasia esculenta*
10. Coriander: *Coriandrum sativum*
11. Cucumber: *Cucumis sativus*
12. Garlic: *Allium sativum*
13. Kundru: *Coccinia grandis*
14. Lady's finger: *Abelmoschus esculentus*.
15. Lalbhaji: *Amaranthus* spp.
16. Onion: *Allium cepa*.
17. Potato: *Solanum tuberosum*.
18. Pumpkin: *Cucurbita moschata*.
19. Radish: *Raphanus sativus*.
20. Ridge gourd: *Luffa acutangula*.
21. Sem Bean: *Dolichos lablab*.
22. Snake gourd: *Trichosanthes anguina*.
23. Spinach: *Beta olirecia*.
24. Sponge gourd: *Luffa cylindrica*.
25. Tomato: *Lycopersicum esculantum*
26. Turmeric: *Curcuma longa*.
27. White gourd: *Benincasa hispida*.

**e. Major Ornamental Plants:** Following is the list of ornamental plants in the study area.

1. Marigold: *Tagates erecta*.
2. Periwinkle: *Catharanthus roseus*.
3. China rose: *Hibiscus rosasinensis*.
4. Chrysanthemum: *Chrysanthemum americanum*.
5. Sunflower: *Helianthus annuus*.
6. Rose: *Rosa indica*.
7. Jasmin: *Jasminum sambac*.

8. Stick Rose: *Polyanthes tuberosa*.

**Rare and Endangered Flora in the Study Area:**

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. Out of 17000 species of higher plants known to occur in India, nearly 614 higher plant species were evaluated by IUCN. Among them 247 species are under threatened category (IUCN, 2008).

Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants (Jain and Sastry, 1984; Nayar and Sastry, 1987; 1988; 1990; Oldfield *et al.*, 1998; Kholia and Bhakuni, 2009) and Red list of threatened Vascular plants (IUCN, 2010).

**Endemic Plants of the Study Area:**

De Candolle (1855), Swiss botanist, first used the concept of Endemic, which is defined as an area of a taxonomic unit, especially a species which has a restricted distribution or habitat, isolated from its surrounding region through geographical, ecological or temporal barriers. Out of 17000 species of known flowering plants of India nearly 5000 species are said to be endemic. Nearly 58 genera and 1932 taxa are found to be endemic to peninsular India (Nayar, 1980; Ahmedullah and Nayar, 1986; 1987; Jain 1992; Nayar, 1996; Vijaya Shankar *et al.*, 2005; Nautiyal *et al.*, 2009a,b; Shendage *et al.*, 2010).

Among recorded plant species none can be assigned the status of endemic plant of this region.

**Status of the Forest, Their Category in Study Area:**

No forest was observed in the study area except few scrub land and grazing

lands with thin vegetation cover of *Prosopis juliflora* and *Prosopis cineria*.

**Faunal Biodiversity of Study Area**

For the documentation of the faunal biodiversity of the study area with respect to birds, reptiles, amphibians, and butterfly species, a baseline survey had been conducted. The study area falls under two states Haryana and Uttar Pradesh (interstate boundary).

**Avifauna:** The sighting of bird species was very less during the study period during June 2015. The most commonly spotted bird species of this area were; Cattle Egret, Intermediate Egret, Black-winged Stilt, Red-wattled Lapwing, Rock Pigeon, Eurasian Collared-Dove, Spotted Dove, Chestnut-headed Bee-eater, Bank Myna and Common Myna. Only one Indian Peafowl was observed which is listed as schedule –I as per IWPA, 1972.

Total 1,224 bird species reliably recorded from India, together with their status categories. In total there are 1219 extant native species including migrants and vagrants (but excluding 3 species now known to be extinct in the country and 2 introduced species). There are 923 breeding species (911 residents, plus 12 suspected residents). IUCN evaluated 1254 bird species from India and categorized 77 species as threatened (13 species as critically endangered, 10 species as Endangered and 54 species as Vulnerable). No one sighted birds were evaluated as near threatened by IUCN, 2010 and BirdLife International, 2010. A taxon is Near Threatened, when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable categories, but is close to qualifying or is likely to qualify for a threatened category in the near future. List of schedule -1 as per Wild life Protection Act 1972, species is given in the table 6. Systematic account of the birds in the study area with the status of occurrence is given in the table 7.

