कार्यालय प्रमुख वन संरक्षक, वन्य जीव, उत्तर प्रदेश, लखनऊ।

पत्रांकः— /26—11 (वेल्सपन एनर्जी) लखनऊ, दिनांकः अक्टूबर, 15 2014,

सेवा में,

मुख्य वन संरक्षक,
मीरजापुर क्षेत्र,उ0प्र0
मीरजापुर।

विषयः— ग्राम ददरी खुर्द, तहसील—सदर, जनपद मीर्जापुर में मेसर्स वेल्सपन एनर्जी यूपी प्राइवेट लि0 द्वारा 2X660 एम0डब्लू0 सुपर क्रिटिकल कोल आधारित थर्मल पावर प्लान्ट की स्थापना के सम्बन्ध में प्रस्तुत Biodiversity Assessment and Preparation of Conservation Management Plan(including wildlife) के अनुमोदन के सम्बन्ध में।

सन्दर्भः— 1—आपका पत्रांक 1151/मी0 क्षे0/33 दिनांक 18—09—2014।
2—प्रभागीय वनाधिकारी, मीरर्जापुर वन प्रभाग, मीर्जापुर का पत्रांक 995/33—वेल्सपन दिनांक 09—09—2014।

महोदय,

कृपया उपरोक्त सन्दर्भित पत्रों से प्रेषित विषयक प्रस्ताव का अवलोकन करें। उल्लेखनीय है कि ग्राम ददरी खुर्द, तहसील—सदर, जनपद मीर्जापुर में, मेसर्स वेल्सपन एनर्जी यूपी, प्राइवेट लि0 द्वारा 2X660 एम0 डब्लू0 सुपर क्रिटिकल कोल आधारित थर्मल पावर प्लान्ट की स्थापना के सम्बन्ध इस कार्यालय के पत्रांक 272/26—11(वेल्सपन) दिनांक 24—06—2014 से वांछित आख्या के क्रम मे प्रभागीय वनाधिकारी, मीरजापुर वन प्रभाग, मीरजापुर द्वारा पत्रांक 995/33—वेल्सपन दिनांक 09—09—2014 से स्पष्ट किया गया है कि प्रश्नगत परियोजना कैमूर वन्य जीव विहार, मिर्जापुर की सीमा से लगभग 25 किमी0 दूर मीरर्जापुर वन प्रभाग क्षेत्रान्तर्गत प्रस्तावित है। परियोजना की स्थापना व कार्यान्वयन के सम्बन्ध में प्रस्तावक विभाग द्वारा 10 वर्षों हेतु प्रभाग के पादप व जन्तु जगत के संरक्षण उनसे प्रासंगिक विषयों के सन्दर्भ में प्रस्तुत Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) में 184.15 लाख रूपये का प्राविधान किया गया है। उक्त के सम्बन्ध परीक्षण व वांछित आख्या के क्रम में आपके पत्रांक 1151/मी0 क्षे0/33 दिनांक 18—09—2014 से प्रश्नगत Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) से सहमति के साथ प्रतिहस्ताक्षरित कर अनुमोदन हेतु प्रस्तुत किया गया है।

अतः आपके पत्रांक 1151/मी0 क्षे0/33 दिनांक 18—09—2014 द्वारा की गयी संस्तुति के क्रम में प्रस्तुत Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) निम्न शर्तो के अधीन अनुमोदित कर संलग्न किया जाता है।

1— उक्त Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) में वन्य जीवों के संरक्षण हेतु प्रस्तावित कार्यो का कार्यान्वयन सुनिश्चित

करने हेतु उक्त प्रबन्ध योजना में उल्लिखित Monitoring Committee का गठन कर जिसका अनुमोदन मुख्य वन संरक्षक, वन्य जीव पश्चिमी क्षेत्र, उ0प्र0, कानपुर से प्राप्त करना होगा।

2– जनपद मिर्जापुर व सोनभद्र में कैमूर वन्य जीव विहार क्षेत्र में व सन्निकट आरक्षित वन क्षेत्रों में विचरण करने वाले काले हिरन (Black Buck) के विस्तृत अध्ययन व संरक्षण हेतु एक कार्ययोजना वन्य जीव संस्थान देहरादून से तैयार करवा कर मुख्य वन्य जीव प्रतिपालक, उ0प्र0 को प्रस्तुत करना होगा।

भवदीय,

(डा0 रूपक डे)
प्रमुख वन संरक्षक, वन्य जीव,
उत्तर प्रदेश, लखनऊ।

पत्रांक 389 /उक्तदिनांकित।
प्रतिलिपिः–निम्नांकित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. मुख्य वन संरक्षक, (मध्य क्षेत्र), भारत सरकार केन्द्रीय भवन पॉचवा तल, सेक्टर एच अलीगंज, लखनऊ।
2. मुख्य वन संरक्षक, (वन्य जीव) पश्चिमी क्षेत्र उ0प्र0, कानपुर।
3. प्रभागीय वनाधिकारी, मिर्जापरु वन प्रभाग, मिर्जापरु।
4. प्रभागीय वनाधिकारी, कैमूर वन्य जीव प्रभाग, मिर्जापुर।
5. मुख्य प्रबन्धक, मेसर्स वेल्सपन एनर्जी यूपी प्राइवेट लि0 मिर्जापुर।

(डा0 रूपक डे)
प्रमुख वन संरक्षक, वन्य जीव,
उत्तर प्रदेश, लखनऊ।

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Welspun Energy UP Private Limited (WEUPPL) proposes to setup a Greenfield Coal based Thermal Power Plant (TPP) of 1320 MW (2x660 MW) capacity at Dadri Khurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh. As per the Environmental Impact Assessment (EIA) Notification dated 14th September 2006 as well as its amendment thereafter on 1st December 2009, the proposed thermal power plant project falls under 'Category A' with project or activity type number '1(d)', which requires preparation of EIA Report to get Environmental Clearance (EC) from the Ministry of Environment and Forests (MoEF), New Delhi.

In addition to the EIA study, as part of the Environment Clearance (EC) of MoEF, New Delhi, the project proponent (WEUPPL) need to carryout Ecological and Biodiversity status assessment study to identify endangered (Schedule I species) species and prepare Conservation and Management Plan for the same.

In this context, Green Future Foundation (GFF), New Delhi was given consultancy to carry out the biodiversity assessment study covering the project site and 10km radius buffer. This report discuss the biodiversity status covering major floral and faunal groups in terms of species richness, diversity, distribution and abundance specific to core and buffer zones of the study area. In addition, presence of ecologically sensitive areas were also identified. Based on this, species specific conservation and management plans were suggested for threatened/endangered biota, which include habitat improvement plans suggested under green belt development program to support the threatened fauna and enhance the overall biodiversity of the project study area.

Date:

Authorized Signature
(Project -In-charge)

CHAPTER 1- PROJECT INTRODUCTION

1.1. AN OVERVIEW OF PROJECT PROPONENT

Welspun Energy UP Private Limited (WEUPPL) is a Special purpose Vehicle (SPV) of Welspun Energy for developing the proposed 2x660 MW coal based power plant based on supercritical technology.

VISION OF WEUPPL

"Looking at the growing energy needs of Uttar Pradesh, Welspun Energy Limited envisages initiating a 2 x 660 MW thermal power plant in Mirzapur. This will help the state of Uttar Pradesh to minimize its energy deficit and contribute towards making India energy independent. Environment safety and community interest are paramount to us in this endeavor. We are using super critical technology, which will minimize adverse impact to the environment. We are committed to improving the lives of the local people by generating direct/ indirect employment in this region and would be investing in their health &education. We endeavor to provide the community a sustainable and secure future."

Welspun Energy, an integral part of the Welspun Group, established to setup over 5,000 MW commercial thermal power plants over the next three years in various states of India. It would also fulfill its commitment towards a green and clean energy setting up solar, hydro, biomass and wind energy power generating facilities.

Welspun Group ranks amongst India's fastest emerging conglomerates with an enterprise value of ` 15,000 Crores. Welspun Stahl Rohren, the flagship company of the group is the world's 2nd largest pipe producer. With proven capabilities in steel, steel pipes, power generation and home textiles, Welspun have global presence in over 50 countries. The group enjoys strong relationship with marquee clients including most of the Fortune 100 Companies.

The company started its activity in 1995 with Hsaw pipe manufacturing facility of 30,000 TPA at Dahej, Gujarat. The company also manufactures steel plates cum coil at its recently commissioned facility at Anjar, Gujarat. Welspun is accredited with over 50 oil and gas majors of the world and among one of the few preferred vendors across the globe.

1.2. RATIONLAE OF THE STUDY

Welspun Energy UP Private Limited (WEUPPL) proposes to setup a Greenfield Coal based Thermal Power Plant (TPP) of 1320 MW (2x660 MW) capacity at Dadri Khurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh.

As per the Environmental Impact Assessment (EIA) Notification dated 14th September 2006 as well as its amendment thereafter on 1st December 2009, the proposed thermal power plant project falls under '**Category A**' with project or activity type number '1(d)', which requires preparation of EIA Report to get Environmental Clearance (EC) from the Ministry of Environment and Forests (MoEF), New Delhi.

The EIA report was prepared as per the Terms of Reference (ToR) issued by MoEF, vide letter no. J-13012/12/2011-IA. II (T) dated 15th June, 2011 and submitted. In addition to the EIA study, as part of the Environment Clearance (EC) of MoEF, New Delhi, the project proponent (WEUPPL) need to carryout Ecological and Biodiversity status assessment study to identify endangered (Schedule I species) species and prepare Conservation and Management Plan for the same.

In this context, **Green Future Foundation (GFF), New Delhi** was given consultancy to carry out the ecological study in and around the proposed project site covering 10km radius. This study aimed to identify the presence of threatened biota (flora and fauna), assess their status and provide conservation and management plan for the endangered or Schedule I species of Wildlife Protection act (1972) reported in the project study area.

1.3. PROJECT DETAILS

The proposed coal based power plant is of 1320 MW capacity will comprise of two units of 660 MW capacity each, based on super-critical technology. The project utilize domestic coal from NCL/SECL /CCL / or Imported Coal from Indonesia as primary fuel. The plant will be designed for base load operation with a plant design life of about 25 years. The land requirement for the project is 875 acres including power plant, ash pond and other auxiliaries and the estimated cost of the project is about Rs 7500 Crores.

1.3.1 Location of the Project

The proposed plant site is located at Dadri Khurd village in Mirzapur Sadar tehsil, Mirzapur district in Uttar Pradesh. Varanasi town is located at a distance of about 50 km from the proposed plant site, whereas the district head-quarter of Mirzapur is located at a distance of about 18 km from the proposed plant site. The details of environmental setting are given in **Table-1.1**. The index map of the project site is shown in **Figure-1.1**.

1.3.2. Access to the Site

The State Highways, SH-5 and NH-7 run at a distance of 1.5 km, SW and 10 km, N respectively from the proposed plant boundary. The nearest railway link is located at Sakteshgarh Railway Station & Sarsongram Railway Station at a distance of 15.5 km, E-NE & 15.5 km, E respectively from the project site. The nearest airport to the project site is located in Varanasi.

1.3.3 Environmental Setting of the Project Site

The Upper Khajuri Dam is at a distance of 5.5 km, NW and Ganga River is flowing at a distance of 17.0 km, N from the project site. However, the project area is devoid of any major stream meeting these water bodies. There are no protected areas as per Wild Life Protection Act 1972 like biospheres, tiger reserves, wildlife sanctuaries, Natural parks in the 10 km radius of the study area. The project area falls under Seismic Zone-III as per Indian Standards, IS: 1893-2000.

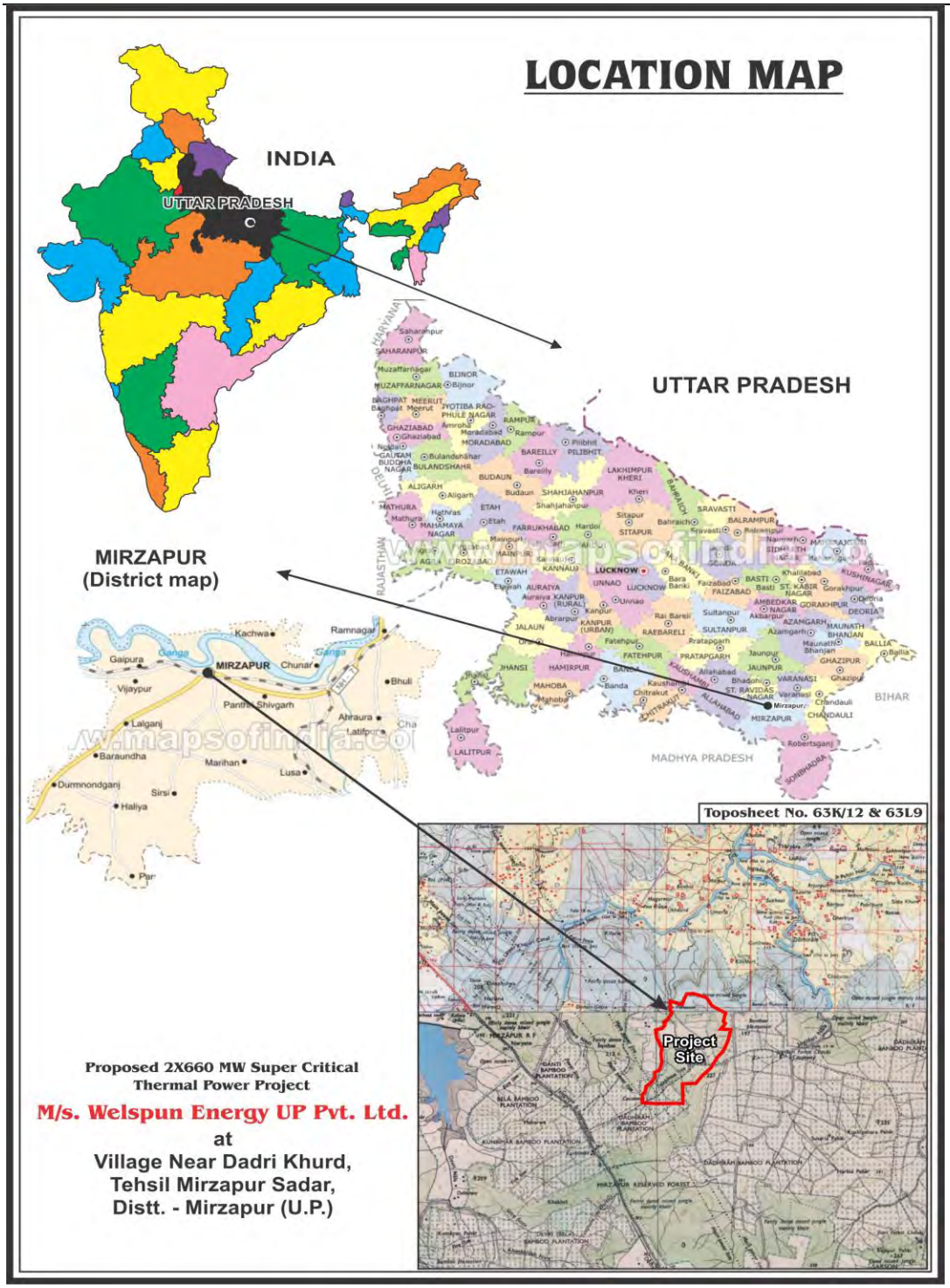
Table 1.1 Environmental Setting around 10-km radius of WEUPPL Project site

Sr. No	Particular	Details		
1	Location	Dadri Khurd Village, Mirzapur Sadar Tehsil, Mirzapur District, Uttar Pradesh		
2	**Coordinate Range**	**Sr. No.**	**Latitude**	**Longitude**
a	Plant Boundary	1	25° 00' 16.887"N,	82° 40 29.204"E
		2	24° 59' 45.117"N,	82° 41 03.728"E
		3	24° 58' 41.858"N,	82° 40 23.802"E
		4	24° 58' 41.645"N,	82° 39 50.425"E
		5	24° 59' 08.278"N,	82° 40 00.404"E
		6	24° 59' 44.581"N,	82° 40 00.552"E
b	Ash Dyke Area (within plant boundary)	A	82° 40' 27.5"E	25° 0' 14.5"N
		B	82° 40' 57.8"E	24° 59' 57.1"N
		C	82° 40' 43.5"E	24° 59' 54.8"N
		D	82° 40' 8.2"E	24° 59' 46.8"N

Sr. No	Particular	Details		
		E	82° 40' 13.7"E	25° 0' 7.5"N
c	Chimney	C	82°40'26.15" E	24°59'35.08"N
3	Toposheet No.	63 K/12 & 63 L/9		
4	Site elevation	180 m above Mean Sea Level (MSL)		
5	Topography	Slightly undulating		
6	Climatic Conditions : IMD, Varanasi, Pre- Monsoon season	Mean Minimum Temperature: 12.1°C Mean Maximum Temperature: 37.6°C Predominant Wind Direction: W Relative Humidity: At 8:30 hrs: 31 % to 61% and at 17:30 hrs: 14 % to 45 % Rainfall: 47.5 mm		
7	Climatic conditions at site (monitored during Pre Monsoon season, 2011)	Mean Minimum Temperature:11.6°C Mean Maximum Temperature: 42.0°C Predominant Wind Direction: W Relative Humidity: At 8:30 hrs: 32 % to 62 % and at 17:30 hrs: 16 % to 48 % Rainfall: 0 mm		
8	Nearest Habitations (Population as per Census-2001 Data)	Dadri Khurd (Population : 09) Dadri Gahira (Population : 48)		
9	Present land use at the site	Mostly barren		
10	Nearest Major Roads/ Highway	State Highway, SH-5 (1.5 km, SW) National Highway, NH-7 (10.0 km, NNE)		
11	Nearest Railway Line	Broad Gauge Railway line of Northern Railways (NR)		
12	Nearest Railway Station	Sakteshgarh R.S. (15.5 km, ENE) Sarsongram R.S. (15.5 km, E)		
13	Nearest Airport	Varanasi (50 km, NNE)		
14	Nearest Seaport	Haldia		
15	Nearest Town	Mirzapur –District Headquarters (18 km, NW)		
16	Nearest water bodies	Jamtlhwa Nadi (2.0 km, N) Jogiadar Nadi (2 kms, NE) Pahiti Nadi (3.75 kms, NE) Upper Khajuri Dam (4 km, W) Ganga River (17 km, NE)		
17	Eco sensitive Zone (National Part, Wildlife Sanctuary, Biosphere reserve wildlife corridors etc.) Within 10 km radius of the project site.	No Eco sensitive Zone viz. National Park, Wildlife Sanctuary, Biosphere reserve, Wildlife corridors and Protected Forest falling with the 10 km radius of the project site.		
18	Reserved/Protected forests	Danti RF (on northern side of project site) Mirzapur RF (on southern side of project site) Bahati RF(6.0 km in SW) Karaunda RF (5 km, SW) Patehra RF(5.0 km in SW) Malua RF (8.5 km in SW) Chandlewa Khurd RF (6.0 km in NNE) Nanauti RF (7 km in E) Golhanpur RF (6.5 km in E) Sarson RF (5.5 km in SE)		

Sr. No	Particular	Details
19	Areas susceptible to natural hazards (earthquakes, erosion, flooding or extreme or adverse climatic conditions)	None within 10 km radius study area
20	Archaeologically important places as per Archeological Survey of India Records	None within 10 km radius study area
21	Existing Industries	None within 10 km radius study area
22	Seismic Zone	Zone-III as per IS:1893-2000

Note: All distances mentioned above in parenthesis are aerial distances



Source: WEUPPL

Map 1.1. Location details of the Proposed Thermal Power plant - WEUPPL

1.4. IMPORTANCE OF THE PROJECT

Though there has been substantial growth in power sector infrastructure in India, the power supply position is still characterized by shortages, both in terms of demand met during peak periods and the overall energy supply. Many parts of the country continue to reel under severe power shortages. The all India region-wise forecast for electrical energy requirement and peak demand scenario fare presented in **Table-1.2**.

Table 1.2. Long term forecast of power demand

Sr. No	Region	Electrical Energy Requirement (TWh)			Peak Electric Load (GW)		
		2011-12	2016-17	2021-22	2011-12	2016-17	2021-22
1	Northern	294.8	411.5	556.8	48.1	66.6	89.9
2	Western	294.9	409.8	550.0	47.1	64.3	84.8
3	Southern	253.4	380.1	511.7	40.4	60.4	80.5
4	Eastern	111.8	168.9	258.2	19.1	28.4	42.7
5	North-Eastern	13.3	21.1	37.0	2.5	3.8	6.2
6	**All India**	968.7	1392.1	1914.5	152.7	218.2	298.3

Source: "Long Term Forecast at Power Station Bus Bars", 17th Electric Power Survey (EPS) of India, Central Electricity Authority (CEA)

The economic growth of any country depends upon the availability and consumption of energy. The level of development of a country is measured in terms of per capita energy consumption. Presently India's per capita energy consumption at 717 KWh/year (during 2007-08), which is less than that of other developing countries like China (1891) and Malaysia (1000). The per capita energy consumption of the developed countries is very much higher like United States of America (13338), Sweden (16665) and Canada (18117).