**Table 6. Schedule –I Bird(s) of Study Area**

Species	As IWPA 1972	IUCN	CITES
Indian Peafowl ( <i>Pavo cristatus</i> )	Schedule I	Least Concern ver 3.1	Not listed

**Table 7. Systematic Lists of Birds in the Study Area with Its Distribution and Migratory Status**

Old Common name	New Common Name	Scientific Name	Dist.
<b>I ORDER: APODIFORMES</b>			
<b>Family: Apodidae (swifts)</b>			
Common Swift	Common Swift	<i>Apus apus</i>	R
House swift	Little Swift	<i>Apus affinis</i>	R
<b>II ORDER: FALCONIFORMES</b>			
<b>Family: Accipitridae (vulture, Sparrow hawk, Eagle, Harrier, Kite and Vulture)</b>			
Shikra	Shikra	<i>Accipiter badius</i>	R
Black-winged Kite	Black-winged Kite	<i>Elanus caeruleus</i>	R
<b>III. ORDER: : CICONIIFORMES</b>			
<b>Family: Ardeidae (heron, Egret, Bittern)</b>			
Cattle Egret	Cattle Egret	<i>Bubulcus ibis</i>	R
Median or Smaller Egret	Intermediate Egret	<i>Mesophoyx intermedia</i> <i>Egretta intermedia</i>	R
Little Egret	Little Egret	<i>Egretta garzetta</i>	R
Pond Heron	Indian Pond-Heron	<i>Ardeola grayii</i>	R
<b>Family: Charadriidae (Plover, Stilt, Oystercatcher, Lapwing, Avocet )</b>			
Black-winged Stilt	Black-winged Stilt	<i>Himantopus himantopus</i>	R
Red-wattled Lapwing	Red-wattled Lapwing	<i>Vanellus indicus</i>	R
<b>Family: Threskiornithidae (Spoonbill and Ibis)</b>			
Black Ibis	Red-naped Ibis	<i>Pseudibis papillosa</i>	R
<b>IV. ORDER: COLUMBIFORMES</b>			
<b>Family: Columbidae (Pigeon, Dove)</b>			
Blue Rock Pigeon	Rock Pigeon	<i>Columba livia</i>	R
Ring Dove	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	R
Rufous Turtle Dove	Oriental Turtle-Dove	<i>Streptopelia orientalis</i>	R
Spotted Dove	Spotted Dove	<i>Streptopelia chinensis</i>	R
<b>V. ORDER: CORACIFORMES</b>			
<b>Family: Dacelonidae (Kingfishers)</b>			
White breasted Kingfisher	White-throated Kingfisher	<i>Halcyon smymensis</i>	R
<b>Family: Coraciidae (Roller)</b>			
BlueJay or Roller	Indian Roller	<i>Coracias benghalensis</i>	
<b>Family: Meropidae (Bee Eater)</b>			
Chestnut-headed Bee-eater	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	R
Blue-cheeked Bee-eater	Blue-cheeked Bee-eater	<i>Merops persicus</i>	R
Olive Bee eater	Olive Bee eater	<i>Merops superciliosus</i>	
<b>VI. ORDER: CUCULIFORMES</b>			
<b>Family: Centropodidae (Cocucal)</b>			
Crow-Pheasant or Coucal	Greater Coucal	<i>Centropus sinensis</i>	R
<b>Family: Cuculidae (cuckoo, Koel)</b>			
Koel	Asian Koel`	<i>Eudynamys scolopacea</i>	R
Indian Drongo Cuckoo	Drongo Cuckoo	<i>Surniculus lugubris</i>	R
<b>VII. ORDER: GALLIFORMES</b>			
<b>Family: Phasianidae (Peafowl, Partridge, Quail, francolin, Spur fowl, Jungle fowl, Monal)</b>			
Common Peafowl	Indian Peafowl	<i>Pavo cristatus</i>	R
Grey Partridge	Grey Francolin	<i>Francolinus pondicerianus</i>	R
Common Quail	Common Quail	<i>Coturnix coturnix</i>	R
Red jungle fowl	Red jungle fowl	<i>Gallus gallus</i>	R
<b>VIII. ORDER: GRUIFORMES</b>			
<b>Family: Rallidae (Waterhen, coot, crane water cock, Moorhen, Rail)</b>			
White-breasted Water hen	White-breasted Water hen	<i>Amauormis phoenicurus</i>	R
Indian Moorhen	Common Moorhen	<i>Gallinula chloropus</i>	R
<b>XI. ORDER: PASSERIFORMES</b>			
<b>Family: Paridae (Tit )</b>			
Grey Tit	Great Tit	<i>Parus major</i>	R
<b>Family: Corvidae</b>			
Raven	Common Raven	<i>Corvus corax</i>	R