World average per capita energy consumption is 2500 kwh/year. The present installed capacity in India is around 1,49,111 MW as on 31st May, 2009 and requires significantly more generating capacity to match the pace of development taking place in the country as well to bridge the gap between demand and supply. Government is aiming to increase the present installed capacity to 200,000 MW by 2012 and aiming per capita energy consumption of 1000 kwh/year. The investment from public and private sector for capacity addition shall help the nation to achieve the energy availability.

The Central, State and Private contribute to the availability of power in the country. State owns a share of about 52%, central own a share of about 33% of installed capacity and the rest 15% by private sector. Major contribution of energy came from thermal (64%) followed by Hydel energy (25%). Ministry of Power has estimated that by the year 2012, India's peak demand would be 152,746 MW with energy requirement of 975 Billion Unit (BU).

1.4.1. Power Development Scenario-11th Plan Period

As per the "5th National Power Plan (2002-2012)" prepared by CEA, a need based installed capacity of the order of 2,12,000 MW is required by the end of 11th plan based on demand projections of 17th Electric Power Survey (EPS). The primary resources for electric power generation are water, fossil fuel (coal, lignite, oil and natural gas) and nuclear energy. These would continue to serve as major sources of power generation in the long run, though various forms of renewable sources viz, wind, bio-mass, tides, etc., will also contribute to meeting the demand.

As per Central Electricity Authority's (CEA) projection for the 11th Plan (2007-2012), the capacity addition requirement is 78,578 MW comprising 16,627 MW of hydro, 58,571 MW of thermal and 3,380 MW of Nuclear. Out of the total thermal capacity of 58,571 MW, the coal/lignite based capacity shall be 53,930 MW. This implies that the capacity addition has to be about 10,786 MW per annum through coal / lignite alone

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1.4.2. Power Development Scenario-Beyond 11th Plan

The Indian Power System requirement had been assessed to need a hydro power and thermal/nuclear power mix in the ratio of 40:60 for flexibility in system operation depending on typical load pattern. The motion to achieve this mix and to accelerate the hydro electric power generation of 50,000 MW has already been initiated by Government of India (GOI).

CEA has identified new hydro schemes aggregating to a capacity of 30,000 MW for yielding benefits during the 12th Plan period (2012-2017). These schemes have been identified based on their present status as available with the CEA. Nuclear Power Corporation has planned to add nuclear power projects aggregating to 12,000 MW to be commissioned in year 2012-2017.

A capacity addition of 21180 MW has been achieved during 10th plan and 78578 MW is assessed as required during the 11th plan. However, it may be noted that the proposed capacity addition in the 11th Plan is three and a half times of that achieved in the 10th Plan, which is rather very ambitious.

As per CEA/Planning Commission, a tentative capacity addition of 82,200 MW has been envisaged for the 12th Plan. This comprises of 30,000 MW hydro, 40200 MW thermal and 12000 MW of Nuclear power plants Considering the slippages in the past, and keeping in view the huge power generation capacity requirement to be added during the 11th and 12th

Plan periods, an urgent need is felt for a large scale thermal power development programme in an environment friendly manner.

All the three sectors namely Central, State and Private contribute to the availability of power. On the consumption side, industrial sector is the principal consumer of electricity followed by agricultural and domestic sector. The domestic sector shows the highest growth rate in electricity consumption in the recent past and electricity consumption in the agricultural sector has been rising at the rate of 7 to 8 percent due to government's policy of supplying heavily subsidized power to the farmers and massive rural electrification.

The rapid pace of all round developments of the states in the region due to globalization of economy has seen the states in the region to be a few of the highest power consuming states in the country. The power demand and availability figures of the state exhibit a wide uncovered margin calling attentions of the SEB's to accelerate the pace of growth in this core sector. With the present trend of growth rate ranging around 7-9% for the past two decades, the concern of State Government in the region can be gauged from the urgency with which they are exploring all possible means of augmenting the generating capacity.

The power scenario in the region during 10th and 11th Five Year Plans has been discussed in detail and need for the proposed station is studied in the backdrop of past and future power demands, viz, present and future generation capacities planned for bridging the gap.

1.4.3. Justification of Project

The actual growth in industrial, agricultural and domestic demand will establish that there is a considerable shortfall in the installed capacity, demand and energy availability as on date. This shortfall will continue even after the commissioning of the proposed power plants in various parts of the State. As Uttar Pradesh is the most preferred State for industrialization, the industrial demand for power will be ever increasing.

In order to narrow down the bridging gap between supply and demand, the proposed capacity addition by 2x660 MW TPP which will yield benefits in the 12th Plan gets justified due to projected deficit in the Northern Region.

With open access of the transmission lines now available and power trading possible, the merchant power plants can sell electricity to registered power traders, who will in turn identify buyers for the power. Under such a favorable condition, putting up of a thermal power plant by WEUPPL is justified.

CHAPTER 2: ECOLOGICAL STUDY APPROACH AND METHODOLOGY

2.1. SCOPE OF WORKS

In order to assess the overall status of biological environment of pre-project scenario and status of threatened biota and prepare Conservation and Management Plan for schedule I species the following scope of works have been formulated and studied.

FLORA

- **Assess the status of major floral components of all the terrestrial habitats within the study area (10km radius buffer) of the proposed thermal power plant.**
- **Collection and compilation of secondary information on the status of floral components and habitats from the concerned stakeholders – Forest department and others.**
- **Identification and listing of floral species of conservation significance (Rare, Endangered and Threatened - RET species) accordance with WCMC and BSI in the study area.**

FAUNA

- **Assess the status of major faunal groups (amphibians, reptiles, terrestrial and aquatic birds and mammals) within the study area (10km radius buffer) of the proposed thermal power plant.**
- **Collection and compilation of secondary information on the status of faunal groups and habitat from the concerned stakeholders – Forest department and others.**
- **Identification and listing of faunal species of conservation significance (RET species) in accordance with IUCN / WPA – 1972 act of MoEF in the study area.**

HABITAT

- **Identification of ecologically sensitive area (Protect Area: Sanctuary, National Parks, Biosphere Reserve, pertaining to Faunal diversity) exist in the vicinity of the (Within 10 km Radius) study area**

MANAGEMENT PLAN

- **Provide conservation and management plan to improve the habitat quality of the project area to enhance the overall biological diversity (Flora & Fauna) on need basis**
- **Suggest conservation and management plan for the critically endangered & endangered (schedule I) species if any reported within the study area**

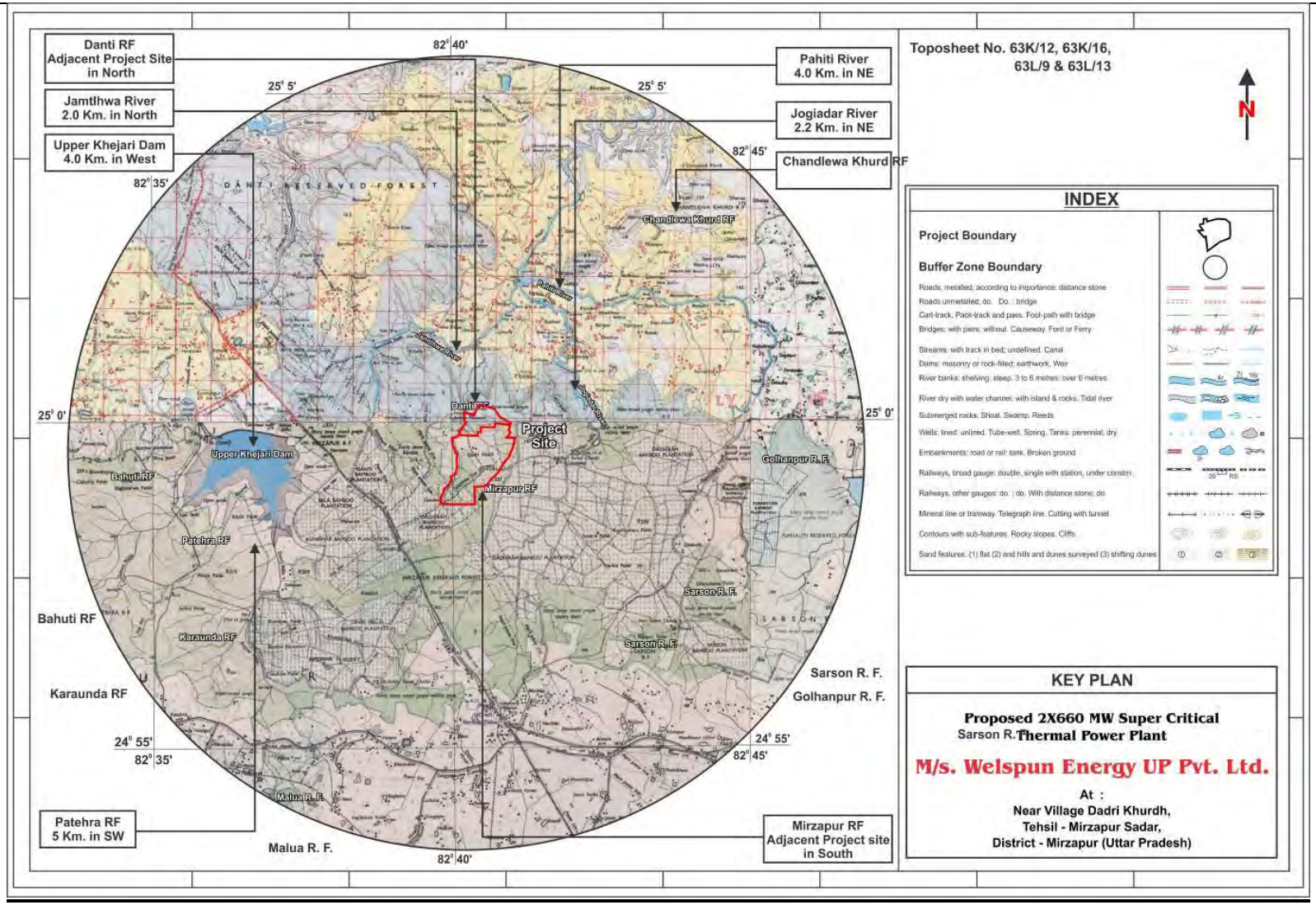
2.2. PROJECT STUDY AREA.

The proposed power plant will have two units with a total power generation capacity of 1320 MW. The land requirement for the project is 875 acres (354.11ha) including power plant, ash pond and other auxiliaries. The proposed plant site is located at Dadri Khurd village in Mirzapur Sadar tehsil, Mirzapur district in Uttar Pradesh. The details of environmental setting are given in **Table-1.1**. The index map of the project site is shown in **Figure-1.1**. The geographical co-ordinates of the proposed plant site on Survey of India (SOI) toposheet No. 63K/12 & 63 L/9 falls between 24°58'41.6"to 25°0'16.8" N Latitudes and 82°39'50.4"E to 82°41'03.7"E longitudes (**Figure 2.1**)

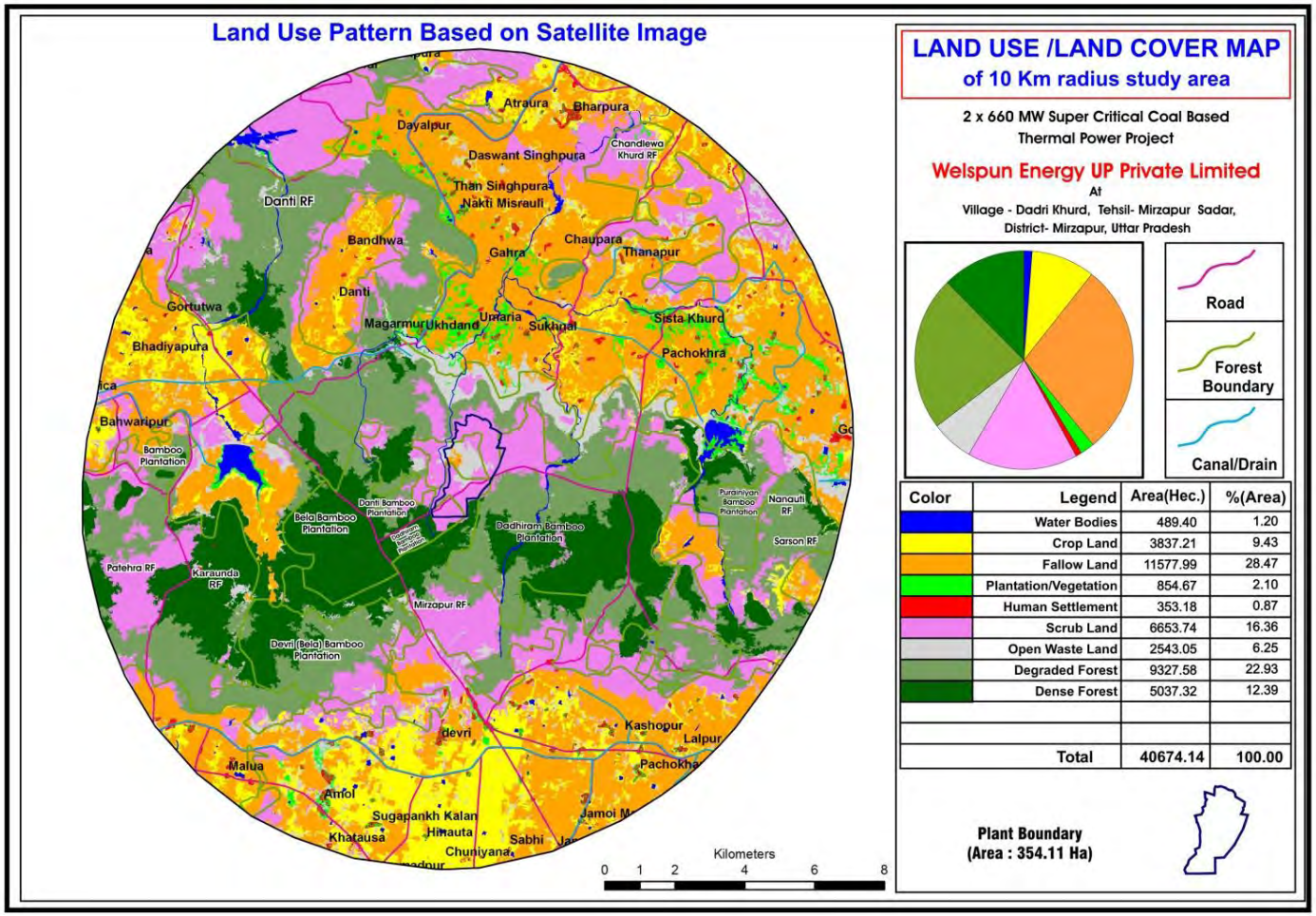
In addition to the 875 acres (354.11 ha) land of the project site, area of 10 km radius from the boundary of the plant site has been taken as buffer zone which covers the total extend of 40674.14 ha. The breakup of the land use and land cover showed nine types of land use and land cover. Among the land use maximum extent of 11,577.99 ha fall under fallow land followed by 9327.58 ha of degraded forests and they contribute 28.47 and 22.93% of the total respectively. Adding the dense forest, overall the study area comprises 14364.90 ha of forest land which shares 35.32% of the land use of the study area **Table 2.1. & Figure 2.2.**

Table 2.1. Land Use /Land cover details of the Study area - WEUPPL

S.no.	Land Use/Land Cover	Area (in Ha)	% (Area)
1	Water bodies	489.40	1.20
2	Crop land	3837.21	9.43
3	Fallow land	11577.99	28.47
4	Plantation /Vegetation	854.67	2.10
5	Human settlement	353.18	0.87
6	Scrub land	6653.74	16.36
7	Open waste land	2543.05	6.25
8	Degrade forest	9327.58	22.93
9	Dense forest	5037.32	12.39
	Total	**40,674.14**	**100.00**



Map 2.1. Study Area Map of the Thermal Power Plant Project (10 km radius) - WEUPPL



Color	Legend	Area(Hec.)	%(Area)
	Water Bodies	489.40	1.20
	Crop Land	3837.21	9.43
	Fallow Land	11577.99	28.47
	Plantation/Vegetation	854.67	2.10
	Human Settlement	353.18	0.87
	Scrub Land	6653.74	16.36
	Open Waste Land	2543.05	6.25
	Degraded Forest	9327.58	22.93
	Dense Forest	5037.32	12.39
	Total	40674.14	100.00

Map. 2.2 Land use land cover map of the proposed project study area

2.3. STUDY APPROACH AND METHODOLOGY

2.3.1. Study Plan

In order to understand the ecological status of different habitats and the status of biodiversity in and around the proposed Thermal power plant project area of WEUPPL, field work was carried out between April 2012 and June 2012 (**Table 2.2).**

Table 2.2: Field Survey and Report Preparation Schedule

Month	Broad level approach
April 2012	Reconnaissance of the Existing Environmental Setup of the proposed Thermal Power Plant project (WEUPPL) study area with project proponents. Collection of project related secondary information from the project proponent, government departments (forest Dept) and other stakeholders Review of literature – scientific publications
May 2012	Field work and data collection pertaining to different scope of works formulated for the biological components covering flora, fauna and habitat
June 2012	Data analysis and report preparation and submission of draft report
July 2012	Submission of final report

2.3.2. Macro level Approach

2.3.2.1. Reconnaissance Survey

- Rapid survey of project area was carried out to identify and understand the existing biological environments and different land use/land cover of the proposed thermal power plant project study area (10 km radius)

- Interaction and discussion was held with the project proponents (WEUPPL) to understand and get the firsthand information about the project and associated activities.

2.3.2.2. Secondary data collection

- Project related secondary information from the project proponent in the form of base maps and technical reports with brief project technical details were collected.
- Project related information specific to project study components (flora, fauna and habitats) were collected from different stakeholders (State Forest departments, Revenue Dept etc).

- Scientific information available in the form of published papers, reports, books, State flora were collected from the in house facilities and other sources like institutions and e-facilities.

2.3.2.3. Delineation of the Study Area

The study area was delineated into two zones: **Core zone** – which includes the project area i.e., the area, earmarked for the proposed thermal power plant project and associated activities – 875 acres.

Buffer zone; which includes the adjacent land area of 10 km radius from the boundary of the project site or Core zone. Based on the availability and heterogeneity of the land use and land cover or habitat types, field based primary data were collected.

2.3.3. Micro level Approach- Field Data Collection

Micro level approach involves mainly the field based primary data collection using standard field techniques on different components of the scope of works. Field data collection mainly includes aquatic micro biota status (phyto and zooplankton) and terrestrial biodiversity status assessment of major habits of floral species such as trees, shrubs, Climbers, herbs and grass. Faunal diversity was assessed by inventorying and quantifying the major faunal groups like: amphibians, reptiles, birds (both aquatic and terrestrial) and mammals.

2.3.3.1. Aquatic Micro biota (Planktons)

Phytoplankton: The water samples were collected from three locations from each dam site. The samples were collected from 10 cm depth below the water surface. Polythene bottles of different capacity were used for collection of water samples. All sampling bottles were soaked in 10% Nitric acid solution for 24 hrs and then rinsed with distilled water before use. The samples were subjected to phytoplankton and zooplankton analysis using following techniques. The Lackey Drop (micro-transect) Count Method (Lackey, 1938; Edmonson, 1969) is used for obtaining counts of phytoplankton.

Zooplankton: Around 20-50 L of water is passed through plankton net (mesh size 50 μm) to concentrate zooplankton. The entire water is centrifuged, decanted and concentrated to make 1 ml volume for observation in S-R (Sedgwick-Rafter) counting cell. The zooplankton is counted in 10x magnification. For studying community structure, the species are grouped in taxonomic classes and percentages of groups are calculated from total counts of sample.

2.3.3.2. Floral Status

- Status of floral species was assessed in the representative habitat types like; forest, agriculture/fallow land, scrub land and water bodies/wetlands (river, streams and dams) existing in the study area.

- Quantitative data were collected using standard Quadrat methods (Circular plot) following Mueller-Dombois and Ellenberg 1967, Kershaw 1973.

- Status of tree, shrub and annuals (grass and herb) was quantified using circular plots of different sizes of 15m, 8m radius and 2 x 1m ^{2} plots respectively.

- List of plant species ascertained from the concerned State Forest Department (Mirzapur Division) was compiled and included in the annexure along with filed data to give near complete floral list of the study area.

2.3.3.3. Faunal Status

Herpetofauna

- Intensive search was made along the hedges of all the aquatic habitats to list the amphibians and relative abundance will be discussed.

- Status of reptiles was assessed using Intensive Time Constrained Search Method covering different micro habitats (Welsh, 1987., Welsh and Lind. 1991).

Birds

Avifaunal status was assessed both in terrestrial and aquatic habitats

- Total count or flock count method was adopted to assess the status of aquatic birds in selected water bodies of the project area (Sridharan 1989, Bhupathy 1991., Thompson 2002 and Steinkamp *et al.,* 2003).

- Point Centre Count and perambulation techniques were applied to assess the status of terrestrial birds (Hutto *et al*., 1986, Bibby *et al.,* 1992, Rosenstock *et at*., 2002).

- Additional effort was made to locate/identify the presence of any breeding/nesting sites / roosting sites of avifauna.

Mammals

- Status and distribution of different mammalian fauna was quantified using direct count covering all the terrestrial habitats of the project area adopting Line transect/road count -Burnham *et al.* 1980, Sale and Berkmuller 1988, Rodgers 1991)(**Plate 1**).

- In addition circular (50m Radius) plots were laid in each sampling location and searched for indirect evidences (pellets, dungs, droppings, scats and other tracks and signs) which would provide relative abundance of presence of mammalian fauna (Thompson *et al*., 1989, Daniels 1992, Henke and Knowlton 1995, Allen *et al*., 1996).

- In addition, presence of different faunal species was also be ascertained and substantiated by interviewing the local people with the pictorial representation and discussion with local experts

- Secondary information collected from the state forest department was incorporated in the list along with field data to give the near complete list of all the major faunal groups.

2.3.3.4. Statues of Rare Endangered and Threatened (RET) Flora & Fauna

- List of threatened flora and fauna of the project study area was prepared and quantified based on the primary field data. Final list was prepared with the comparison of secondary information collected from the DFO office (Mirzapur Forest Division). Baseline information were also reviewed the status of the existing threatened species within the study area by refereeing the authorized references (Anon -IWPA 1972, WCMC 1994, IUCN 2010).

2.3.3.5. Habitat

- Habitat structure and quality covering all the forests were studied using authorized maps (So I) and field survey.

- Baseline primary data collected were used to discuss the overall habitat quality

- Identification of ecologically sensitive area and wildlife corridor based on secondary resources and map work

Plate 1. Field Data Collection in different habitats

	
Floral survey - Open Scrub forest	**Survey in *A.Cathechu* forest**
	
Data collection – Open mixed forest	**Data collection –riverine habitat**
	
Checking micro-habitat for Amphibians	**Checking Micro habitat for Reptiles**
	
Data collection – wetland (Dam Site)	**Data collection – wetland habitat**

2.4. ANALYTICAL ASPECTS

2.4.1. Species Diversity

For studying community structure for flora, terrestrial and aquatic birds, the species were grouped into taxonomic classes and percentage of groups were calculated from total counts of sample. The diversity was calculated for each community using Shannon Wiener Diversity Index (SWDI).

$$d = -\sum_{i=1}^{n} (ni/N).\log_2(ni/N)$$

Where,
n = number of species
N = total number of individuals of all species
ni = number of individuals of "i" th species
d = Shannon Wiener Diversity Index

Where proportion is obtained by dividing the number of individuals of a species by total number of individuals of all species for which $\log_2$ proportion is obtained by Index table (Shannon and Weaver, 1963).

2.4.2. Important Value Index -IVI

The following formula was used to estimate the IVI

Abundance:

Abundance of a species is determined as the number of individuals per sample plot.

$$\text{Abundance} = \frac{\text{Total number of individuals of a species}}{\text{No. of plots in which the species occurred}}$$

Density

Density is defined as the number of individuals of a species in a unit area and is an expression of the numerical strength of a species in a community. The density was calculated from the data sampled using the formula

$$\text{Density} = \frac{\text{Total number of individuals}}{\text{Total number of quadrates studied}}$$

Relative Density

Relative density (RD) is the study of numerical strength of a species in relation to total number of all species and is calculated as:

$$\text{Relative Density} = \frac{\text{Number of Individuals of a species X100}}{\text{Number of Individuals of all species}}$$

Dominance & Relative Dominance (Basal area and Relative Basal Area):

The basal area and the relative basal area were calculated with the diameter of the stem at breast height using the following formula.

$$\text{Basal Area} = \frac{(GBH)\,2}{4\pi}$$

$$\text{Relative Basal Area (Dominance)} = \frac{\text{Total basal area of Individuals}}{\text{Total basal area of all species}} \text{ X100}$$

Frequency, density, dominance and importance value index (IVI) of all woody species were determined according to Misra (1968) and Muller-Dombois and Ellenberg (1974). Basal area, relative density, relative frequency, relative dominance and importance value indices were calculated following the formulae of Curtis and Cottam (1962), where:

- Basal area (m^2) = area occupied at breast height (1.3 m) = (π X $(dbh/2)^2$)
- Relative density = number of tree of species / total number of trees
- Relative frequency = number of times the species occurs / total number of species
- Relative dominance = total basal area of a species / total basal area of all species

Importance value index (IVI) = sum of (relative density + relative frequency + relative dominance).

2.4.3. Relative Important Index

Relative important value index is nothing but the added value of only Relative Frequency and Relative Density estimated for RVI. This index was used only for the status assessment of woody shrub species

2.5. SAMPLING DETAILS – FLORA AND FAUNA

2.5.1. Sample Locations

Under the biological components study a total of 22 locations were surveyed in the core zone (Plant site) which includes eight, 5 locations agriculture/fallow land and 16 in scrub/waste land habitats. In case of buffer zone, out of 94 sampling locations, 27 were surveyed in forests, 16 in the agriculture habitats, while three dam sites and 17 sites along the riverine and stream were surveyed. All the three dam sites were also studied for aquatic fauna and flora. Overall 116 locations were intensively surveyed under this study (**Table 2.3, Map 2.3**).

Table 2.3. Number of locations surveyed in different habitats in the project study area

Habitats	Core Zone	Buffer Zone	Study Area
Forest	NA	27	27
Agriculture/Fallow Land	5	16	21
Scrub/wasteland	17	31	48
Water bodies/Wetland (dams & rivers)	NA	20	20
Total	**22**	**94**	**116**

2.5.2. Sample Plots

Within those 116 sampling locations, different sizes of sampling plots were laid to quantify different habits of floral and taxas of faunal species and details are discussed below.

2.5.2.1. Aquatic Ecology

For the study of aquatic ecology total 3 sampling locations were identified. All three samples were taken from dam sites. The dams are situated away from any pollution sources. Some agricultural fields were observed around the dam sites. Since all the rivers and streams are ephemera with only small puddles of water available, only the three dams which had more water was sampled. The details of sampling locations are given below

D1 (Dam 1): Upper Khajuri Dam (UKD) 3 samples, D2 (Dam 2): Lower Khajuri Dam Location (LKD), D3 (Dam 3): Kathua Bandh Location (KBD)

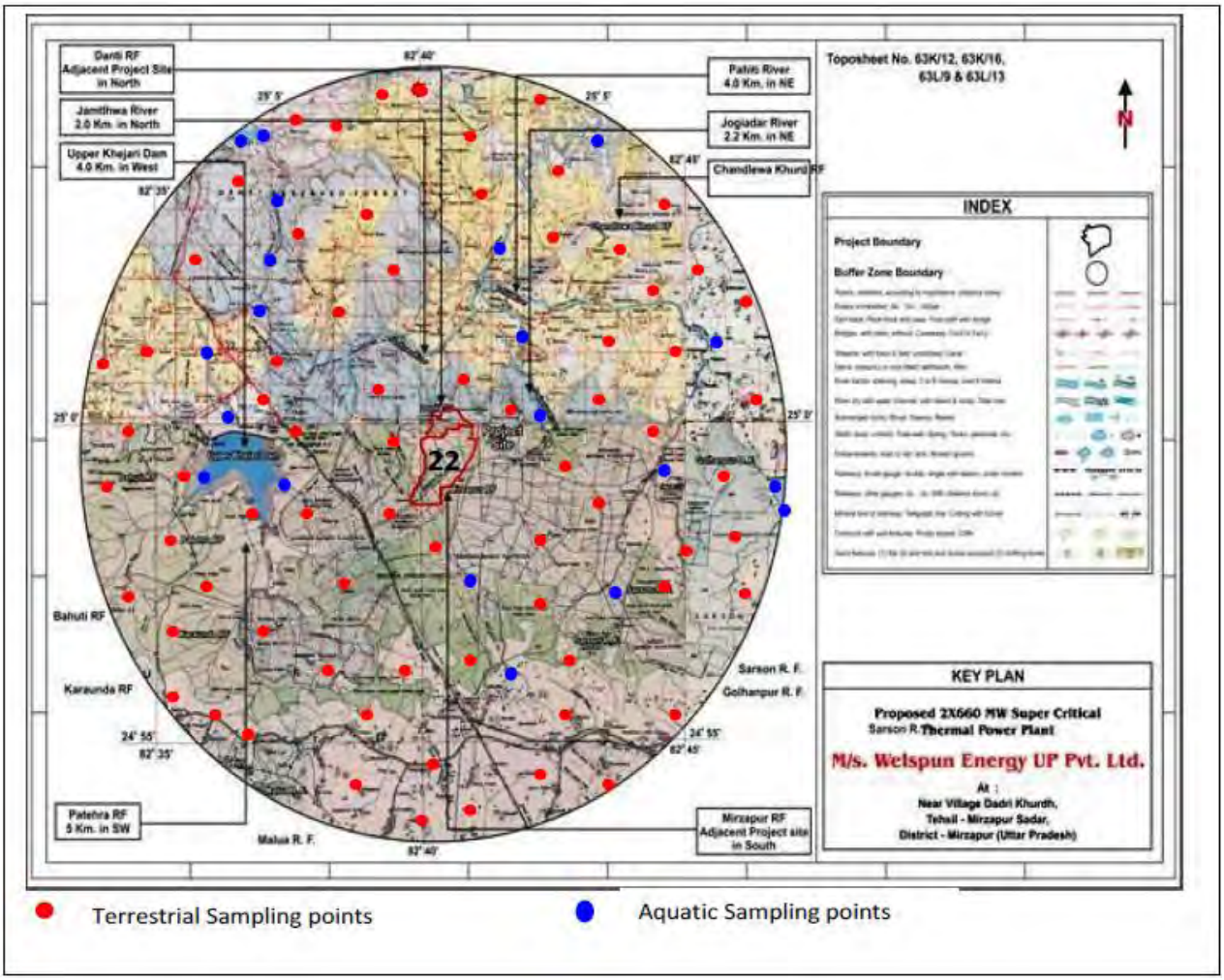
2.5.2.2. Flora

To quantify floral status, a total of 116 x 15 m radius circular plots (22 core zone and 94 buffer zone) were laid and within the sample plots matured tree species > 20 cm gbh were identified and their numbers counted. Within the 15m radius circular plots, 8m radius and 1x1m squire plots were nested to quantify each class of shrub and annuals (herbs, sedges

and grasses).

2.5.2.3. Herpetofauna

A total of 22 and 94 circular plots of 25 m radius were laid and intensively searched all the micro habitats for herpetofauna in both Core and Buffer zones respectively.



Map 2.3. Map showing the sampling locations

2.5.2.4. Birds

To quantify terrestrial birds, 116 x 100m radius Point centre quadrates were used including core and buffer zones. Total count and flock count techniques were used to quantify the aquatic bird species during different times of the study period. A total of 3 dam sites (two

sample in each) and 14 locations along the two river/streams were identified and surveyed for aquatic birds in the buffer zone. Since the core zone / plant site not having any water body aquatic bird survey was not possible

2.5.2.5. Mammals

A total of 116 x 50m radius plots were intensively searched for indirect evidences of mammalian fauna. In addition, roads crisscrossing the project area were traveled exclusively during early morning and late evenings for the direct sightings of mammalian fauna. Details of number of sample plots laid to assess the floral and faunal diversity status are given in **Table 2.4 & Map 2.3.**

All the nomenclature and scientific names have been referred from standard flora for plants and pictorial guides for fauna (Herpetofauna - Daniel J.C. 2002, Birds: Ali, S. 2002, Grimmett, et al.,2006., Mammals: Prater. 2005).

Table 2.4: Details of Sample Plots Used to Assess Floral and Faunal Status: WEUPPL Study Area - Mirzapur, Uttar Pradesh

Components	Plot size	Core Zone	Buffer Zone	Study Area
Planktons			3 Dam sites	
Plants	**Trees: 15** m Radius circular plot	22	94	116
	Shrub: 8 m Radius circular plot	22	94	116
	Herbs & Grass: 1m x1m plots	22	94	116
Herpetofauna	25 m Radius circular plot	22	94	116
Birds	**Terrestrial:** Point centre quadrate method 100 m radius	22	94	116
	Aquatic: Total count and flock count	o	20 (6 in three dams & 14 in rivers)	
Mammals –	**Indirect evidences: 50** m Radius circular plot	22	94	116

CHAPTER 3: BASE LINE STATUS OF BIODIVERSITY

3.1 BIODIVERSITY STATUS

This chapter discuses the ecological status of biota (Flora and Fauna) of the Thermal Power Plant of WEUPPL **(875 acres or 354.11 ha) and 10 km radius of the project study area (40674.14 ha)** in terms of biodiversity covering different life forms of plant species (tree, shrub, herb, grass and others) and major faunal groups (amphibians, reptiles, terrestrial birds, aquatic birds and mammals). Aquatic biology included listing of phyto and zooplanktons of three dam sites and other faunal groups (amphibians and aquatic birds) discussed under major faunal species status. The baseline status of biota (plant and animals) is discussed at three levels; **1. Core zone:** *i.e.,* only the plant area, 2. **Buffer zone** i.e., area of 10 km radius from the core zone boundary **3. Study area:** i.e., overall combining of the status of both core and buffer zones.

3.2 STUDY HABITATS AND COMPONENTS

The Survey of India 1:50,000 Topo sheets: # 63L/9, - covers the Core Zone or Plant site, and 63K/12, 63L/13 and 63K/16 cover 10 km radius Buffer zone. Though the study area has been identified 9 land use patterns (**Table 2.1**), however, since delineation of the study area into more sub-habitat types likely to dilute the biodiversity values, they have been grouped into four major habitat types such as: Forest (Dense forest, Degraded forest, Plantation forest) Agricultural land (agro-ecosystem/agriculture fallow land), wetlands (includes riverine habitats and Dams and Scrub land (Open waste land and scrub land) for the ecological study. Since human habitation was influenced by the agricultural area list of common tree species was prepared and rest of the faunal groups reported were included in the agriculture habitat (**Table 3.1 & Plate 2**).

Table 3.1. Land Use /Land cover and details: WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Land Use/Land Cover	Study Habitats
1	Water bodies	Wetland
2	Agriculture or Crop land	Agriculture/agro ecosystem
3	Fallow land	
4	Scrub land	Scrub Land
5	Open waste land	
6	Degraded forest	Forest Ecosystem
7	Dense forest	
8	Plantation /Vegetation	
9	Human settlement **	

Plate 2. Major Habitat Types of the project study Area

	
Open Scrub/waste land	**Open forest – Zizyphus thorn forest**
	
Dense forest – *Lannea coromandelica*	**Bamboo plantation**
	
Dense forest – *Boswellia serrata*	**Riverine Habitat - *Terminalia arjuna***
	
Seasonal Stream- puddle of water	**Wetland habitat – Dam site**

3.3. BASELINE STATUS- AQUATIC ECOLOGY

3.3.1. Phytoplankton

The phytoplankton community in the study area comprised of three major classes namely Chlorophyceae, Bacillariophyceae and Cyanophyceae. In total 19 taxa were recorded at different sites during the study period **(Table 3.2.)**. Chlorophyceae and Bacillariophyceae were the most dominant group observed in the study area. Some dominant species observed in all the sampling locations were *Chlamydomonas cingulata, Ankistrodesmus falcatus Anacystis spp., Fragilaria capucina, Cosmarium spp., Pediastrum spp., Scenedesmus spp. etc.* The result shows that the fresh water sources found in the study area are without any contamination. The species shows that there is lowest to medium level impact of pollution present in the study area**.**

Table 3.2. Taxa recorded at different Dam sites: Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S. No.	Species Observed	Sampling Sites		
		UKD	LKD	KBD
1	*Rhopalodia gibba*	+	-	-
2	*Navicula radiosa*	+	++	+
3	*Cymbella cistula*	-	+	+
4	*Nitzschia frustulum*	++	++	-
5	*Surirella striatula*	-	-	+
6	*Synedra ulna*	+++	++	+
7	*Tabellaria fenestrate*	+	-	-
8	*Chlamydomonas cingulata*	++	++	+
9	*Ankistrodesmus falcatus*	+++	+	++
10	*Fragilaria capucina*	+	++	++
11	*Cyclotella Stelligera*	++	++	-
12	*Euglena spp.*	+	++	+
13	*Anabaena spp.*	+++	-	++
14	*Anacystis spp.*	++	+	++
15	*Oscillatoria spp.*	+	++	-
16	*Ulothrix spp.*	-	+	++
17	*Cosmarium spp.*	++	+	+++
18	*Pediastrum spp.*	+	++	++
19	*Scenedesmus spp.*	+++	+++	+

UKD-Upper Khajuri Dam, LKD- Lower Khajuri Dam, KBD- Kathua Bandh,
Abundance Category: +=Low, ++=Moderate, +++=High

3.3.2. Zooplankton

Zooplankton, comprised of a total six taxa recorded from the study area **(Table 3.3)** and has shown the presence of two taxa of Rotifer *(Keratella valga and Brachionus bidentata)*, three taxa of Copepoda *(Nauplius* larva, *Diatomus spp.* and *Cyclops vicinus*) and one taxa of Cladocera (*Daphnia magna)*. Zooplankton were observed in all the sampling locations.

Table 3.3. Taxa recorded at different Dam sites: Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S. No.	Species Observed	Sampling Locations		
		UKD	LKD	KBD
1	*Brachionus bidentata*	++	+	+
2	*Nauplius larva*	+++	++	+++
3	*Daphnia magna*	+	-	+
4	*Keratella valga*	++	-	++
5	*Cyclops vicinus*	+++	+++	+++
6.	*Diatomus spp.*	+	+	-

UKD-Upper Khajuri Dam, LKD- Lower Khajuri Dam, KBD- Kathua Bandh, Abundance Category: +=Low, ++=Moderate, +++=High

3.3.3. Aquatic plants

Aquatic plants are also referred as hydrophytes or aquatic macro-phytes. In the study area some hydrophytes were observed during the survey, these are *Azolla spp., Wolffia spp., Spirodella spp.* and *Lemna spp.* These are free floating hydrophytes observed on water surface. These groups of are very important for survival of the fishes and some of the birds that depend on planktons and indirectly the survival of many fish eating water birds present in these water bodies.

3 .4 STATUS OF FLORA

3.4.1 Taxonomical status, species richness and diversity of Plant Species

Core Zone: Core zone i.e., the proposed Plant unit area showed species richness of 87 of 74 genera and 36 families. Among the habitats, 61 plant species were reported from open scrub area followed by 48 from the agriculture habitat with the species diversity of H' 2.08 and H' 3.11 in OS/WL and AG/FL areas respectively (**Table 3.4**). Out of the 87 species only 19 species are trees and the list of core zone do not have any threatened or endangered flora

Buffer Zone: The large extent of 10 km radius of the buffer zone reported 259 species of plants come under 203 genera and they belong to 74 families. The agriculture/fallow land habitat recorded maximum of 140 species of 116 genera belongs to 57 families. Forest habitat was identified 96 species of plants fall under 80 genus and 42 families. Due to moisture availability and record of 52 species of herbs in agriculture habitat showed domination of floral species. Added, dryness of forest area and separation of riverine habitat of forested area reasoned for comparatively lower species richness. The estimated diversity for forest and agriculture was 2.71 and 3.58 respectively (**Table 3.4**). The wetland/riverine

habitat (WB/R) was identified with 111 plant species and diversity of H' 3.81, which was the higher that the other habitats of the buffer zone. Minimum of 67 species were recorded from the open scrub/wasteland habitat. Overall the buffer zone covering large extent of area reported 259 plant species with diversity of H'3.77 (**Table 3.4**).

Study Area: Status of floral species in the proposed Thermal power plant of WEUPPL project study area, which include core and buffer zones reported an overall species richness of 271 species of plants belong to 212 genera and 74 families. (**Table 3.4**) Species list with their life forms and common names are given in **Annexure 1**.

Table 3.4: Taxonomical Status of Floral Species - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OSWL	AGFL		
Family	33	26	36	42	52	35	57	74	74
Genus	54	40	74	80	99	57	116	203	212
Species	61	48	87	96	111	67	140	259	271
Species Diversity	2.08	3.11	3.24	2.71	3.81	3.28	3.58	3.77	3.76

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , Ct- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.4.2 Habit

Core Zone: In case of core zone annuals (herb and grass) showed high richness (42 species) followed by tree species (19 species, including small and large tree species) and they contributed 48 % and 22 % respectively. Shrub (Woody and small shrub) reported with 14 species and they contributed 16% followed by twiners and creepers 12 species (**Table 3.5**). Though the core zone reported 87 floral species, the annuals which include grass, herbs (44 species) and twiners and creepers (12 species) shared overall 61 % of the habit types. Hence the record of only 12 tree species indicate poor canopy vegetation cover in the project site.