House Crow	House Crow	<i>Corvus splendens</i>	R
Black drongo- King Crow	Black Drongo	<i>Dicrurus macrocercus</i>	R
Tree Pie	Rufous Treepie	<i>Dendrocitta vagabunda</i>	R
<b>Family: Muscicapidae (Short wing, Chat, Robin, Shama)</b>			
Indian Robin	Indian Robin	<i>Saxicoloides fulicata</i>	R
Pied Bushchat	Pied Bushchat	<i>Saxicola caprata</i>	R
<b>Family: Nectariniidae (Sun Birds, Flower pecker, Spider hunter )</b>			
Purple Sunbird	Purple Sunbird	<i>Nectarinia asiatica</i>	R
Small Sunbird	Crimson-backed Sunbird	<i>Nectarinia minima</i>	R
<b>Family: Passeridae (Avadavat, Pipit, Wagtail, Munia, Snowfinch, Sparrow, Accentor)</b>			
House Sparrow	House Sparrow	<i>Passer domesticus</i>	R
<b>Family: Pycnonotidae (Bulbul)</b>			
Red-whiskered Bulbul	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	R
Red-vented Bulbul	Red-vented Bulbul	<i>Pycnonotus cafer</i>	R
<b>Family: Sturnidae (Myna, Starling)</b>			
Bank Myna	Bank Myna	<i>Acridotheres ginginianus</i>	R
Indian Myna	Common Myna	<i>Acridotheres tristis</i>	R
<b>Family: Sylviidae (Warbler, Browning, Fulvetta ,Babbler, Laughing thrash, Tailor birds)</b>			
Common Babbler	Common Babbler	<i>Turdoides caudatus</i>	R
Jungle Babbler	Jungle Babbler	<i>Turdoides striatus</i>	R
Tailorbird	Common Tailorbird	<i>Orthotomus sutorius</i>	R
<b>X. ORDER: PSITTACIFORMES</b>			
<b>Family: Psittacidae (Parrot and Parakeet)</b>			
Rose-ringed Parakeet	Rose-ringed Parakeet	<i>Psittacula krameri</i>	R
<b>Family: Ploceidae</b>			
Baya	Baya weaver	<i>Ploceus philippinus</i>	R
<b>XI. ORDER: STRIGIFORMES</b>			
<b>Family: Strigidae (Owl and Owlet)</b>			
Owl	Indian Great Horned owl	<i>Bubo bubo</i>	R

Note: R = Widespread Resident, r = Very Local Resident, W = Widespread Winter Visitor, w = Sparse Winter Visitor, RW =Resident and winter visitor as per the distribution (Dist.) given in WCMC, Check list of Indian Birds.

**Other Fauna:** Butterflies observed during the present study are documented in the Table 8. Frog and toad were sighted during the study period during June 2015. The reptiles' document in the region is given in the table 9. The wild mammals observed other than the domesticated ones are given in the table 10. The fishes observed are given in the table 11. The domestic animals observed in the study area are given in the table 12.

**Table 8. Butterflies in the Study Area**

Scientific Name and Family	Common Name
<b>Family Papilionidae</b>	
<i>Papilio polytes</i>	Common Mormon
<b>Family Pieridae</b>	
<i>Eurema hecabe</i>	Common Grass yellow
<i>Ixias Marianne</i>	White orange tip
<b>Family: Nymphalidae</b>	
<i>Danaus genutia</i> Cramer	Stripped Tiger
<i>Hypolimnastis misippus</i>	Danaid egg fly
<i>Mycalesis perseus</i>	Common bush brown

**Table 9. Reptiles and Amphibian in Study Area**

S.No.	Common	Scientific	Schedule
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	Name	Name	IWPA, 1972
1.	Toad	<i>Bufo bufo</i>	Not listed
2.	Medhak	<i>Rana tigrina</i>	Schedule IV
3.	Common Garden Lizard	<i>Calotes versicolor</i>	Not listed
4.	Common Indian Monitor	<i>Varanus bengalensis</i>	Schedule I
5.	Fan-Throated Lizard	<i>Sitana ponticeriana</i>	Not listed
6.	House Gecko	<i>Hemidactylus flaviviridis</i>	Not listed
7.	*Indian Cobra	<i>Naja naja</i> (L)	Schedule II
8.	*Russell's Viper	<i>Daboia russelii</i>	Schedule II

\*Not sighted but included as per the secondary information from the villagers.