Buffer Zone: Overall the buffer zone recorded 259 species, of which maximum of 116 species were annuals (herb and grass) and shared 44. 79 % followed by trees 76 species with 29% (including small and large tree). Woody climbers, Creepers and Twiners contributed a total of 24 species and shared 9% of the list. Shrub habit (woody and small shrub) dominated second and reported 37 species with the share of 14.29% **(Table 3.5**).

Study Area: Inclusive of both the core and buffer zone, a total of 271 species were reported

for the entire study area and dominated by 44% of annuals (herbs and grass) with 118 species, followed by 29% of tree species (79). Only two species of parasitic species were reported in the study area (**Table 3.5**).

Table 3.5: Habit/life form Status of Floral Species - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Habit/Life form	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OSWL	AGFL				
Herb	17	19	31	35.63	23	22	49	52	96	37.07	97	35.79
Grass	8	6	11	12.64	7	8	10	9	20	7.72	21	7.75
Sedge	0	0	0	0.00	0	0	4	1	5	1.93	5	1.85
WC/C/TW	10	4	11	12.64	12	6	9	12	24	9.27	26	9.59
Woody Shrub	6	9	12	13.79	12	9	11	17	26	10.04	30	11.07
Small Shrub	2	2	2	2.30	2	7	3	5	11	4.23	11	4.06
Small Tree	4	2	4	4.60	6	3	2	6	10	3.86	10	3.69
Large Tree	13	6	15	17.24	33	11	22	37	66	25.10	69	25.46
Parasite	1	0	1	1.15	1	1	1	1	2	0.77	2	0.74
Total	61	48	87	100.00	96	67	111	140	260	100	271	100.00

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.4.3. Status of Woody shrubs –RVI

Status of woody shrub was assessed based on Relative Value Index. It is similar to IVI but only total values of Relative frequency and Relative density which reflects the abundance and distribution status.

Core Zone: Core zone reported only 11 species woody shrubs of that *Zizyphus xylopyrus, Zizyphus oenoplia and Cocculus hirsutus* were dominated with 50%, 44% and 32% of RVI values and were first three in order of ranking respectively. Other eight species secured less than 30 % of RVI, therefore only three woody shrubs were dominant in the core zone, which are very common species (**Table 3.6**).

Buffer Zone: Out of 24 woody shrubs reported for the study area 22 species were identified and enumerate from the different habitats of the buffer zone. Among the species, *Zizyphus xylopyrus* topped in the rank and secured 62.49% of RVI followed by *Carissa congesta* and *Cocculus hirsutus* in the second and third position with 29% and 20% of RVI respectively. *Zizyphus nummularia*, *Securine gavirosa, Helicteres isora,* were the other three species secured more than 10% of RVI while rests of 16 species estimated RVI less than 10%. Thus it showed the study area dominated with few woody shrubs (**Table 3.6**).

Overall Status: Based on top six ranking species of core zone, since they secured more than 10% of RVI and top 10 species of buffer zone (leaving *Lantana camara* as it is an exotic species) a cumulative list of 11 species shared 45.83 of the total list of shrub species and 6 species were common between the zones. These species due to their high population and wider distribution in nature they are promising species to consider for habitat restoration program to develop ground vegetation cover, which would arrests soil erosion and also provide forage for browsers (ungulates) of the study area (**Table 3.6**).

Table 3.6: Relative Value Index (RVI) of Common and Wild Woody Shrub species - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Common Woody Shrub species	Core Zone				Buffer Zone				SPS
		RF	RDN	RVI	RO	RF	RDN	RVI	RO	
1	*Zizyphus xylopyrus*	19.23	30.66	49.89	1	25.95	36.54	62.49	1	*
2	*Zizyphus oenoplia*	21.15	23.11	44.27	2	3.05	3.31	6.36	9	*
3	*Capparis spp.*					0.76	0.31	1.08	18	
4	*Zizyphus nummularia*	19.23	9.43	28.66	4	7.63	8.82	16.45	4	*
5	*Cocculus hirsutus*	15.38	16.51	31.89	3	10.69	9.29	19.98	3	*
6	*Capparis sepiaria*					4.58	2.52	7.10	8	*
7	*Capparis zeylanica*	3.85	1.42	5.26	7	4.58	1.57	6.15	10	*
8	*Grewia Sp.*					0.76	0.16	0.92	19	
9	*Securine gavirosa*	1.92	0.94	2.87	9	7.63	4.09	11.73	5	*
10	*Helicteres isora*					3.82	6.30	10.12	6	*
11	*Agave americana*					0.76	0.47	1.24	17	
12	*Carissa congesta*	5.77	7.08	12.84	6	12.98	15.59	28.57	2	*
13	*Lantana camara*					3.05	4.09	7.15	7	
14	*Waltheria indica*	7.69	6.60	14.30	5	2.29	1.26	3.55	12	*
15	*Cocculus pendulus*					3.82	1.57	5.39	11	*
16	*Hibiscus sp*					0.76	0.47	1.24	17	
17	*Woodfordia fruticosa*					1.53	0.79	2.31	14	
18	*Calotropis procera*	1.92	0.47	2.39	10	1.53	0.63	2.16	15	
19	*Kirganeli areticulata*					0.76	0.94	1.71	16	
20	*Ipomoea carnea Subsp. Fistulosa*					1.53	0.94	2.47	13	
21	*Citrus limon*					0.76	0.16	0.92	19	
22	*Hibiscus ovalifolius*					0.76	0.16	0.92	19	
23	*Jatropha curcas*	1.92	2.83	4.75	8					
24	*Asparagus racemosus*	1.92	0.94	2.87	9					
Total species		**11**				**22**				**11**

RF- Relative Frequency, RDN – Relative Density, RVI –Relative Value Index, SA- Study Area, RO - Rank Order, * SP – Selected species

3.4.4. Status of Common Tree species

List of common tree species was prepared simply listing of tree species found in and around the human habitation. This list identified overall 31 species of 27 genera and they belong to

16 families. Among the species 26 were large tree species rests are small trees. Within the list 11 species were selected as domestic use values as fruit trees and suggested for plantation in and around the any residential area proposed to develop under this project **Table 3.7.** These fruit bearing trees are likely to provide food for many bird species. This list also includes some wild tree species commonly found in and around the human habitations.

Table 3.7: Common Tree Species reported in and around the habitation -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family & Species name	Local Name	Size	SP
1	**Anacardiaceae**			
1	*Mangifera indica* L.	Ama	L	*
2	**Annonaceae**			
2	*Annona squamosa* L.	Shareefa	S	*
3	**Apocynaceae**			
3	*Alstonia scholaris* (L.) R. Br.	Saptaparni	S	
4	**Arecaceae**			
4	*Cocos nucifera* L.	*Narial*	L	*
5	*Borassus flabellifer* L.		L	
5	**Caesalpiniaceae**			
6	*Cassia fistula*L.	Amaltas	L	
7	*Cassia siamea* Lam.	Sandan	L	
8	*Delonix elata* (L.) Gamble	Gul Mahor	L	
9	*Parkinsonia aculeata* L.		S	
10	*Peltophorum pterocarpum*		L	
11	*Tamarindus indica* L.	Imli	L	*
6	**Euphorbiaceae**			
12	*Emblica officinalis* Gaertn.	Aawla	S	*
7	**Fabaceae**			
13	*Dalbergia sissoo* Roxb.	Shishu	L	
14	*Derris indica* (Lam.) Bennet	kiramal,karanj	L	
8	**Meliaceae**			
15	*Azadirachta indica* A. Juss.	Neem	L	
9	**Mimosaceae**			
16	*Albizia lebbeck* (L.) Bth.	Shireesh, Chichola	L	
17	*Leucaena latisiliqua* (L.) Wt. & Arn.		L	
18	*Pithecellobium dulce* (Roxb.) Bth.		L	
10	**Moraceae**			
19	*Artocarpus heterophyllus* Lamk.	Katahal	L	*
20	*Ficus benghalensis* L.	Bargad	L	
21	*Ficus religiosa* L.	Pipal	L	
11	**Moringaceae**			
22	*Moringa oleifera* Lam.		L	*
12	**Myrtaceae**			
23	*Eucalyptus globulus* Labill.		L	
24	*Psidium guajava* L.	Amrut	S	*
25	*Syzygium cumini* (L.) Skells	Jamun	L	*
26	*Syzygium heyneanum* Wall. ex W. & A.	Kathjamun	L	*
13	**Rutaceae**			
27	*Aegle marmelos* (L.) Corr.	Bel	L	*

S.no.	Family & Species name	Local Name	Size	SP
14	**Sapotaceae**			
28	*Madhuca indica* J. F. Gmel.	Mahua	L	
29	*Manilkara hexandra* (Roxb.) Dub		L	
15	**Simaroubaceae**			
30	*Ailanthus excelsa* Roxb.		L	
16	**Verbenaceae**			
31	*Tectona grandis* L.f.	Sagon	L	

L-Large tree , S- Small Tree , SP –Selected Species

3.4.5. Status of Wild Tree Species

Status of wild tree species was discussed based on Important Value Index (IVI) estimated by combining Relative frequency (RF), Relative density (RDN) and Relative Dominance (RDO) considering only the matured trees of more than 20cm GBH.

Core Zone: Though the core zone showed high species richness of overall 87 species, it reported only 19 tree species (Table 3.5) and within these only 12 wild tree species were reported as large tree2 (> 20cm GBH). Among the 12 species, *Ficus mollis Vahl (IVI 75%)* ranked 1st followed by *Butea monosperma (*55%), *Acacia cathechu (*44%) and *Flacourtia indica (34%)* and they estimated IVI value of more than 30%. These species were dominant in terms of their wider distribution; more in number and larger in size in the study area. *Zizyphus mauritiana, Lagerstroemia parviflora, Sterculia urens*, *Bauhinia racemosa,* were dominated in the second level with higher than 10% of IVI ***(*Table 3.8**).

Out of the 19 species reported in the core zone only 12 were of matured trees with more than 20 cm GBH. Among these species *Ficus mollis Vahl (IVI 75%)* ranked 1st followed by *Butea monosperma (*55%), *Acacia cathechu (*44%) and *Flacourtia indica (34%)* and they estimated IVI value of more than 30%. Rest of the nine species were estimated IVI value less than 30 % and it shows their poor distribution, density and dominance.

Buffer Zone: Out of 76 tree species reported in the buffer zone, 39 species identified in the forest habitat while maximum of 43 species were reported in agriculture habitat which had few wild tree species. Overall the larger buffer zone listed 24 large trees with >20cm GBH. Among the species *Terminalia bellerica (33%), Ficus mollis (33%), Butea monosperma (32%), Acacia cathechu (21%), Acacia leucophloea (15%),* reported as top five ranking species and they secured more than 15% of IVI values. *Madhuca indica, Terminalia arjuna, Lagerstroemia parviflora* were dominated as second level with more than 10% IVI values.

Study area: Including both the core and buffer zones, a cumulative list of 27 trees were assessed IVI value since they had GBH > 20cm. The species which are secured more than 10% of IVI in core and buffer zones were selected as potential and promising tree species for habitat improvement and any greenbelt development programs. This list include a total of 13 tree species and among those, *Acacia cathechu, Ficus mollis*, *Butea monosperma, Lagerstroemia parviflora* were found dominated in both the zones (**Table 3.8**).

Table 3.8: Status of wild Tree species based on IVI index- Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttrapradesh

S.no.	Wild/Forest Tree species	Core Zone				RO	Buffer Zone				RO	SP
		RF	RDN	RDO	IVI		RF	RDN	RDO	IVI		
1	*Acacia nilotica*						3.27	2.31	0.58	6.16	12	
2	*Aegle marmelos*						1.96	1.16	0.10	3.22	19	
3	*Cassia fistula*						1.31	0.66	0.01	1.98	23	
4	*Dalbergia sissoo*						0.65	3.14	2.00	5.79	14	
5	*Emblica officinalis*						1.31	0.50	0.33	2.13	21	
6	*Ficus benghalensis*						1.31	0.50	7.84	9.64	9	
7	*Ficus racemosa*						3.27	1.49	1.21	5.96	13	
8	*Ficus religiosa*						0.65	0.17				
9	*Madhuca indica*						3.27	1.82	8.32	13.41	6	*
10	*Syzygium cumini*						1.96	0.83	4.34	7.12	11	
11	*Syzygium heyneanum*						0.65	0.17	1.19	2.01	22	
12	*Acacia cathechu*	16.67	24.36	2.58	43.61	3	9.80	11.06	0.26	21.12	4	*
13	*Terminalia arjuna*						3.27	3.96	4.23	11.46	7	*
14	*Ficus mollis*	2.08	1.92	70.69	74.70	1	1.96	0.50	30.11	32.56	2	*
15	*Butea monosperma*	20.83	30.77	3.13	54.73	2	12.42	18.48	0.26	31.16	3	*
16	*Holoptelea integrifolia*	4.17	1.28	2.08	7.53	11	5.23	3.30	0.03	8.56	10	
17	*Stereospermum suaveolens*						0.65	0.17				
18	*Ixora arborea*						1.31	1.49				
19	*Acacia leucophloea*	4.17	2.56	0.60	7.33	12	9.80	5.28	0.07	15.15	5	*
20	*Flacourtia indica*	18.75	14.74	0.03	33.52	4	3.92	2.15				*
21	*Mitragyna parvifolia*						0.65	0.17	0.27	1.09	24	
22	*Xeromphis uliginosa*						1.31	1.16				
23	*Bauhinia racemosa*	2.08	0.64	8.02	10.74	9	2.61	1.32				*

S.no.	Wild/Forest Tree species	Core Zone				RO	Buffer Zone				RO	SP
		RF	RDN	RDO	IVI		RF	RDN	RDO	IVI		
24	*Holarrhena antidysenterica*						6.54	13.86				
25	*Zizyphus mauritiana*	8.33	6.41	1.01	15.76	5	2.61	0.99	0.18	3.79	17	*
26	*Xeromphis spinosa*	4.17	4.49	0.003	8.66	10	1.96	1.32				
27	*Lannea coromandelica*	6.25	5.13	0.52	11.90	8	1.96	0.83	0.71	3.50	18	*
28	*Diospyros melanoxylon*						2.61	1.65				
29	*Lagerstroemia parviflora*	8.33	4.49	2.84	15.66	6	4.58	6.77	0.09	11.43	8	*
30	*Terminalia belerica*						0.65	0.17	32.61	33.43	1	*
31	*Leucaena latisiliqua*						0.65	2.81				
32	*Alangium salvifolium*						1.31	2.31				
33	*Boswellia serrata*						1.31	2.31	1.47	5.09	15	
34	*Wrightia tinctoria*	2.08	0.64				1.31	0.83	0.31	2.45	20	
35	*Sterculia urens*	2.08	2.56	8.51	13.16	7	0.65	0.17	3.48	4.29	16	*
36	*Streblus asper*						0.65	3.96				
37	*Balanites aegyptiaca*						0.65	0.33				
	Total no large tree species	**12**					**24**				**27**	**13**

RF-Relative frequency, RDN- Relative density, RDO-Relative dominance, IVI – Important Value Index, RO – Rank order. SP – Selected species

3.4.6. Status of crop Species

As per the secondary sources, Major crops of the study area cultivated during monsoon period (Kharif crop) and in winter months (Rabi crop) include:

Rabi: Wheat, gram, Pea, Arhar, Barley, Lentil and Mustard etc.

Kharif: Paddy, Gingili, Minor millet, Rapseed, Black gram, Millet, Smaller millet, Green gram and Ground nut.

However, during the study, the list of crop species was prepared based on the casual observation while collecting data in and around the agriculture habitat. Based on the survey a total of 39 species were reported in the study area which were cultivated as major and minor crops, while some species were reported as hedge cultivation in small extent of areas. Based on their use value they have been grouped into five categories.

Among these, three species fall under grain crops, 18 vegetable crops, 11 species of fruit crops, two timber crops, five cash crops. Among the grain crops wheat, paddy, tuvar, millets, grams and ground nut are cultivated extensively as major crops species. Vegetable crops include 18 species; however, bhindi, tamater, chilli, muri and ringna were commonly cultivated as minor vegetable crops. All the 11 species of fruit crops are grown in small areas along the agricultural hedges and mainly for local use. All the five commercial crops are cultivated extensively and they form major income of the local agriculturalists **(Table 3.9)**. *Tectona grandis* and Dalbergia sissoo are the wild timber species, but few trees grown along the agriculture edges in addition to extensive plantation of sissoo under forest plantation.

Since the land use of the core zone has only open scrub/wasteland and agriculture /fallow land and absence of perennial water sources, no intensive agriculture takes place within it.

Table 3.9: List of Agriculture and Commercial Crop Species Reported - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttrapradesh

S. No	Species Name	Family	Common Name	Habit
1	**Grain Crops**			
1/1	*Cajanus cajan*	Fabaceae	Tuvar	Under Shrub
2/2	*Oryza sativa*	Poaceae	Rice	Grass
3/3	*Triticum aestivum*	Poaceae	Gehu	Grass
2	**Vegetable Crops**			
4/1	*Abelmoschus esculentus*	Malvaceae	Bhindi, Bhindo	Under Shrub
5/2	*Allium cepa*	Liliaceae	Pyas	Herb
6/3	*Amorphophallus campanulatus*	Araceae	Sooran	Herb
7/4	*Atriplex hortensis*	Chenopodiaceae	Palak	Herb
8/5	*Capsicum annum*	Solanaceae	Green chili	Herb
9/6	*Cucumis sativus*	Cucurbitaceae	Kheera	Climber
10/7	*Cucurbita maxima*	Cucurbitaceaea	Kaddu	Climber
11/8	*Daucus carota*	Apiaceae	Gajar	Herb
12/9	*Lagenaria siceraria*	Cucurbitaceae	Lauki	Climber
13/10	*Luffa cylindrica*	Cucurbitaceae	Torai	Climber
14/11	*Lycopersicon lycopersicum*	Solanaceae	Tamater	Herb
15/12	*Momordica charantia*	Cucurbitaceae	Karela	Climber
16/13	*Momordica dioica*	Cucurbitaceae	Kheksa	Climber
17/14	*Moringa oleifera*	Moringaceae		Tree
18/15	*Raphanus sativus*	Brassicaceae	Muri	Herb
19/15	*Solanum melongena* var. *melongena*	Solanaceae	Bhanta	Herb
20/17	*Solanum melongena* var. *insana*	Solanaceae	Ringna	Herb
21/18	*Trichosanthes dioica*	Cucurbitaceae	Parval	Climber
3	**Fruit Crops**			
22/1	*Aegle marmelos*	Rutaceae	Bel	Tree

S. No	Species Name	Family	Common Name	Habit
23/2	*Annona squamosa*	Annonaceae	Shareefa	Small Tree
24/3	*Artocarpus heterophyllus*	Moraceae	Katahal	Tree
25/4	*Carica papaya*	Caricaceae	Papita	Small tree
26/5	*Citrus limon*	Rutaceae	Nimbu	Woody shrub
27/6	*Cocos nucifera*	Arecaceae	Narial	Tree
28/7	*Cucumis melo var. melo*	Cucurbitaceae	Kharbooja	Herb
29/8	*Emblica officinalis*	Euphorbiaceae	Aawla	Tree
30/9	*Mangifera indica*	Anacardiaceae	Ama	Tree
31/10	*Musa paradisiaca*	Musaceae	Kela	Herb
32/11	*Punica granatum*	Punicaceae	Anar	Small Tree
4	**Timber Crops**			
33/1	*Dalbergia sissoo*	Fabaceae	Shishu	Tree
34/2	*Tectona grandis*	Verbenaceae	Sagvan, Sag	Large Tree
5	**Cash/Commercial Crops**			
35/1	*Brassica nigra*	Brassicaceae	Rai	Herb
36/2	*Foeniculum vulgare*	Apiaceae	Saunf	Herb
37/3	*Ricinus communis*	Euphorbiaceae	Rendi ,Arandi	Shrub
38/4	*Saccharum officinarum*	Poaceae	Ganna	Grass
39/5	*Sesamum indicum*	Pedaliaceae	Til	Herb

3.4.7. Overall Species Richnes

During this study a total of 271 plant species of different habits were reported within the study area and they belong to 212 genus and 74 families. The forest department list showed only 82 species of 63 genus and 34 families. All the species given in the forest department list were reported in the sampling plots of the study area and no new species added in the cumulative list. Since the study reported diverse floral species it added 189 species to the forest list. Overall species richness of the study area stands as in case of the study list (**Table 3.10 & Annexure 1**).

Table 3.10: Overall Species Richness of Flora -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	74	34	
Genus	212	63	
Species	271	82	

3.5 STATUS OF FAUNA

This section includes the discussion of major faunal groups like; amphibians, reptiles, birds (terrestrial and aquatic) and mammals. Among the groups, due to taxa specific nature of life, direct sightings of herpetofauna and mammalian fauna was always lower than the avifauna,

which is more active and mobile. Therefore status of herpetofauna and mammal groups were discussed only at species richness and abundance levels based on actual number of animals and indirect evidences recorded for those groups respectively.

3.5.1 Status of Herpetofauna

3.5.1.1 Taxonomical status and Species Richness – Amphibians

Core Zone: In the core zone, i.e., the proposed Thermal Power Plant –, WEUPPL project site no amphibians were reported, which was due to absence of water source and all the small seasonal water bodies were dry (**Table 3.11**).