**Table 10. Mammals in Study area**

S.No.	Common Name	Scientific Name	Status as per IWPA 1972
1.	Bat	<i>Rousettus leschenaulti</i>	Schedule V
2.	Common House	<i>Rattus rattus</i>	Schedule

	rat		V
3.	Common Mongoose	<i>Herpestes edwardsii</i>	Schedule II
4.	Five striped Palm Squirrel	<i>Funambulus pennanii</i>	Schedule IV
5.	Hare	<i>Lepus nigricollis dayanus</i>	Schedule IV
6.	Indian field mouse	<i>Mus booduga</i>	Schedule IV
7.	Jackal	<i>Canis aureus</i>	Schedule II
8.	Monkey (Rhesus macaque)	<i>Macaca mulatta</i>	Schedule II
9.	Nilgai (Blue Bull)	<i>Boselaphus tragocamelus</i>	Schedule-III
10.	*Jungle Cat	<i>Felis chaus</i>	Schedule II

\*Not directly seen, based on secondary information from the villagers.

**Table 11. Fishes in Study area**

S.No.	Local Name	Scientific Name
1.	Calbasu	<i>Labeo calbasu</i>
2.	Kali Machali	<i>Barbus chilinadea</i>
3.	Mahseer	<i>Tor barakae</i>
4.	Rohu	<i>Labeo rohita</i>
5.	Singi	<i>Clarias batrachus</i>

**Table 12. Domestic Animals in Study area**

S.No.	English/Hindi Name	Scientific Name
1.	Buffalo/ Bhains	<i>Bulbalus bulbalis</i>
3.	Cow/Gai	<i>Bos primigenius</i>
5.	Dog/Kutta	<i>Canis lupus familiaris</i>
2.	Goat/Bakri	<i>Capra aegagrus hircus</i>
4.	Sheep/Bhed	<i>Ovis aries</i>

#### Rare and Endangered Fauna of Study Area:

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is

recognized as the most authoritative guide to the status of biological diversity. IUCN, (2008) has evaluated 1976 animal species from India, among them 313 have in recognized as threatened species. Among them one species is considered as extinct, while 44 species are in critically endangered (CR) category, 88 is in endangered category (EN), while 181 is considered as vulnerable (VU). Wild Life (Protection) Act, 1972, amended on 17<sup>th</sup> January 2003, is an Act to provide for the protection of wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensuring the ecological and environmental security of the country. Some of the sighted fauna was given protection by the Indian Wild Life (Protection) Act, 1972 by including them in different schedules. Among the birds in the study area, Pea fowl (*Pavo cristatus*) is included in schedule I of Wild life protection Act (1972), while many other birds are included in schedule IV. Among the reptiles, Indian Cobra (*Naja naja*) and Russell's viper were provided protection as per Schedule-II of Wild life protection act, (1972). Among mammals; Common Indian monitor (*Varanus bengalensis*) is schedule-I and Common Mongoose (*Herpestes edwardsi*), Common Garden Lizard (*Calotes versicolor*), Jackal (*Canis aureus* (Linnaeus) Monkey (*Rhesus macaque*) and Jungle cat (*Felis chaus*) are a schedule –II animals. Nilgai (*Boselaphus tragocamelus*) is protected as Schedule-III animal and hares and five striped squirrels are included in schedule IV of Wild Life Protection act 1972.

**Endemic Fauna of the Study Area:** None of the sighted animal species can be assigned endemic species category of the study area.

**Table 13. List of Schedule –I and II Fauna Observed During the Study**

S.No.	Scientific Name	Local Name	Schedule As Per (WPA, 1972)	IUCN Category	CITES Listing
1.	<i>Pavo cristatus</i>	Indian Peafowl	Schedule I	Least Concern ver 3.1	Not listed
2.	<i>Varanus bengalensis</i>	Common Indian monitor	Schedule I	Least Concern ver 3.1	Appendix I
3.	<i>Canis aureus</i>	Jackal	Schedule II	Least Concern ver 3.1	Appendix II
4.	<i>Herpestes edwardsi</i>	Common Mongoose	Schedule II	Least Concern ver 3.1	Appendix III
5.	<i>Macaca mulatta</i>	Rhesus macaque	Schedule II	Least Concern ver 3.1	Not listed
6.	<i>Felis chaus</i>	Jungle Cat	Schedule II	Least Concern ver 3.1	Appendix II
7.	<i>Naja naja</i>	Indian Cobra	Schedule II	Least Concern ver 3.1	Appendix II