Buffer Zone: In case of overall buffer zone (OBZ), which is largest extent of area included water bodies/ rivers and agricultural land with water reported three species of amphibians. Maximum of three species were identified from water bodies/rivers, while two species were recorded in agriculture/fallow lands (**Table 3.11**).

Study Area: Since there were was no amphibians recorded in the core, the overall status of the study area was same as in case of buffer zone (**Table 3.11)**.

Table 3.11: Taxonomical Status of Amphibians-Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	0	0	0	0	1	0	1	1	1
Genus	0	0	0	0	3	0	2	3	3
Species	0	0	0	0	3	0	2	3	3

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.1.2 Abundance Status – Amphibian

Core Zone: No amphibians were reported from the core zone.

Buffer Zone: In the buffer zone, where three species were recorded, Skittering Frog (*Occidozyga cyanophlyctis)* accounted for 30 frogs, which formed 79% of the total 38 reported (**Table 3.12**).

Study Area: Since no amphibians were recorded in the core zone the abundance status of amphibians in the study area was the same as in the buffer zone (**Table 3.12**). Overall the amphibian richness and abundance was poor in the study area.

Table 3.12: Abundance Status of Amphibians -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.No	Family & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
	Randidae										
1	*Limnonectes limnocharis*	Cricket Frog	0	0	0	0	3	0	0	3	3
2	*Hoplobatrachus tigerinus*	Indian Bull Frog	0	0	0	0	3	0	2	5	5
3	*Occidozyga cyanophlyctis*	Skittering Frog	0	0	0	0	23	0	7	30	30

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.1.3 Taxonomical Status and Species Richness – Reptiles

Core Zone: Reptilian status in the core zone was represented by only three species belonging to three genera and three families, with two species each found in open scrub/waste land and agriculture /fallow land (**Table 3.13**).

Buffer Zone: In buffer zone nine species of reptiles were recorded, which belonged to eight genera and six families. Among these nine species, maximum of seven species were recorded in water bodies/ river followed by forest (five species) and open scrub/wasteland (four species) others (**Table 3.13**).

Study Area: The overall richness in the study area, that includes both the core and buffer zones, showed that 10 species were recorded in the area (**Table 3.13**).

Table 3.13: Taxonomical Status of Reptiles -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	2	2	3	4	4	3	3	6	7
Genus	2	2	3	5	6	3	3	8	9
Species	2	2	3	5	7	4	3	9	10

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.1.4 Abundance status – Reptiles

Core Zone: In the core zone a total of only seven individuals were recorded of which Garden Lizard (*Calotes versicolor)* was with four individuals followed by Leschenault's Lecertid (*Ophisops leschenaultii*) (two) and Spectacled Cobra (*Naja naja*) (one individual) that was recorded only in the core zone. Maximum of five individuals were recorded in open scrub/waste land (**Table 3.14**). On the whole, the core zone showed poor richness and population /abundance.

Buffer zone: Abundance status of the buffer zone resulted in enumeration of 77 animals of nine species. Among the species, *Calotes versicolor* recorded a maximum of 31 individuals followed by Bronze grass skink - *Mabuya macularia* (20) and *Ophisops leschenaultii* (15) and these species contributed 86 % of the total abundance. There was not much variation among different species in terms of abundance in the buffer zone (**Table 3.14**).

Study Area: The overall abundance status for the study area was 84 individuals with 92% of the total abundance of reptiles found in the buffer zone. The overall status of different species in the study area also showed that *Calotes versicolor* (35 individuals), Bronze *Mabuya macularia* (20) and *Ophisops leschenaultii* (17) were with more individuals (**Table 3.14**). This clearly shows the low richness and abundance of reptiles in the study area.

Table 3.14: Abundance Status of Reptiles -Proposed Thermal Power Plant –WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.No	Family & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
1	**Agamidae**										
1	*Calotes versicolor*	Indian Garden Lizard	3	1	4	9	6	10	6	31	35
2	*Sitana ponticeriana*	Fan-throated Lizard	0	0	0	3	1	0	0	4	4
2	**Lacertidae**										
3	*Ophisops leschenaultii*	Leschenault's Lacerta	2	0	2	6	1	8	0	15	17
3	**Scincidae**										
4	*Mabuya macularia*	Bronze Grass Skink	0	0	0	2	6	1	11	20	20
5	*Mabuya carinata*	Common Keeled Grass Skink	0	0	0	0	1	1	0	2	2
4	**Gekkonidae**										
6	*Hemidactylus frenatus*	Asian House Gecko	0	0	0	0	0	0	1	1	1
5	**Varanidae**										
7	*Varanus bengalensis*	Common Indian Monitor	0	0	0	1	0	0	0	1	1
6	**Colubridae**										
8	*Ptyas mucosa*	Rat Snake	0	0	0	0	1	0	0	1	1
9	*Xenochrophis piscator*	Checkered Keelback	0	0	0	0	2	0	0	2	2
7	**Elapidae**										
10	*Naja naja*	Spectacled Cobra	0	1	1	0	0	0	0	0	1
Overall			**5**	**2**	**7**	**21**	**18**	**20**	**18**	**77**	**84**

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total, * information from Local People / Forest Staff

3.5.1.5. Overall Species Richness

During the study, including amphibian and reptiles a total of 13 herpetofauna were reported from the study area. The State Forest Department list reported 12 species of reptiles (no amphibian in the list) belonging to 12 genera and 10 families. Inclusive of three species of amphibian and five reptiles that were exclusively recorded during this study, the seven reptile species recorded exclusively by the Mirzapur Forest Division and five species common to the present study and Forest Department list, the cumulative list resulted with 20 species of 18 genera and 13 families for the Mirzapur Forest area (**Table 3.15 & Annexure 2**).

Table 3.15: Overall Species Richness of Herpetofauna-Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	8	10	13
Genus	12	12	18
Species	13	12	20

3.5.2. Status of Avifauna- Terrestrial

3.5.2.1 Taxonomical Status, Species Richness and Diversity

Core zone: Status of birds assessed within the core zone, which had only open scrub / wasteland and agriculture / fallow land habitats, reported a total of 46 species belonging to 35 genera of 22 families and with estimated diversity of H'=3.1. Among the two habitats, the status was more in open scrub /wasteland (45 species, H'=3.1) compared to 19 species (H'=2.6) in the agriculture/ fallow land (**Table 3.16**).

Buffer Zone: The buffer zone area covers the large extent of forest habitat and it had in total 85 terrestrial bird species that come from 63 genera and 30 families with maximum of 58 species from the forest in and around the wetland/river habitat followed by 53 in forest, 45 in agriculture and 41 in open scrub / wasteland. The overall species diversity estimated was H'=3.7, and contributed 97% of the total species listed (88 species) in the study area (**Table 3.16**).

Study Area: Including the core and buffer zones, the proposed project study area reported 88 species of 65 genera and 31 families. In the entire study area terrestrial birds were with an estimated species diversity of H' =3.7, which is of moderate to high level **(Table 3.16).**

Table 3.16: Taxonomical Status of Terrestrial Birds species -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	21	12	22	24	28	20	22	30	31
Genus	34	16	35	37	49	32	38	63	65
Species	45	19	46	53	58	41	45	85	88
Species Diversity	3.1	2.6	3.1	3.2	1.5	2.8	3.3	3.7	3.7

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.2. Abundance Status

Core zone: A total of 385 birds of 46 species were reported from the core zone and it formed only 28% of the total birds counted in the sampling points of the study area. Among the two habitats, open scrub / wasteland recorded 291 birds of 45 species and they accounted for 76% of birds of the core zone while agriculture / fallow land contributed 24% (**Table 3.17**)

Buffer zone: Within the buffer zone, 997 birds were counted of 85 species. Among the habitats, the vegetation in and around the wetland / rivers recorded 302 birds followed by forest (281 birds) and open scrub / wasteland (233 birds) and they contributed to 30%, 28% and 23% respectively to the overall buffer zone. The contribution of agriculture / fallow land habitat was 43 species and 181 birds with 18% (**Table 3.17**).

Study area: Overall 1382 terrestrial birds of 88 species were counted in the study area (**Table 3.17**). However, number of birds enumerated in the study area seems to be low.

3.5.2.3. Abundance Category Status

Abundance status of bird species in the study area was further categorized into five classes based on the number of birds reported in each species. The category wise status is discussed for all the zones.

Core zone: within the core zone, among the two habitats, 93% of the species in the open scrub / wasteland belonged to very low category, while in the agriculture / fallow land all species (19 species) were of very low category, thus reflecting very low abundance of terrestrial birds (**Table 3.17**).

Buffer Zone: The area of 10km radius reported 85 species, however 76 species (89%) fall under very low category while five species were low. None of the species were found to be under very high abundance categories (**Table 3.17**) Only two species, Red-vented Bulbul (*Pycnonotus cafer* -87 birds) and Laughing Dove (*Streptopelia senegalensis* -88 birds) were found to be abundant with 75-100 birds (**Annexure 3**).

Study area: Since both core and buffer zones, had more species with less than 25 birds, the overall status reflected that 95 % of species fall under very low and low categories. This study showed that though the study area reported 88 birds species, majority of them were found to be in low numbers (**Table 3.17**). Only 6 % of species such as Spotted Dove (*Streptopelia chinensis* -82 birds), Large-grey Babbler (*Turdoides malcolmi* – 99 birds) and Laughing Dove (*Streptopelia senegalensis* -101 birds), Indian Robin (*Saxicoloides fulicata* -106 birds), Red-vented Bulbul (*Pycnonotus cafer*-135 birds) fall under high and very high categories respectively, which are common bird species (**Annexure 3**).

Table 3.17: Abundance Status of Terrestrial Bird- Proposed Thermal Power Plant –WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Total Species	45	19	46	53	58	41	45	85	88
Total Birds	291	94	385	281	302	233	181	997	1382
R %	**75.6**	**24.4**	**100**	**28.2**	**30.3**	**23.4**	**18.1**	**100**	
	Abundance Category								
Very Low 1-25 birds	42 (93.3)	19 (100)	42 (91.3)	50 (94.3)	57 (98.3)	41 (100)	45 (100)	76 (89.0)	73 (83.9)
Low 26-50 birds	3 (6.7)	--	4 (8.7)	3 (5.7)	1 (1.7)	--	--	5 (6.1)	10 (11.4)
Medium 50-75 birds	--	--	--	--	--	--	--	2 (2.4)	
High 75-100	--	--	--	--	--	--	--	2 (2.4)	2 (2.3)
Very high >100	--	--	--	--	--	--	--	--	3(3.4)

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.4. Foraging Status

Foraging guild status was assessed by grouping them based on the major food items the birds feed. Foraging status generally reflects the availability of major and diverse habitat types in the study area. A total of six foraging guilds were identified among all species identified in the study area.

Core Zone: Among the 46 species reported insectivores dominated with 44% (20 species) followed by omnivore (12 species and 26%), Granivores were represented by eight species and formed 17% of the total species recorded (**Table 3.18**).

Buffer Zone: Out of 85 species, 43 species were insectivores forming 51% that contributed the maximum, followed by omnivores and granivores each with 15 and 14 species respectively shared 18% and 17% of the total. Frugivores represented only by six species contributed 7% to the foraging guild (**Table 3.18**).

Study Area: On the whole the study area, that included both the core and buffer zones, was dominated by insectivores (50%) and omnivores (18%), this could be due to domination of insect and extent of forest habitat in the buffer zone. Since the study area had agriculture / fallow land, granivores was also found represented by 14 species, which formed 16% of the overall list (**Table 3.18**).

Table 3.18: Foraging Status of Terrestrial Bird- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Foraging Guilds	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Omnivore	12	4	12	26.1	12	12	11	12	15	17.7	16	18.2
Carnivore	2	2	2	4.3	1	3	0	4	5	5.9	6	6.8
Insectivore	**20**	**8**	**20**	**43.5**	**27**	**27**	**17**	**18**	**43**	50.6	44	50.0
Granivore	7	4	8	17.4	9	10	7	6	14	16.5	14	15.9
Frugivore	3	1	3	6.5	3	5	4	3	6	7.1	6	6.8
Necterivore	1	0	1	2.2	1	1	2	2	2	2.4	2	2.3
Total	45	19	46	100	53	57	41	45	85	100	88	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.5. Migratory Status

Core Zone: Among the 46 terrestrial bird species recorded in the core zone, majority of them were resident species, which formed 96% (44 species), while only two species were found to be migrant (**Table 3.19**).

Buffer Zone: In this zone except for one winter visitor rest of the 84 species were residents (**Table 3.19**).

Study Area: Overall the study area supported more local or resident species (86 species & 98%) than the migrant species (two species & 2%) **Table 3.19**. This is because the study was conducted during summer season and does not cover the winter season which is the period when migrants are more.

Table 3.19: Migratory Status of Terrestrial Bird- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Migratory status	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Resident	43	19	44	95.7	53	57	41	45	84	98.8	86	97.7
Winter Migrant	2	--	2	4.3	--	1	--	--	1	1.2	2	2.3
Vagrant	--	--	--	--	--	--	--	--	--	--	--	--
Summer visitor	--	--	--	--	--	--	--	--	--	--	--	--
Total	45	19	46	100	53	58	41	45	85	100	88	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.6. Overall Species Richness

This study reported presences of 88 terrestrial avifauna within the study area of 65 genera and 31 families. The State Forest Department working plan of Mirzapur forest division had listed 47 species belonging to 40 genera and 20 families, which is for the entire Mirzapur forest landscape. Based on these two lists, the cumulative estimate of species was 107 in and around the Mirzapur forest areas belonging to 76 genera and 31 families (**Table 3.20**). This study added 60 species that were not listed by the forest department and 19 species reported only by the forest department **while** 28 species found to be common to both, forest department and present study (**Annexure 3**).

Table 3.20: Overall Species Richness of Terrestrial Birds in the Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	31	20	31
Genus	65	40	76
Species	88	47	107

3.5.3. Status of Avifauna – Aquatic

3.5.3.1. Taxonomical Status, Species Richness and Diversity

Core Zone: The core zone, which had no permanent water bodies, reported only five aquatic bird species belonging to four genera and three families. This zone estimated low species diversity of 1.4 (**Table 3.21**).

Buffer Zone: This larger extent of buffer zone reported only 31 species and they belong to 28 genera and 16 families. Among the four habitats, wetland / riverine habitat reported maximum of 30 species, while the open scrub / wasteland recorded 16 species. The total species diversity estimated for the buffer zone was H'=2.5 (**Table 3.21**)

Study Area: All the 31 aquatic bird species recorded in the buffer zone that included the five species recorded in the core zone, depicts the richness of the study area. Even though the study area had three dam sites and network of river and streams (Nullahs), due to survey in summer and ephemeral in nature of the streams and river, this study reported very low species richness and diversity estimated was moderate of H'=2.5 (**Table 3.21**).

Table 3.21:Taxonomical Status of Aquatic Birds species -Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	1	3	3	0	16	10	3	16	16
Genus	1	4	4	0	27	15	3	28	28
Species	1	5	5	0	30	16	3	31	31
Species Diversity	0	1.5	1.4	0	2.4	2.3	1.1	2.5	2.5

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.2. Abundance Status

Core Zone: Comparatively being a small area, the core zone recorded a total of only 10 aquatic birds, which formed only 1% of the total 740 birds counted in the study area. Since there was no permanent aquatic system in the core area and it being summer and dry, the number of birds recorded were very low with all five species with a total abundance of nine birds recorded from agriculture / fallow land, while the other habitat the open scrub/ wasteland harbored only one species with one bird (**Table 3.22).**

Buffer Zone: In this zone 730 birds were recorded of which the wetland / riverine habitat accounted for 91% of the abundance. This was followed by open scrub / wasteland (8%) and agriculture / fallow lands that contributed less than 1% (**Table 3.22**).

Study area: In spite of the presence of diverse habitats in the study area, like dense and open forests, agriculture and network of rivers and few dam sites, the overall estimation of 740 aquatic birds showed low abundance in the study area (**Table 3.22).**

3.5.3.3. Abundance Category Status

Core Zone: In the core zone, all the five species recorded were under very low abundance category thus showing the low or no availability of the aquatic system (**Table 3.22 & Annexure 4**).

Buffer Zone: In total 31 species were recorded in this zone of which 90% of the species were in very low and low abundance category, with only two species that formed only 7% falling under very high abundant category. Lesser Whistling Duck (*Dendrogyna javanica*- 237 birds) and Cattle Egret (*Bubulcus ibis* -106 birds) were the two species fall under very high category (**Table 3.22 & Annexure 4**).

Study Area: Due to low species richness of aquatic birds, and all species recorded in the buffer zone that included the species reported from core zone, the overall status of the study area was same as the buffer zone (**Table 3.22 & Annexure 4**).

Table 3.22: Abundance Status of Aquatic Bird in Proposed Thermal Power Plant –WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Total Species	1	5	5	0	30	16	3	31	31
Total Birds	1	9	10	0	667	60	3	730	740
R %	**10**	**90**	**100**	**0**	**91.4**	**8.2**	**0.4**	**100**	100
	Abundance Category								
Very Low 1-25 birds	1 (100)	5 (100)	5 (100)	--	22 (73.3)	16 (100)	3 (100)	22 (71.0)	22 (71.0)
Low 26-50 birds	--	--	--	--	5 (16.7)	--	--	6 (19.3)	6 (19.3)
Medium 50-75 birds	--	--	--	--	1 (3.3)	--	--	1 (3.2)	1 (3.2)
High 75-100					0	--	--	0	--
Very high >100	--	--	--		2 (6.7)	--	--	2 (6.5)	2 (6.5)

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.4. Foraging Status

Core Zone: All five aquatic bird species recorded in the core zone were insectivores. Absence of aquatic systems reflecting the low aquatic bird richness. All five species were found in agriculture / fallow land while one species from open scrub / wasteland (**Table 3.23**).

Buffer Zone: Among the 31 species recorded in this zone 14 were piscivore species, which formed 45% of all foraging guilds, followed by insectivores (12 species- 39%). However, omnivore (three species) and herbivores (two species) were also present they formed comparatively very low proportion (**Table 3.23**).

Study area: Since the all guilds and richness status found in the core zone was among that recorded in the buffer zone, the overall guild status was same as that reported for the buffer zone, with piscivore and insectivores forming the major guilds (**Table 3.23**) .

Table 3.23: Foraging Status of Aquatic Birds- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Foraging Guilds	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Omnivore	--	--	--	--	--	3	1	--	3	9.7	3	9.7
Carnivore	--	--	--	--	--	-	--	--	--	--	--	--
Herbivore	--	--	--	--	--	2	1	--	2	6.4	2	6.4
Insectivore	1	5	5	100	--	12	6	1	12	38.7	12	38.7
Granivore	--	--	--	--	--	--	--	--	--	--	--	--
Frugivore	--	--	--	--	--	--	--	--	--	--	--	--
Piscivore	--	--	--	--	--	13	8	2	14	45.2	14	45.2
Total	1	5	5	100	--	30	16	3	31	100	31	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.5. Migratory Status

Core Zone: Of the five species reported in the core zone, three (60%) were residents and two (40%) species was winter visitors (**Table 3.24**). The winter visitor recorded were in breeding plumage, which would probably stay back or migrate late, however it is a rare phenomenon.

Buffer zone: Out of 31 species recorded in this zone, 23 were residents, while eight species belonged to winter migrant and they shared 74% and 26% respectively of the total species recorded (**Table 3.24**). The winter visitors were the ones that had some individuals that stay back or migrate late.

Study area: Even though the study area had aquatic habitats like river, dam and village ponds, as sampling was done in summer and the season when no winter visitor is present, the study area reported low migratory species (eight species forming 26%) compared to 23 species of residents (74%) (**Table 3.24**).

Table 3.24: Migratory Status of Aquatic Birds- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Migratory status	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Resident	1	3	3	60	--	22	15	3	23	74.2	23	74.2
Winter Migrant	--	2	2	40	--	8	1	--	8	25.8	8	25.8
Vagrant	--	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--	--
Summer visitor	--	--	--	--	--	--	--	--	--	--	--	--
Total	1	5	5	100	--	30	16	3	31	100	31	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.6. Overall Species Richness

During this study 31 species of aquatic avifauna were reported in the study area. The list of state forest department showed 14 species belonging to 13 genera under seven families. The combined list gave a total of 40 species of 35 genera and 18 families. This overall list included nine species that was reported only by the forest department that were not sighted during this study and 26 species recorded during this study that were not listed in the working plan of the forest department, on addition to five species that were common to both (**Table 3.25 & Annexure 4**). Overall status of aquatic avifauna was found to be moderate to low in the study area.

Table: 3.25: Overall Species Richness of Aquatic Birds -Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	16	7	18
Genus	28	13	35
Species	31	14	40

3.5.4. Status of Mammals

3.5.4.1. Taxonomical status of Mammals

Core Zone: Core zone reported 11 mammalian species and each belong to 11 separate genera and eight families, which was the same as in the open scrub / waste land, one among the two habitat types sampled in the core zone. Agriculture / fallow land recorded nine species of nine genera and seven families (**Table 3.26**).

Buffer Zone: Overall buffer zone recorded 18 mammalian species each belonging to 18 separate genera and 13 families. Among the habitats forest area reported maximum of 15 species of 15 genera and 12 families, followed by water bodies / rivers (13 species), open scrub / wasteland (nine) and agriculture / fallow land (eight species) (**Table 3.26**).

Study Area: The overall list of mammalian fauna of the study area includes species recorded in both the core and buffer zones. This showed that in total 19 species belonging to 18 genera and 13 families (**Table 3.26**).

Table 3.26: Taxonomical Status of Mammals -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	8	7	8	12	10	8	7	13	13
Genus	10	9	10	15	13	9	8	18	18

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Species	10	9	10	15	13	9	8	18	19

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.4.2. Abundance status – Mammals

Core Zone: The project area had 10 species and none of the species were sighted directly. In total 184 evidences of these species were recorded in the core zone. Based on indirect evidences Nilgai (*Boselaphus tragocamelus*) (65 evidences - pellets) was found to be more followed by Indian Hare (*Lepus nigricollis*) (53 evidences - pellets & tracks) and Indian Gerbil (*Tatera indica*) (23 evidences - holes & tracks), while other species were less abundant, and reported less than 15 evidences. Among the habitat types, open scrub / waste land reported more evidences with Nilgai, Indian Hare and Indian Gerbil being more common (**Table 3.27**).

Buffer Zone: overall buffer zone area confirmed the presence of 18 species based on 33 direct sightings of animals and 316 indirect evidences. The abundance status showed dominance of Nilgai (107 indirect evidences & 16 direct sightings), followed by Indian Gerbil (45 evidences) Indian Hare (39 evidences), Jackal (38 indirect evidences & one direct evidence), Wild Pig (28 evidences) and Jungle Cat (28 evidences). Among the habitat types, forest area recorded 133 evidences and 27 direct sightings of 15 mammal species followed by open scrub / wasteland with 92 evidences and 19 direct sightings of nine species, water bodies / rivers with 57 evidences and five direct sightings and agriculture / fallow lands reported the least abundance of mammals (**Table 3.27 & Annexure 5**).

Study Area: Within the study area that includes core zone and 10 km radius buffer, in total 500 evidences and 33 direct sightings of 18 mammalian species were reported. Among these species Nilgai, Indian Hare, Indian Gerbil, Jackal, Wild Pig and Jungle Cat were with more abundance, which is based mainly on indirect evidences. Of the 33 direct sightings, Nilgai (16 direct sightings) and Five-striped Palm Squirrel (Funambulus pennantii) (seven direct sightings) accounted for 70% of the direct sightings. Though the study area reported 19 species of mammalian fauna, direct sightings of only five species, with maximum sightings of only 16 Nilgai indicate, low population /abundance status in spite of presence of large extent of forest area in the buffer zone (**Table 3.27 & Annexure 5**).

Table 3.27: Abundance Status of Mammals of the Proposed Thermal Power Plant -WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Families & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
1	**Cercopithecidae**										
1	*Semnopithecus entellus*	Common Langur	0	0	0	3	1	0(6)		4(6)	4(6)
2	**Cervidae**										
2	*Axis axis*	Spotted Deer	0	0	0	*	0	0	0	*	*
3	**Bovidae**										
3	*Boselaphus tragocamelus*	Nilgai	47	18	65	60(3)	14	25(13)	8	107(16)	172(16)
4	*Tetracerus quadricornis*	Four Horned Antelope	0	0	0	6	0	0	0	6	6
4	**Suidae**										
5	*Sus scrofa*	Wild Pig	3	1	4	14	12	2	0	28	32
5	**Ursidae**										
6	*Melursus ursinus*	Sloth Bear	0	0	0	1	1	0	0	2	2
6	**Canidae**										
7	*Canis aureus*	Jackal	7	4	11	11(1)	12	10	5	38(1)	49(1)
8	*Vulpes bengalensis*	Indian Fox	1	3	4	1	2	0	0	3	7
7	***Hyaenidae***										
9	*Hyaena hyaena*	Striped Hyena	3	1	4	3	0	1	0	4	8
8	**Felidae**										
10	*Felis chaus*	Jungle Cat	2	0	2	16	5	5	2	28	30
11	*Panthera pardus*	Common Leopard	0	0	0	0	3	0	0	3	3
10	**Viverridae**										
12	*Paradoxurus hermaphroditus*	Common Palm Civet	0	0	0	1	0	0	0	1	1
11	**Herpestidae**										
13	*Herpestes edwardsii*	Common or Grey Mongoose	2	2	4	0	0	0	0	0	4
14	*Herpestes smithii*	Ruddy Mongoose	0	0	0	0	1(3)	0	1	2(3)	2(3)
12	**Leporidae**										
15	*Lepus nigricollis*	Indian Hare	29	24	53	9	3	24	3	39	92
13	**Sciuricidae**										
16	*Funambulus pennantii*	Five-striped Palm Squirrel	0	0		0(3)	0(2)		0(2)	0(7)	0(7)
14	**Muridae**										

S.no.	Families & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
17	*Tatera indica*	Indian Gerbil	17	6	23	9	1	23	12	45	68
18	*Golunda ellioti*	Indian Bush Rat	0	0	0	1	0	0	0	1	1
19	*Mus booduga*	Little Indian Field Mouse	4	10	14	0	2	2	1	5	19
Overall			**115**	**69**	**184**	**135(7)**	**57(5)**	**92(19)**	**32(2)**	**316(33)**	**500(33)**

FR- Forest, AG-Agriculture, WE-Wetland, CT- Core Zone Total, RH- Riverine Habitat, BT – Buffer Zone Total, SAT Study Area Total ; NOs in parenthesis indicates "Direct Sightings" of animals, * information - Locals / Forest Staff

3.5.4.3. Overall Species Richness

During the present study 18 mammalian fauna were reported from the project study area. The State Forest Department Working Plan, which is for a larger mainly the forest under Mirzapur division, listed a total of 29 mammal species belonging to 28 genera of 15 families. Based on the study four species *viz.* Indian Gerbil (*Tatera indica*), Indian Bush Rat (*Golunda ellioti*) Ruddy Mongoose (*Herpestes smithii*) and Common Palm Civet (*Paradoxurus hermaphroditus*) were added to the list, which gave a cumulative list of 33 species of 31 genera and 16 families in Mirzapur division forest areas (**Table 3.28** & **Annexure 5**)

Table 3.28: Overall Species Richness of Aquatic Birds -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	13	15	16
Genus	18	28	31
Species	19	29	33

3.6 STATUS OF THREATENED BIOTA (Flora & fauna)

3.6.1. Threatened Plant

During the study within the sampling location a total of two plant species were reported as threatened and those species include *Terminalia arjuna* (24 trees) and *Boswellia serrata* (14 trees) reported in the buffer zone of the study area fall under threatened category (vulnerable) according to WCMC 1994 (**Table 3.29 & Annexure 1**). None of these species were reported from the core zone. *Terminalia arjuna* was mainly reported along the riverine and stream habitats while *Boswellia serrata* was reported in the forest patches of moderately undulating terrine. These species were brought under threatened category due highly restricted distribution and high cutting pressure in general. However, in the study area they were found in few patches of forest habitat which are far from the proposed project site.

Terminalia arjuna was included in the proposed plantation list since it secured 7th rank in IVI value of wild tree species and in addition *Boswellia serrata* (15th rank in IVI **Table 3.8**) was also suggested to grow in the plantation to enhance their population.

Table 3.29: Status of Endangered Flora - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Species & common name and Habits	Project Study Area		Dharmjaygarh-Forest Division
	Core	Buffer	
Terminalia arjuna (arjun) - Large Tree)		24	@
Boswellia serrata – Salai (Large Tree) Iai		14	@

3.6.2. Status of Threatened Animals

3.6.2.1 Herpetofauna

Amphibians: Among the three species of amphibians reported within the study area none of them fall under the threatened category of IUCN and Schedule I of Indian Wildlife Protection Act (1972).

Reptiles: Out of 10 species of reptiles reported in the study, only one IUCN Red List species Common Monitor Lizard (one individual) was reported from the forest in the buffer zone area further it fall under schedule II list of IWPA (1972). The other two species Gharial (*Gavialis gangeticus*) and Indian Flapshell Turtle (*Lissemys punctata*) both Schedule I species, were listed by the forest department, which is for the entire Mirzapur forest division and were not recorded during this study within the study area(**Table 3.30 & Annexure 2)**.

Table 3.30: Status of Endangered (Schedule I) Herpetofauna- Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Species & Common Name	Project Study Area		Mirzapur Forest Division
		Core	Buffer	
1	*Crocodylus palustris*- Mugger / Marsh Crocodile	-		FD@
2	*Gavialis gangeticus*- Gharial	-		FD@
3	*Lissemys punctata*- Indian Flapshell Turtle	-		FD@
34	*Varanus bengalensis*- Common Monitor Lizard	-	Sch II	FD+

FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department

3.6.2.2. Avifauna

Terrestrial birds: Among terrestrial birds, however six RET species of birds were found or reported to occur in the Mirzapur forest division, that included four vultures of which three

were had been listed as Critically Endangered, while one Egyptian Vulture (*Neophron percnopterus*) has been listed as endangered IUCN 2011.2, and two species (Indian Peafowl - *Pavo cristatus* and Indian Grey Hornbill - *Ocyceros birostris*) list as Schedule I in the IWPA 1972. Among these RET species, Egyptian Vulture (one individual- buffer zone), Indian Peafowl (three individual in core zone & 15 in buffer zone) and Indian Grey Hornbill (one bird in buffer zone) were recorded during this study, but their abundance was very low (**Table 3.31**). Other three vultures of critically endangered were not reported within the study area during this study. Conservation status of all the bird species is given in **Annexure 3**

Aquatic birds: There were no RET species of aquatic birds reported during the present study, but the forest department list, which is for the entire Mirzapur forest division that covers a large landscape reported the presence of Sarus Crane that list as vulnerable in IUCN Red List IUCN 2011.2 (**Table 3.31)** and conservation status is given in **Annexure 4.**

Table 3.31: Status of Endangered (Schedule I) Avifauna - Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttrapradesh

Species Name	Project Study Area		Mirzapur Forest Division
	Core	Buffer	
Aquatic Birds			
Grus antigone Sarus Crane	Nil	Nil	FD
Terrestrial birds			
Gyps indicus Long-billed Vulture	Nil	Nil	FD
Gyps bengalensis White-rumped Vulture	Nil	Nil	FD
Sarcogyps calvus Red-headed Vulture	Nil	Nil	FD
Pavo cristatus- Indian Peafowl	3	15	FD
Neophron percnopterus Egyptian Vulture	Nil	1	FD

3.6.2.3 Mammals

Based on the present study (19 species) and the list of forest department, a total of 33 mammalian fauna is reported from the Mirzapur forest division. This study reported only three Schedule I (WPA -1972) and IUCN Red List species of mammalian fauna in the study area, while the forest department list had six species more as Schedule I, which was for the entire Mirzapur forest Division. However none of the species had any quantitative information. Common Leopard, Sloth Bear and Four Horned Antelope were recorded based on very few indirect evidences, that to only in the buffer zone. Only two scats of common leopard, one dropping, and one track of Sloth Bear and six pellet groups of Four Horned Antelope were recorded in the study area during this study that to in the forest area of buffer zone (**Table 3.32).** Conservation status of all the mammalian fauna is given in

Annexure 5.

Table 3.32: Status of Endangered (Schedule I) mammalian fauna - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Species Name	Project Study Area		Mirzapur Forest Division
		Core	Buffer	
1	*Gazella bennettii*- Indian Gazelle	-	-	FD
2	*Tetracerus quadricornis*-Four Horned Antelope		6 IE	FD
3	*Melursus ursinus*- Sloth Bear	-	2 IE (Sch I)	FD
4	*Canis lupus*- Wolf			FD
5	*Cuon alpinus*- Wild Dog			FD
6	*Panthera pardus*- Common Leopard		3 IE (Sch I)	FD
7	*Caracal caracal*-Caracal			FD
8	*Lutrogale perspicillata*-Smooth-coated Otter			FD
9	*Melivora capensis*-Honey Badger			FD

IE – Indirect Evidences, FD – Forest Department List

3.7. HABITAT ECOLOGY – STUDY AREA

Though the study area has been identified with nine land use patterns (**Table 2.1**), they have been grouped into four major habitat types such as: Forest (Dense forest, Degraded forest, Plantation forest) Agricultural land (agro-ecosystem/agriculture fallow land), wetlands (includes riverine habitats and Dams and Scrub land (Open waste land and scrub land) for the ecological study (**Table 3.1**).

3.7.1. Forest

The forest types within the study area fall under tropical dry deciduous and moist mixed deciduous forest. Forests of the study can be divided into four major types based on the domination of floral composition.

1. Fairly dense mixed forest dominated by bamboo plantation with *Zizyphus species (Zizyphus mauritiana). Bauhinia racemosa, Dalbergia sissoo, Cassia fistula and Holarrhena antidysenterica are other tree species scatterdly found in this forest.*

2. Open mixed forest dominated by *Acacia catechu* with Zizyphus. These forest patches are found in flat terrain. Other forest two types include *Lannea coromandelica and Boswellia serrata* dominated forests and mainly found on moderately undulating hillocks.

3. Riverine forest; this forest types found along the major river systems and mainly dominated by *Terminalia arjuna, Syzygium cumini, Terminalia belerica, Holoptelea integrifolia and Mitragyna parvifolia*

A total of 11 reserved forest area located within 10 km radius of the project site /study area

and their location details are given **Table 3.33 & Map 2.1)**.

Table 3.33. Details of Reserved forests located within 10 km radius of the project site: Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Name of RF	Distance from forest boundary	Direction
1	Danti RF	Adjacent to the project site	N
2	Barkachha RF	8.5 km	NW
3	Mirzapur RF	Adjacent	S
4	Sarson RF	5.5 km	SE
5	Malua RF	8.5 km	SW
6	Karaunda RF	5 km	SW
7	Patehra RF	5 km	SW
8	Bahuti RF	6.5 km	W
9	Newaria RF	10 km	SW
10	Nanuti RF	7 km	E
11	Golhanpur RF	6.5 km	E

3.7.2. Open scrubland

Open scrub land is one of the habitat types of the study area come under forest as well as revenue land. This scrub land is dominated by all the Zizyphus species with scattered tree species mainly dominated by stunted growth of *Butea monosperma, Wrightia tinctoria, Bauhinia racemosa, Balanites aegyptiaca and Aegle marmelos* are found scatterdly

3.7.3. Wetland/ river and streams

Aquatic habitat is concerned there three dam sites are located within 10 km radius of the project sites namely Upper Khajuri dam, Lower Khajuri dam and Kathua Bandh are located 4, 9 and 10 km distance, and west, North and East directions of the project site respectively (**Map 2.1**)

Added, three river systems namely Jamtlhwa river (2 km N), Pahiti river (4 km NE) and Jogidar River (2.2 km NE) flowing south to north cutting across the 10 km radius study area and join (Map 2.1). These, river systems are highly seasonal and therefore not supporting diverse aquatic fauna and flora. The perennial River Ganga located 17km in the NE of the project site.

3.7.4. Agriculture habitat

One of the major habitat types of the study area is Agriculture lands (agro-ecosystem) covers a total of 3837.21 ha of the area. This habitat identified 140 floral species with

adjacent fallow lands. Added, 39 species major, minor, fruit and vegetable crops reported form this habitat with 45 species of terrestrial birds.

3.8. ECOLOGICALLY SENSITIVE ECOSYSTEMS

All the 11 forests are located within the study area fall under Reserved forest category while none of the water bodies (dams and rivers) have been designated as important wetland habitat of the state and/or national. Added, the study area has not having any breeding and feeding grounds of aquatic avifauna. Except the above said habitat types with overall biodiversity of low to moderate level, the project study area do not have any Protected Areas such as: wildlife sanctuary, national park, biosphere reserve and tiger and elephant reserves within 10 km radius.

3.9. WILDLIFE CORRIDOR

Overall the study reported 19 species of mammalian faun during the study period within 10 km radius. The forest department list prepared for the entire Mirzapur forest division showed presence of 29 species and cumulative species list reached to 33 species. However, during the study the abundance status of faunal group showed low status with only 500 indirect evidences and 33 direct sightings with maximum of 16 nilgai (**Table 3.28**). This clearly indicates that, the forest area do not reported and larger group of faunal species and their regular movement cutting across the project site and within the study area to move between two forest ranges. Hence, no wildlife corridors exist within 10 km and well beyond the project study area. Some of the faunal species reported in study area are given in plate (**Plate 3,4 5,6 & 7**).

Plate 3. Herpetofauna reported in the project study area

	
Skittering Frog	**Indian Bull Frog**
	
Indian Garden Lizard	**Fan-Throated Lizard**
	
Bronze Grass Skink	**Common Keeled Grass Skink**
	
Leschenault's Lacerta	**Asian House gecko**

Plate 4. Terrestrial birds of the study area

	
Ashy-crowned Finch Lark	**Asian Pied Starling**
	
Greater Cocual	**Indian Roller**
	
Large grey Babbler	**Yellow footed Green Pigeon**
	
Yellow wattled Lapwing	**Long tailed Shrike**

Plate5. Aquatic birds of the study area

Bronge winged Jacana

Cattle Egret

Intermediate Egret

Lesser Whistling Duck

White Stork

Black wined Stilt

Indian Pond Heron

White-throated Kingfisher

Plate 6. Track and signs of some mammalian fauna reported in the project study area

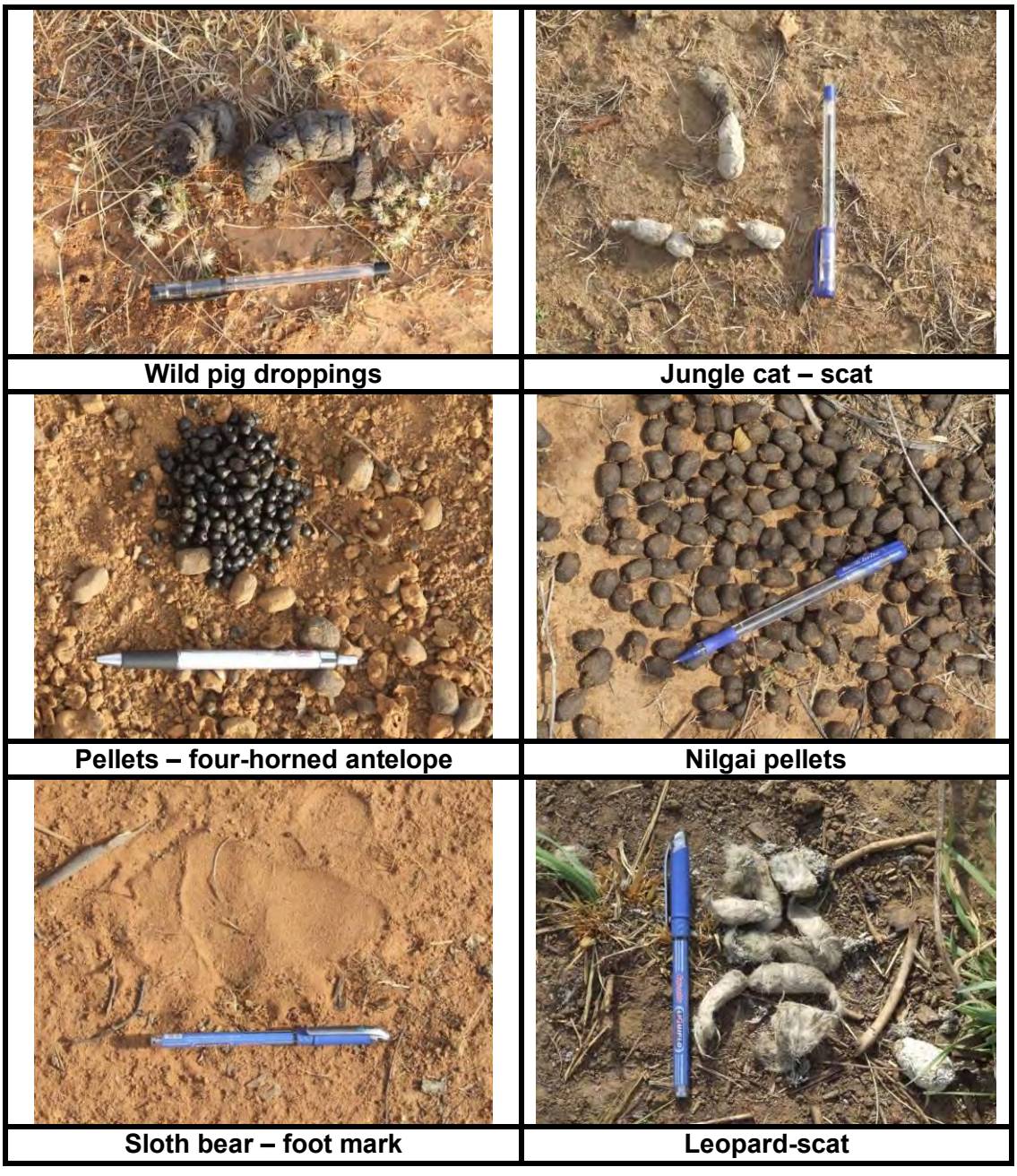
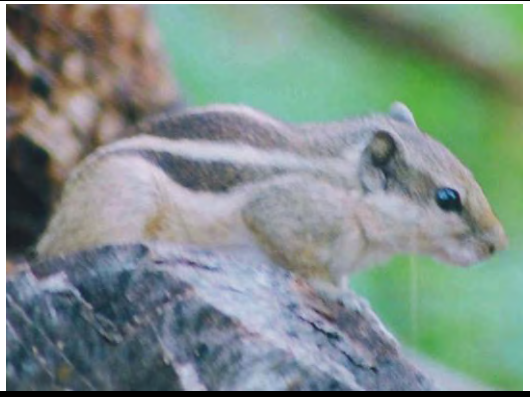


Plate 7 Mammalian fauna sighted in the study area

	
Common langurs	**Jackal**
	
Nilgai	**Five-striped Palm Squirrel**

Chapter 4. ECO-MANAGEMENT & WILDLIFE CONSERVATION PLAN

4.1 MANAGEMENT PLAN

One of the operating principals in Environmental Impact Assessment is to suggest Environmental Management Plan (EMP) in general and Conservation Plan for the threatened biota reported in the study area which is an appropriate follow-up process, involved monitoring, management, and evaluation that are based on the significance of potential effects. It also provides opportunity for making future improvements in project related activities. Further it is a follow up activity of the EIA study in order to improve the ecological and environmental integrity in and around the proposed project area.