8.	<i>Vipera/Daboia russelli</i>	Russell's Viper	Schedule II	Least Concern ver 3.1	Appendix III
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### Plankton Study

Most of the villages in the study area are with large village ponds for rain water harvesting option as wells to recharge aquifers for better quality water in the wells at the periphery of these village ponds. The village ponds in Murthal village, Jainpur village, Tikola village, Omadgarh village and Yamuna River at Kotana Revenue were sampled to document the plankton diversity. Biotic communities of the in an inland water body consist of Phytoplankton (plant plankton) includes minute photosynthetic cells and microscopic unicellular and multi cellular species of several phyla of true algae, which are either solitary or colonial. Phytoplankton is autotrophs, containing photosynthetic pigments. Most of the phytoplankton has a density greater than the water hence they tend to sink down. Water

turbulence combined with other factors such as shape, and physiological state, reduce the sinking rate of non motile organisms. Motile phytoplankton, like most of the dinoflagellates may actively swim to compensate for sinking. Phytoplankton is of great ecological significance because they comprise the major portion of primary producers for all the consumers such as zooplankton and fishes. Zooplankton (animal plankton) includes a great variety of animals from single-celled protozoa to large invertebrates. Among the zooplanktons crustaceans of phylum Arthropoda easily predominate, these include numerous species within several categories. Zooplankton includes animals that are planktonic throughout their lives as well as larvae of animals that grow up to be nekton or benthos.

**Table 14. Plankton Community of Inland Water bodies**

Plankton Community	River Yamuna at Kotana	Village Murthal	Village Jainpur	Village Tikola	Village Omadgarh
<b>Phytoplankton</b>					
<b>Sub Phylum Chlorophyceae</b>					
Order: Chlorococccale					
Family: Scenedesmaceae					
<i>Scenedesmus</i> sp.	*	✓	✓	✓	✓
<i>Ulothrix</i> sp.	✓	*	✓	*	✓
Famiy: Hydrodictyacea					
<i>Hydrodictyon</i> sp	*	*	*	✓	✓
<i>Pediastrum</i> sp.	*	✓	*	✓	*
Order: Zygnematles					
Family: Zygnemataceae					
<i>Spirogyra</i> sp.	✓	✓	*	✓	✓
Family : Desmidiaceae					
<i>Closterium</i> sp.	*	✓	✓	✓	✓
<i>Cosmarium</i> sp	✓	*	*	✓	✓
<b>Phylum: Euglenophyta</b>					
Order Euglenales					
Family Euglenaceae					
<i>Phacus</i> sp	*	✓	*	*	*
<i>Euglena</i> sp.	*	✓	*	*	*
Phylum: Chrysophyta					
Sub Phylum: Bacillariophyceae					
Order: Centrales					
<i>Melosira</i> sp	*	✓	*	*	*
Order: Pennales					
Family: Fragilariaceae					
<i>Fragilaria</i> sp					
<i>Synedra</i> sp.	*	*	*	✓	✓
Family: Naviculaceae					

<i>Navicula</i> sp.	✓	✓	✓	✗	✓
<i>Pinnularia</i> sp.	✗	✓	✓	✓	✗
<b>Zooplankton</b>					
Phylum Rotifera					
Class : Monogononta					
Order : Ploima					
Family : Brachionidae					
<i>Brachionus angularis</i>	✗	✗	✓	✓	✓
<i>Brachionus forficula</i>	✗	✓	✗	✗	✗
<i>Notholca</i> sp.	✓	✗	✗	✓	✗
<i>Keratella</i> sp.	✗	✓	✓	✗	✓
Phylum: Arthropoda					
Class Brabchiopoda					
Order Cladocera					
Famliy Daphnidae					
<i>Daphnia</i> sp.	✗	✗	✓	✓	✗
<i>Bosmina</i> sp.	✗	✗	✓	✓	✗
Class : Crustaceae					
Sub class Copepoda					
Order: Calanoida					
Family: Diaptominae					
<i>Neodiaptomus</i> sp.	✗	✓	✓	✓	✗
Order: Cyclopoida					
Family: Cyclopidae					
Sub family: Eucyclopiniae					
<i>Cyclops</i> sp.	✗	✓	✓	✓	✗
<i>Eucyclops</i> sp.	✗	✓	✗	✓	✓
<i>Ectocyclops</i> sp.	✗	✓	✓	✓	✓
<b>PCI</b>	<b>0</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>3</b>

✓ Indicates presence; ✗ Indicates absence. PCI Codes as per Colebrook, 1960 and Batten *et al.* 2003.