4.2 ECO – MANAGEMENT

There are many scientific studies discussed the performance specific plant species at population and species level which can be related to pollution (Mansfield, 1976., Sanders 1976., Scholz, 1981 and Garsad and Rutter 1982). Therefore, plant species act as bio-monitoring agent to monitor the air environment as well as to keep and maintain the project environ healthy. The two areas of air pollution by gases and by dust need to be urgently attended to, using plants. Such treatments have numerous benefits, especially social and ecological aspects (Chapherkar 1994).

With the above understanding of the role of plant species as bio-filter to control air pollution and changes likely to occur in the ambient air quality of the area in and around the project, appropriate plant species (mainly tree species) have been suggested considering the area/site requirements and needed performance of specific species.

Under Eco-management Plan Three types of plantations have been suggested which include:

1. Greenbelt development along the boundary of the project site with wild tree species (refer Table 4.1)
2. Greenbelt development within the project site with common and wild tree species(refer Table 4.2)

3. Plantation for habitat improvement and to facilitate forage availability for major faunal species especially for the RET species of the project study area (refer Table 4.2, 4.3, 4.4)
4. Plantation for fodder resource development (refer Table 4.5)

4.2.1. Greenbelt - project boundary

In order to enhance and maintain the ambient air quality of project area during the construction and operational phase of the project the following list of wild tree species have been suggested to develop greenbelt along the boundary of the project site (**Table 4.1**).

Table 4.1: List of Wild Tree species suggested – Greenbelt along the boundary of the project site- Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Wild/Forest Tree species	Common Name	IVI RO		DC #	FR
			CZ	BZ		
1	*Acacia nilotica*	Babul			6.12	
2	*Aegle marmelos*	Bel, Bili Patra, Bili			18.9	*
3	*Cassia fistula*	Amaltas			23.03	*
4	*Dalbergia sissoo*	Shesham			17.02	
5	*Ficus benghalensis*	Gular/Pipal			7.72	*
6	*Ficus religiosa*	Pipal			12.94	*
7	*Madhuca indica*	Mahua		6		
8	*Syzygium cumini*	Jamun			14.39	*
9	*Acacia cathechu*	Khair,	3	4		
10	*Terminalia arjuna*	Arjun Sadad		7	30.54	
11	*Ficus mollis*		1	2		*
12	*Butea monosperma*	Kesudo	2		24.44	
13	*Holoptelea integrifolia*	Chilbil			35.01	
14	*Acacia leucophloea*	Shoe Babool		5		
15	*Flacourtia indica*		4			
16	*Bauhinia racemosa*	Kaliar	9			
17	*Zizyphus mauritiana*	Jherberi	5			*
18	*Lannea coromandelica*		8			
19	*Lagerstroemia parviflora*		6	8		
20	*Terminalia belerica*	Bahrai		1		
21	*Sterculia urens*		7			
22	*Tectona grandis*	Teak, Sagon			14.94	
23	*Albizia lebbeck*	Siris			18.3	
24	*Melia azedarch*	Bakani Nim			31.77	
25	*Boswellia serrata*			15		
26	*Pithecolobium dule*				19.21	*
	Total species		**13**		**14**	**8**

CZ-Core Zone, BZ-Buffer Zone. IVI RO – Important Value Index Rank Order,

DC- % of Dust control efficiency, FT-Fruit Trees, # Source-Anon

The list of plant species suggested includes the following criteria.

- **A total of 26 tree species suggested for greenbelt development of that 13 species selected based on the species secured more than 10% of IVI values because they are ecologicaly potential to show high survival and growth rate.**
- **This list also include 14 tree species which are potential to control dust emission and thereby maintain the ambient air quality of the area in and around the proposed project site.**
- ***Terminalia arjuna, Melia azedarch, Holoptelea integrifolia*, *Butea monosperma* and Cassia fistula are the tree species control dust emission more that 20% and therefore the project environment likely to have low dust pollution**
- **Some fruit trees (8 species) were in the selection list to attract specifically frugivore birds of the study area.**
- ***Terminalia arjuna and Boswellia serrate are* threatened plant species of the study area included in the list to improve the local population status.**

4.2.2. Greenbelt- Within Project site

The proposed project planned to have different structures like; power plant, godown, Coal yard, administrative premises, colony area, school, hospital or health centre etc. In order to improve the quality of ambient air quality and control other pollutions (gas and noise) and maintain the visual quality many tree species of wild, common and species of aesthetic values are suggested under this plantation program (**Table 4.2**)

Table 4.2. List tree species suggested to develop greenbelt – within the project site area

S.no.	Scientific Name	Common & Local Name	NC@	OGE@	%of DC #	Locations				
						1	2	3 &4	4	5
1	*Acacia nilotica (W)*	Babul,			6.12	*				
2	*Aegle marmelos (W)*	Bel,	*		18.9	*				
3	*Albizia lebbeck (W)*	Siris, Karo Sirish	*	+	18.3	*	*			
4	*Annona squamosa (C)*	Sugar apple, Jamfal			12.09			*	*	*
5	*Azardirachta indica (c)*	Neem	*	+	25.54	*	*	*	*	*
6	*Bauhinia variegata (W)*	Kanchnar			18.58	*	*	*		
7	*Butea monosperma (W)*	Kesudo	*		24.44	*	*			
8	*Cassia fistula (W)*	Amaltas			23.03	*	*	*	*	*
9	*Dalbergia sissoo (W)*	Shesham			17.02	*	*			
10	*Delonix regia (c)*	Gulmohar			18.05		*	*	*	*
11	*Diospyros melanoxylon (w)*	Thendu	*			*	*			

S.no.	Scientific Name	Common & Local Name	NC@	OGE@	%of DC #	Locations				
						1	2	3 &4	4	5
12	*Ficus benghalensis (C)*	Banyan, Vad	*		7.72		*	*	*	*
13	*Ficus recemosa (W)*	Gular	*			*				
14	*Ficus religiosa (C)*	Pipal	*	+	12.94	*	*	*	*	
15	*Hibiscus rosa- sinensis (c)*	Gurhal, Jasund			21.09			*	*	*
16	*Holoptelea integrifolia* (W)	Chilbil			35.01	*	*			
17	*Leucaena leucocephala (W)*	Shoe Babool, Liso bavar			11.24	*	*			
18	*Mangifera indica (C)*	Mango, Aam			12.25			*	*	*
19	*Manilkara zapota* (C)	Chikkoo			16.39			*	*	*
20	*Melia azedarch (W)*	Melia, Bakani Nim	*	+	31.77	*	*			
21	*Phoenix dactylifera (C)*	Khajoor	*	+	32.07		*	*		
22	*Polyalthia longifolia (C)*	Ashoka,	*	+	29.84		*	*	*	*
23	*Pongamia Pinnata (C)*		*					*	*	*
24	*Syzygium cumini (W)*	Jamun,	*		14.39	*	*	*	*	*
25	*Tamarindus indica L. (W)*		*			*				
26	*Tectona grandis (W)*	Teak, Sagon			14.94		*	*		
27	*Termanilia catappa (C)*	Desi Badam			30.12			*	*	*
28	*Terminalia arjuna (W)*	Arjun	*	+	30.54	*	*			
29	*Terminalia bellirica (W)*	Baharai	*			*				
	Total		16	7	24	**18**	**18**	**16**	**13**	**11**

@ CN –Control Noise level, OGE – Absorb Gas emission (+ So_2), Source of Plant Species: (Saxena 1991),
 # Source –Anon 2007 , Location: 1- Industrial or Plant areas, 2 –Roads, 3&4 Residential, 5-Schools, 6- Health centre

The list of plant species suggested includes the following criteria.

A total 29 tree species of were suggested under this greenery development programs keeping the proposed diverse structures likely to developed within the project area and they include 12 common and 17 wild species.

This cumulative list includes 24 species which performs the bio-filter role to control dust emission due to project activities, while 16 species control noise and 7 species absorb gas emission.

A total 0f 18 species each was suggested in and around the industrial areas and along the road sides to reduce all the pollution problems

Sixteen to 11 species were suggested to grow areas of office, school, residential and health centre which are common, fruit bearing and also produce colourful flowers to maintain the aesthetic and visual value of the area.

Cassia fistula (yellow), Delonix regia (Orange), Bauhinia variegata (purple), Hibiscus rosa-sinensis (Red) Pongamia Pinnata (pinkish) and Syzygium cumini (white) **are the species**

produce colourful flowers to improve the visual quality

***Annona squamosa, Ficus benghalensis, Ficus recemosa, Ficus religiosa, Mangifera indica, Manilkara zapota* are fruit bearing trees suggested in the areas of people live in**

Diverse and local species list suggested to increase the survival, growth rate and also provide habitat for local faunal species specifically avifauna, herpetofauna.

4.3. WILDLIFE CONSERVATION AND MANAGEMENT PLAN

The Welspun Energy UP Private Limited (WEUPPL), to cater growing energy needs of Uttar Pradesh, proposes to setup a Greenfield Coal based Thermal Power Plant (TPP) of 1320 MW (2x660 MW) capacity at DadriKhurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh, which is surrounded by Reserved Forest on all sides. This forest however is under different levels of degradation, which is mainly due to anthropogenic activities mainly due to the villages located within and outside the 10 km buffer zone of the proposed (TPP), who use this forest to cater part their livelihood needs. The survey conducted by Green Future Foundation during April and May 2012 revealed that the forest edges were comparatively more degraded and was sparse to open and mainly dominated by bushes of shrubs and stunted trees. Further, the remaining forest was dense to semi dense dominated by mixed deciduous forest with *Acacia cutachu* trees, bamboo (with already dead after flowering), *Acacia* and *Zizyphus oenphilia* climber (in the form of bushes) in most of the gentle to flat areas, while Butea monosperma was more in the moist rich areas with pure dry deciduous found only on the hill tops where *Boswellia serrata* and *Lannea coromendalica* were predominant.

The biodiversity in these forests are more towards the lower side with Nilgai being the most dominant species, indicating the degradedness of the forest. However, Common Leopard, Sloth Bear and Four-horned antelope, all three RET species, were found in these forests their numbers were found to be very low. Added, three wetlands Viz; Upper Khajuri Dam, Lower Khajuri Dam Location (LKD), and Kathua Bandh Location (KBD) falling within the buffer zone are presently the only perennial source of water, which are also habitat for wetland birds and other water depended flora and fauna.

With this being the scenario, the conservation plan is prepared taking all these into

consideration and mainly includes general plans for the betterment of the forest and wildlife. Habitat improvement of their habitat, specific plans for the RET species, mitigating man-bear conflict, which is presently very rare or very occasional. Added, enhancement of the forest resources along the fringes of the forest adjoining the most dependent villages and within their village boundary is very important mainly to reduce the pressure on the forest. This is very crucial as any conservation done in the forest would go waste unless the mainly reason for the degradation and loss is not addressed appropriately.

Conservation plan is much more than the preservation of certain plants and animal species. It is of high necessity for any landscape when it comes to preserving the wildlife or the biodiversity of that area, which governs the ecological functions. To this end based on the present biodiversity study especially the floral and faunal assessment of the core and buffer zones of the proposed Greenfield Coal based Thermal Power Plant (TPP) of Welspun Energy UP Private Limited (WEUPPL) to be setup at DadriKhurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh, the conservation plan is prepared for the betterment of the wildlife in the area, which includes both general and specific plans targeting the threatened species that were sighted or found to be present in the study landscape.

4.3.1. Leopard

The leopard (*Panthera pardus*), another vulnerable species (IUCN 2010), is the most adaptable and widely distributed among the big cats (Nowell and Jackson 1996). This species is known for the use of habitat edges and its ability to live close to human habitation (Seidensticker *et al*.1990). Leopard feed on a broad spectrum of prey, ranging from smallest rodent to a young buffalo (Qureshi and Advait 2006, Ahmed and Khan 2008 and Ramesh *et al*. 2009). Studies on feeding of leopard have shown that chital, sambar and common langur forms their major diet (Karanth and Sunquist 1995, Sankar and Johnsingh 2002, Ramesh *et al*. 2009 and Mondal *et al*. 2011).

Leopard, scats, in the study landscape was recorded from three locations mainly in stream/riverine habitats. Two scats were recorded along the Jogidari Nala cutting across the forest blocks 1 & 3 of Marihan Range (East to project site) and one scat along Khankardali nala of Bela block of Lalganj Range (south west of project site). However, leopards are adaptable to any type of habitat in and around wilderness areas, it is important

that sufficient prey or food is available in the forest. Though the study area supports good population of Nilgai and Wild pig which can be prey for leopard, as part of conservation plan for this predator, habitat protection and improvement, especially the food availability for both the leopard and the prey species, along with availability of water and salt licks are of priority.

However, many of the tree species used as food by the langurs and the ungulates were available, most of the regeneration and recruitment was low or stunted due to grazing and occasional fire (in some forest areas), that has led to low availability of fodder species in the area. So the nearby forest areas must be protected from fire in addition to improving the fodder availability in and around the high forest dependent villages so as to reduce the grazing pressure and its impact in the forest. Gap plantation and intensive plantation of food plants for major faunal species and also improve their habitat must be taken up in the RFs within the study area especially in the highly degraded parts with the consultation of local forest department. Gap plantation can be done in 10 to 15 locations in the degraded reserve forest areas covering one ha area in each plantation site.

4.3.1.1. Development of Grasslands/patches for prey species of leopard:

Even though the forest department list reported, Chital, Sambar, Indian Muntjac, Indian Gazelle and Four Horned Antelope no sightings and evidences of these species were recorded during this study, except for Sambar and Four Horned Antelope. Of these except for Sambar and Indian Muntjac, rest of the ungulates prefer open habitats with grass. Sambar diet includes large amount of browse in dry season to grass and herbaceous plants in the wet season.

In order to improve the prey species, the habitat improvement should involve developing grass patches in the areas that are open. List of some grass species reported in the study area are suggested for grassland development (**Table 4.3**). This should be done in a minimum of 25ha plots, and at least six such plots, mainly in the degraded patches away from the villages in different directions should be developed.

Table 4.3: List of Grass species suggested for developing grassland/patches

S.no.	Grass Species
1	*Apluda mutica* L.
2	*Cenchrus ciliaris* L.
3	*Cynodon dactylon* (L.) Pers.

4	*Desmostachya bipinnata* (L.) Stapf
5	*Dichanthium annulatum* (Forak.) Stapf
6	*Eragrostis ciliaris* L.
7	*Eragrostis Sp.*
8	*Heteropogon contortus* (L.) P.Beauv. ex.R. & S.
9	*Sporobolus coromandelianus* (Retz.) Kunth
10	*Sporobolus sp*

4.3.1.2 Bamboo Plantation /forest

The forest habitat within 10 km radius of the study area is dominated by bamboo plantation with thickets of *Zizyphus species.* In most of the cases, bamboo thickets attained maturity and flowered and they are in drying stage. In order to improve the habitat quality it is suggested to remove the dead thickets and do re-plantation of bamboo which provide habitat for some of mammalian fauna wild pig, muntjac, sambar which are prey species of leopard and to enhance the associated biodiversity of this bamboo forest which dominated the study area .

4.3.1.3. Population status assessment

Even though the forest department list showed occurrence of many ungulate species like; chital, sambar, Indian Muntjac, Indian Gazelle, no direct sightings and indirect evidences of these species were reported in during the study in the forest areas.

Therefore, along with habitat protection and improvement, it is highly essential to re-assess the status of leopard population and other major prey species especially ungulates within 10 km radius of the project site.

Regular monitoring of the leopard and its prey population using comparable ecological methods is essential and is one of the other most important actions for leopard conservation.

This survey need to be carried out with the wildlife experts and the state forest department to identify the areas or forest needed all the conservation and management interventions which are highly crucial.

4.3.2. Four-horned Antelope

This is one of the smallest Asian bovids and is endemic peninsular India and small parts of low lands in Nepal. Sexually dimorphic Boselophid of small stature with only males having two anterior and two posterior smooth small horns unique among wild horned mammals. This Tetracerus is monotypic (Leslie and Sharma 2009). They have also mentioned that this

antelope prefers dry deciduous forested habitat and hilly terrain and are secretive.

Rice (1990) reported that Four-horned Antelope occurs in low densities and small population sizes. Further, this small bovid prefers dry deciduous forest especially the short grass habitat associated with stunted and sparse tree growth know as 'tree savanna' than the dry thorn forest (Baskaran *et al.* 2011). They have also mentioned that this antelope is a mixed feeder and the major diet of is grass, followed by browse biomass of herbs and shrubs, and leaves and fruits of few trees.

This being a vulnerable species (IUCN Red List 2011.12) and listed in Schedule I of the Wildlife Protection Act (1972), was recorded in six locations, of that two locations in the open scrub / wasteland along the boundary of the core zone, and four locations in the forests along the rivers during this study. This clearly shows that the animal tends to stay in vegetated areas in the study area. Since forests in most parts of the study area is degraded or disturbed, specific conservation plans to improve the habitat and food availability some shrub species are suggested for their long term existence.

It is important that the habitat needs to have short to medium size grasses, with herbs, shrubs and trees of stunted nature. Care must be taken that only species that are locally available and was said to be present earlier in the landscape should be planted as part of habitat improvement and increasing the food availability.

In addition to 10 grass species suggested (**Table 4.1**), a total of 11 woody shrub species are also suggested to grow in the degraded forest areas to enhance the food availability for ungulates. This list include the species secured more than 10% of RVI values of Core zone and top 10 species of buffer zone of the study area (**Table 4.4**).

These species can also provide food resources for some of the other ungulate species reported by the forest department in addition to four-horned antelope reported during this survey in the study area.

Table 4.4: List of woody shrub species suggested under habitat improvement program.

S.no.	Common Woody Shrub species	Core Zone				Buffer Zone				SPS
		RF	RDN	RVI	RO	RF	RDN	RVI	RO	
1	*Capparis sepiaria*					4.58	2.52	7.10	8	*
2	*Capparis zeylanica*					4.58	1.57	6.15	10	*
3	*Carissa congesta*	5.77	7.08	12.84	6	12.98	15.59	28.57	2	*
4	*Cocculus hirsutus*	15.38	16.51	31.89	3	10.69	9.29	19.98	3	*
5	*Cocculus pendulus*					3.82	1.57	5.39	11	*
6	*Helicteres isora*					3.82	6.30	10.12	6	*

7	*Securine gavirosa*					7.63	4.09	11.73	5	*
	Waltheria indica	7.69	6.60	14.30	5	2.29	1.26	3.55	12	*
9	*Zizyphus nummularia*	19.23	9.43	28.66	4	7.63	8.82	16.45	4	*
10	*Zizyphus oenoplia*	21.15	23.11	44.27	2	3.05	3.31	6.36	9	*
11	*Zizyphus xylopyrus*	19.23	30.66	49.89	1	25.95	36.54	62.49	1	*
Total species		**6**				**11**				**11**

4.3.3. Sloth Bear

Sloth bear (*Melursus ursinus*), an omnivore and vulnerable species (IUCN 2010), play a very vital ecological role in the form of seed dispersal (Willson 1993, Sreekumar and Balakrishnan 2002), and aid in improving the diversity of floral species in the forest. Their principal diet is fruits (Bhaskaran *et al.* 1997)**,** followed by termites and ants, in addition to honey. They climb on the tree and feed on fruit and honey, picking fruits fallen on the ground and digging for the termites and ants.