Code 0 = No Colour; Code 1 = Very Pale Green; Code 2 = Pale Green; Code 6.5 = Green

The plankton study reveals that Yamuna River has no much richness of plankton biodiversity, while village ponds have much diversity of phytoplankton and zooplankton. The mining activity will be done on dry river bed except monsoon season, hence no any impact will envisaged on plankton community of the river Yamuna.

### Ecological Impact Assessment

#### Type of impacts on ecology and biodiversity

*Moderate impact on Vegetation:* Uprooted plants, damaged to plant parts such as branches, loss of tree species, disturbances to survival, habitat loss.

*Moderate impact on Animal:* Loss of aquatic habitats (specially for fish and phytoplankton), decreased species diversity due to loss of sensitive species, loss of spawning grounds for aquatic species and river bank dwelling species, disturbances to food webs, habitat loss for bank dwelling species such as aquatic birds, reptiles, amphibians.

*Moderate impact on Ecosystem stability:* Soil erosion, loss of fertile soil, bank instability and collapse, loss of protective structures provided by trees, changes to topography due to temporary foot paths and transportation network, obstacles to water flow.

#### Major Impact on Ecological Environment due to Mining Activity

- i. Transportation of Sand in the trucks/dumper will disturb the movement of Wild animals like jungle cat, jackal, and other reptiles. Fugitive emission from vehicle movement will form a layer in leaves thus reducing the gaseous exchange process. This ultimately affects the growth of plants. Chances of vehicle collisions with wildlife attempting to cross roads are possible.
- ii. Any human settlement in the mining area will disturb the vegetation cover and reptiles.
- iii. Indiscriminate mining from active channels of rivers causes many adverse effects on the benthic fauna, which inhabits the bottom

sandy substratum. Excessive sand extraction from rivers affects the eco-biology of many terrestrial insects whose initial life history begins in aquatic environments.

- iv. The Indian peafowl movement is very common in the area; the noise from sand mining will hinder the same.

#### Proposed Mitigation Measures

- i. Transportation of sand should be minimise in the morning and evening and cannot be done in night. Access roads will not encroach into the riparian zones.
- ii. No human settlement should be permitted in the lease mining or nearby area. No mining will be carried out during the rainy season to minimize impact on aquatic life.
- iii. Green belt and community forestry should be encouraged to mitigate the noise level. Plantation will be carried out on approach roads and nearby vicinity at river banks areas.
- iv. The latest equipment with sound-control devices should be used for sand excavation and loading/unloading, etc. Use of exhaust silencers and optimized acoustical pipe lagging (acoustical wrapping) to minimize compressor noise.
- v. Annual bio-monitoring of roadside plants exposed to vehicular pollution will be done to check the dust load and Air Pollution Tolerance Index (APTI).

#### CONCLUSION

The study area comprise of two district of two states *i.e.* half part falls in Sonapat (Haryana) and other half part falls in Baghpat (Uttar Pradesh). The current study reveals that the study area has most of agriculture land and full of vegetable corps. There is almost plain without much undulation, agriculture land; hence not mush vegetation cover, except scattered *Prosopis juliflora* shrubs and few trees of *Prosopis cineraria*. The ecology and biodiversity patterns reveal that the most part is covered by vegetable crops only in the winter and summer season and during the monsoon there is no vegetable or major crops grown in this area due to over flow of Yamuna River. There is no much tree vegetation and wild animals in the area studied as there is no any

reserve and protected forest. Some of the sighted fauna was given protection by the Indian Wild Life (Protection) Act, 1972 by including them in different schedules. Among the birds in the study area, Pea fowl (*Pavo cristatus*) is included in schedule I of Wild life protection Act (1972), while many other birds are included in schedule IV. Among the reptiles, Indian Cobra (*Naja naja*) and Russell's viper were provided protection as per Schedule-II of Wild life Protection Act, (1972). Among mammals; Common Indian monitor (*Varanus bengalensis*) is schedule-I and Common Mongoose (*Herpestes edwardsi*), Jackal (*Canis aureus* (Linnaeus), Monkey (*Rhesus macaque*) and Jungle cat (*Felis chaus*) are a schedule –II animals. Nilgai (*Boselaphus tragocamelus*) is protected as Schedule-III animal and hares and five stripped squirrels are included in schedule IV of Wild Life Protection act 1972.

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