The signs of sloth bear during this study were recorded at two different locations. Of these, one track was in the forest, while the second, a dropping was found in the riverine forest (Pahiti Nadi) adjacent to the thorn mixed forest both in the Sirso forest block 3 of Marihan Range located in the buffer zone. The dropping revealed that it had eaten termites as it had termite and mud. The forest were the sloth bear signs were seen and other forest areas `nearby revealed that the fruit availability, which the major diet, was low in the forest. However, now there is very less or occasional conflict, it could become a problem, so action plans needs to be developed to address this issue. However, the only one dropping was recorded, the remains of termites (fed mostly during monsoon), it also shows that the availability of the fruits was low.

The specific conservation action needed is improving the habitat through restoration and planting of fruiting trees that are eaten by sloth bear in the forest that would enhance the food availability for this species and also reduce the conflict with humans. Some of the fruit tree species have been suggested to grow in the degraded forest areas to increase the food resources for sloth bear (**Table 4.5**)

Though this list includes 24 tree species, of that 14 species would improve the availability food resources for sloth bear and also support some of the ungulate species reported/said to occur in the forest areas.

In addition some of the shrub species suggested: *Zizyphus nummularia, Zizyphus oenoplia, Zizyphus xylopyrus, Capparis sepiaria, Carissa* congesta are also form food species of sloth bear (especially *Zizyphus* spp.) and other ungulate of the project area.

Table 4.5: List of tree species suggested under habitat improvement program for sloth bear

S.no.	Scientific name	Faunal Species				
		SB	CL	NL	FH	CH
1	*Acacia cathechu*		*	*		
2	*Acacia nilotica*			*		
3	*Aegle marmelos*	*				
4	*Albizia lebbeck*		*			*
5	*Butea monosperma*			*		
6	*Cassia fistula*	*				
7	*Dalbergia sissoo*		*			
8	*Diospyros melanoxylon*	*			*	
9	*Emblica officinalis*	*	*		*	
10	*Ficus benghalensis SB*	*	*			*
11	*Ficus mollis*	*				
12	*Ficus racemosa* SB	*	*			
13	*Ficus religiosa* SB	*	*			
14	*Flacourtia indica*	*				
15	*Holoptelea integrifolia*		*			
16	*Lannea coromandelica* CL		*			
17	*Madhuca indica* SB	*	*	*	*	*
18	*Mangifera indica*	*	*			
19	*Syzygium cumini SB*	*	*			*
20	*Syzygium heyneanum SB*	*	*			
21	*Tectona grandis*		*			
22	*Terminalia arjuna CL*		*			
23	*Terminalia bellirica CL*		*			
24	*Zizyphus mauritiana*	*	*	*	*	
	Total	14	17	5	4	4

SB-Sloth bear, CL-Common Langur, NL – Nilgai, FH- Four-horned antelope, CH – Chital

4.3.4. Long-billed Vulture

However, Long-billed vulture, White-rumped Vulture, Red-headed Vulture (all critically endangered) and Egyptian Vulture (endangered) were listed by the Mirzapur forest division, during this study only Egyptian Vulture was sighted once in the buffer zone. Once all these species were found common in India have presently reach to the stage of extinction mainly due to the use of the Diclofenac, a pain killer used to treat livestock which affected these vulture populations since they feed on dead livestock. Habitat loss in the form of removal of forest with tall and large trees and mining the rocks in the areas with rocky cliffs where they nest is another threat for the population decline.

As said above strict protection must be given to the rocky area especially cliffs and ledges, rocky ledges along the rivers and keep them out from mining in addition to restricting human interference in these sites, as these are probably good nesting and roosting habitats.

Secondly, it is very important to create awareness amongst local veterinary doctors and

the livestock keeper mainly to avoid use of Diclofenac which kills the vultures when they feed on livestock carcass. This is because even after banning of this drug in India, it is found that human Diclofenac is being used on livestock and therefore systematic awareness to be provided to the chemists in the area.

Thirdly, monitoring of the nesting sites and the vulture population numbers are very important during October to May, as these species nest during this period.

- Finally as part of habitat improvement, large sized tree species such as *Ficus benghalensis, F. religiosa, F. recemosa, Terminalia arjuna, T. tomentosa, T. bellirica* and other large sized species can be plant in patches as well as gap plantation keeping in mind the habitat conditions and requirement for other wildlife in the area, that is all open or semi dense forest should not be planted with trees.

4.3.5. Indian Peafowl

The Indian Peafowl (*Pava cristatus*) is an omnivore and listed in Schedule I of IWPA (1972). The Indian Peafowl *(Pavo cristatus)* has been an integral part of the people of the India and their culture for centuries. From religion and mythology to civilization and socio-culture, the Indian Peafowl occupies an important place in the lives of the people. In addition to this, the Indian Peafowl is well recognized for its ecological and aesthetical values, and hence aptly declared as the 'National Bird' of India in the year 1963 . The Indian Peafowl has been widely distributed throughout India except for the Himalayan ranges, north-east India and the Islands (Ali & Ripley 1987). Although the Indian peafowl is widely distributed and locally abundant or fairly common in some areas, the present population status of this species is only speculative and many of its former contiguous range has become fragmented and discontinuous (Choudhury and Sathyakumar 2009).

It is a bird of scrub jungles and forest edges, showing affinity to moist and dry deciduous and semiarid biomes. It is also found in the agriculture fields, along streams with good vegetation and close to human habitations in a semi-feral condition (Johnsgard 1986). It generally prefers a habitat mosaic of scrub and open areas, with adequate sites for dust bathing. Dust bathing is important as this bird has to condition its feathers and remove feather-degrading bacteria and other external parasites (Choudhury and Sathyakumar 2007). It roosts on trees and also uses tall buildings where trees are scarce (Birdlife International 2000).

- During this study only 18 Peafowls was sighted within the study area. However being a schedule - I species of IWPA 1972, it is very crucial to maintain and protect the open scrub habitats mainly through keeping it out from mining, encroachment or expansion

for agriculture and further degradation of the habitat as part of its conservation.

- As part of habitat improvement in the form of increasing the availability of roosting trees, it is important to plant tree species that are tall and with dense branching with good cover like *Ficus benghalensis, F. religiosa* and other locally found tall growing species in additions to opening up spaces by way of uprooting the *Lantana camara* in patches and also creating scrub forest by planting local shrub species.
- Educate and create awareness among local people on the significance of this species and its role as a pest controller, why the roosting trees in the area should not be lopped and need for the proper protection of this species especially during breeding as they are ground nesting birds and its habitat.
- Monitoring of the Peafowl population and its habitat is also very crucial.

4.4. HABITAT QUALITY IMPROVEMENT

4.4.1. Developing Check dams

There are three dams (Upper Khajuri Dam, Lower Khajuri Dam and Kathua Bandh) located in and around the study area, and though many rivers and streams are cutting across the study area from north to south, they are highly seasonal and water availability in most of the forest habitats/blocks are totally nil during summer season. Hence, it is suggested that a total of 12 check dams need to constructed across the streams/rivers passing through four reserve forest areas located in the study area (Table 4.6). As suggested the sites should be identified along the major streams/nullahs and construct check dams which would facilitate water availability for all the major faunal species of the study area.

Table 4.6: Reserve Forests identified for the construction of the Check Dams

No	Area	Number of check dams
1	Danti Reserve forest	3
2	Dadhiram Bamboo forest	3
3	Sarson Reserve forest	3
4	Bela Bamboo forest	3

4.4.2. Developing Water holes:

In addition, developing/creating water holes at strategic location in different forest blocks in the study area is suggested. It is very essential to develop small water holes especially in Lalganj and Marihan Ranges where sightings and evidences of more mammalian fauna reported.

Development of additional water resources likely to improve some of the other faunal groups like: amphibians, other Schedule I reptilian fauna; and Indian Flapshell Turtle reported in the study area.

As part of this six water holes are suggested, three each in the Lalgamj and Marihan Ranges and these should be filled with water through tankers frequently during summer and other periods of unavailability of water.

4.4.3. Salt Licks

Requirement of salt is very important for most wildlife, which they often meet from natural salt licks available in the forests, but during the survey there were no such salt licks present in the forest area. So artificial salt licks should be preferably made in the forest near the water holes, where watch and ward is possible to prevent poaching, as these are most vulnerable sites to poaching. This will help these animals and other wildlife to confine in the forest away from the villages.

4.4.4. Protection

It is very important to protect the forest from biotic interference (cutting, lopping, encroachments, expansion of agriculture lands, and other negative influence) caused mainly by the local population. However the forest department is well equipped and with full-fledged protection strategy in place, the project can complement the forest protection activities including a list of duties in the code of conduct of the project employees and more specifically the security guards in stopping and reporting the illegal activities. Provision of communicating equipment for this purpose would also be very important. Capacity building program on protection would be of high significance.

4.4.5. Forest Fire Protection Plan

This being a tropical forest with dry deciduous and thorn forest type, it is prone to fire each year between mid February to June (until onset of rains). Fire lines are to be cleared around the project area and also along the forest boundaries, in addition to clearing along the roads, footpaths and nullahs to prevent fire.

The forest department identified some areas in Marihan Rage which are prone to frequent

fire and prepared forest fire map and therefore the above said management plans need to be implemented in those areas. In addition, it is suggested to develop watch towers to monitor fire incidences.

4.4.6. Anti-Poaching Plan

Poaching being one of the causes for depletion of wildlife in general, it is necessary to improve enforcement and create awareness among the people for eliminating poaching /hunting, which is present almost nil or very low, and help in improving the status of the wildlife and its habitat. Towards this end the protection staff has to be strengthened through employing more people (3-4 persons). They along with the forest staff should be provided with appropriate equipment including the anti-poaching kit at the project cost. They should help to prevent poaching and illicit felling after being trained appropriately.

4.4.7. Development of Wetland habitat

Among the three dam sites, the larger one Upper Khajuri dam seems to be a potential wetland habitat of the study area. Since the study was carried out during summer, it had only 25% water and supported 30 species of wetland birds. The reservoir covers large extent of area it can support diverse wetland species with good population (**Plate**). Therefore it has been suggested to develop this dam site as potential wetland habitat of the area. The forest department should have stake to implement the following suggestion with the joint venture of the Irrigation department:

The peripheral area of the dam site need to be planted with larger tree species *Ficus benghalensis*, *Ficus religiosa, Syzygium cumini, Mangifera indica, Holoptelea integrifolia*, *Albizia lebbeck*, *Derris indica*, *Azadirachta indica* that can provide habitat for perching and nesting site for some of the aquatic birds species.

The reservoir area need to be developed few (four to five) stone mounds and dead tree shape concrete structures in the middle which can act as perching/resting as well as basking sites for some ducks and cormorants. This would also facilitate for clear sighting of birds by the local visitors and easy counting of birds by professional bird watches visit this wetland.

Two to three watch towers are suggested to construct along the south, east and west sides of the boundary of the reservoir area which can facilitate the tourists and bird watchers to observe birds and to take photograph and bird count.

The forest depart can develop interpretation centre close to dam site with the information

and visuals (photos) of the common birds found in the wetland, breeding birds, migratory birds and species of conservation significance.

4.5. Mitigation of Human – Animal Conflict

4.5.1 *Eco-Education and awareness Generation*

The project should take up widespread awareness program to sensitize the locals through multimedia (slide shows, films, street plays) on relevant subjects like Diclophenac and its dreadful effect on vulture species and complete stopping of its use, general conservation of biodiversity and their benefits to mankind, significance of different species of animals and plants more specifically the species of conservation significance and also on how to live in harmony with the wildlife in the area.

Conduct Panchayat workshops, school programs and events at the weekly markets using eco-educational packages, which would show the locals the interdependence of nature for survival and development along with instilling them a feeling of love and respect for the flora and fauna. Villagers should be made aware that the wildlife should not be disturbed in the forest during any time of the day.

4.5.2. Light

Since the animals generally enter the fields in the night and cause damage to the property, as they are not visible in the darkness and chance of conflict increases, lights are necessary along the boundary of the villages to reduce the conflicts. It is suggested to provide eco-friendly solar lights in the villages where the problems are very high and frequent.

The project proponent must provide funds and take up all the above mentioned initiatives with the help of the forest department and a subject specialist. All these planning needs to be done after an appropriate survey of the area based on which sites and implementation plans can be developed. All these would be basically planned, implemented and monitored by a specific committee.

4.5.3. Project labour force and increasing pressure on the forest resources

The proposed project activities needed larger labour force for non-technical activities. These, labours may depend on the forest area for their stay (land) and fuel wood requirement and construction materials (small poles) for temporary sheds. The sudden influx

of larger labour forces expected to cut of small poles from the forest area for the construction of temporary sheds and fuel wood demand and they may also involve in illegal hunting of animals

Due to the above said likely impact it is suggested that, the project proponent should provide all the basic requirement like: accommodation, fuel resources for their day to day requirements, portable water.

The project proponent should give very strict instruction to the outside labours working in the project related activities should not involved in any illegal cutting of trees from the nearby forest areas and hunting of animals.

4.6 Management for forest resource dependency

4.6.1. Development of energy resources

One of the major problems identified in the forest areas adjacent to the project site is degradation of forest due to severe wood cutting problems for fuel wood and fodder resources and therefore these issues need to be addressed under conservation and management plan. With the concept being that conservation of RET species and enhancement of the forest resource around the highly dependent villages would preserve a larger ecological system and landscape, thus providing safety to all other biodiversity or flora and fauna surviving within it.

- In order to minimize the fuel wood cutting pressure which degrade forest cover and impact the associated faunal biodiversity, it is suggested to develop energy resources to replace the fuel wood requirement.

- The villagers fall under BPL and fully depend on forest resources for fuel wood should be identified and provided energy efficiency smokeless chullas and solar cooker.

- Those who are having livestock should be trained and bring under the practice of development of biogas and use to reduce the fuel wood cutting from the nearby forest areas.

4.6.2. Development of Fodder Resources

- Local villagers cut trees from the forest areas and also graze their livestock which would reduce the food availability for the wildlife and impact overall biodiversity of the local forest areas. Therefore it is suggested to grow fodder trees in the close vicinity of the villages which depend on the forest resources to meet their fodder requirement.

- It is suggested to develop immediately fodder grass plots within the village Gaucher land (land allotted for grazing) to reduce the grazing pressure in the forests.

- These grass plots should be developed with the grass species which are highly nutritive and locally available with the consultation of local villagers especially livestock keepers.

- Simultaneously, it is suggested to develop fodder plantation within the village waste land or along the agriculture hedges to minimize the lopping pressure in the forest area.

- Since it is essential to allow the plantation to develop, in the initial five years the villagers should depend on the grass fodder and agriculture residues to feed their livestock.

- Both the fodder resources suggested to develop need to be used sustainably under the management of Village Fodder Committee - VFC.

- The following are the tree species suggested to develop under fodder plantation which are having high growth rate and high fodder values and grow locally (**Table 4.6.**)

- Added the fodder plantation likely to increase the vegetation cover locally and expected to support local faunal biodiversity

- These species are wild and common species, selected primarily based on the fodder value above five according to Hocking 1993. Among the species except *Boswellia serrata* and *Tamarindus indica* rests of the species having growth rate value of more

than five.

- Though, except five species having lesser than five value of fuel efficiency, rest of the species are good for fuel wood. However, these species can be extracted sustainably for fuel wood provided if they were grown under this program within their agriculture hedges. This can be an additional management option to reduce wood cutting pressure in the forest area for fuel wood.

Table 4.6: List of tree species suggested to grow under fodder plantation

S.no.	Scientific Name	Local Name	Fodder value *	Growth rate*	Fuel value*
1	*Acacia cathechu*	Khair	5	5	6
2	*Acacia nilotica*	Babul	7	6	10
3	*Azadirachta indica* A. Juss.	Neem	6	6	6
4	*Balanites aegyptiaca*	Hingu. Hingot	6	6	4
5	*Boswellia serrata*		5	4	6
6	*Derris indica*		6	6	7
7	*Ficus benghalensis*	Bargad	6	7	4
8	*Ficus religiosa*	Pipal	7	8	4
9	*Pithecellobium dulce*	Vilayati iimli	8	8	5
10	*Syzygium cumini*	Jamun	7	6	7
11	*Tamarindus indica*	Imli	8	2	8
12	*Wrightia tinctoria*	Mitha indrajau	5	5	4
13	*Zizyphus mauritiana*	Baer	6	6	8
14	Zizyphus nummularia	Jhadiabar	8	7	3

*** Plant list sources; Hocking 1993**

4.7 Social Surveys:

Before starting the project or sanctioning the budget for the conservation activities there is a need to carry out social survey to assess the status of forest resources dependency by the local villagers. So that actual data can be collected and collated on species of use for the locals (e.g. fuel-wood species, fodder species and other facilities required- small wood or poles for construction of fencing, gate and cattle sheds etc) Therefore a questioner / social survey need to be carried out in the villagers located within the boundary of the forest areas to exactly identify the areas where the above said management plans need to be implemented.

4.8. MONITORING OF CONSERVATION AND MANAGEMENT ACTION PLANS

The above suggested all the conservation and management plans would be developed and implemented by a different stakeholder's committee that would be headed by the DFO Mirzapur Forest Division. The other members of the committee include DFO (wildlife),

Mirzapur / representative; CEO of Mirzapur block, Project representative, one subject specialist, one NGO working with local people, one NGO working on Wildlife in the area and two representatives from local villages (it would be rotational with two villages getting to represent every year. This committee will be in charge of all issues related to conservation and their implementation, including 25% to 30% or entire fund management along with regular monitoring from the planning, implementing and long term monitoring. The finacial budget/ forecast for the Wildlife Conservation and Eco- Management Plan is detailed in the table (**Table 4.7**).

Conservation Plan

Endorsed By

Signature:

Divisional Forest Officer, Mirzapur, UP.

Approved by

Signature:

PCCF Wildlife, UP State Forest Department,

Lucknow, UP.

Table 4.7: Financial Forecast (in lakhs) for the Wildlife Conservation and Eco-Management Plan

No	Activity	Year wise fund Requirement (in lakhs)										Modified Final
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
1	**Protection**											
1a	**Anti-poaching & Protection**											
A	Four Temporary Guards @ Rs.4500/- + Rs.500 travel per persons x 4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	24.00
b	Anti-poaching Kit ,Wireless etc	2.0	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	03.30
	Sub Total (1a)	***4.4***	***2.5***	***2.5***	***2.5***	***2.5***	***2.9***	***2.5***	***2.5***	***2.5***	***2.5***	***27.30***
1b	**Fire Protection**											
a	Clearance	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.0
b	Wages of Fire Watchers @ Rs.4000 x 5 months x 2 nos. x 10 yrs	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.0
c	Cost of Fire Fighting Equipment	0.5	-	-	0.5	-	-	0.5	-	-	0.5	2.00
d	Training & Drill	0.3	-	-	0.3	-	-	0.3	-	-	0.3	1.20
e	Cost of one Watch Tower & maintenance	3.0	-	-	0.2	-	-	0.2	-	-	0.2	3.60
	Sub Total (1b)	***4.7***	***0.9***	***0.9***	***1.9***	***0.9***	***0.9***	***1.9***	***0.9***	***0.9***	***1.9***	***15.8***
	Total (1a+1b)	***9.1***	***3.4***	***3.4***	***4.4***	***3.4***	***3.8***	***4.4***	***3.4***	***3.4***	***4.4***	***43.10***
2	**Habitat Improvement**											
2a	**Nursery**											
	Development & Maintenance of Nursery	4.5	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	11.25
	Sub Total	***4.5***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***11.25***
2b	**Water Conservation**											
a	Game tank / water holes 3 Nos. @ Rs.80,000 each & Maintenance	2.4	-	-	0.3	-	-	0.3	-	-	0.3	3.30
b	Check- Dams 8 Nos. @ Rs.1.25 lakh each & Maintenance	10.0	-	-	0.75	-	-	0.75	-	-	0.75	12.25
	Sub Total	***12.4***	***-***	***-***	***1.05***	***-***	***-***	***1.05***	***-***	***-***	***1.05***	***15.55***
2c	**Food Availability**											
a	Improvement of vegetation - habitat & Food by RDF method with gap plantation in RF 50 ha @ Rs.40,000/- per ha	20.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	25.00
b	Creation & Maintenance of Meadows (Grassland) 5 plots each 25 ha @ Rs.1 lakh per plot	5.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	9.50
	Sub Total	***25.0***	***1.5***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***34.50***
2d	**Salt Licks**											

No	Activity	Year wise fund Requirement (in lakhs)										Modified Final
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
a	Creation of artificial Salt Lick near meadows & water holes	1.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.80
	Sub Total	***1.0***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***2.80***
	Total (2a+2b+2c+2d)	***42.9***	***2.45***	***1.95***	***3.0***	***1.95***	***1.95***	***3.0***	***1.95***	***1.95***	***3.0***	***64.10***
3	**Man -animal Conflict**											
a	Solar lamps 20 Nos. & its Maintenance (5 lamps per village for 4 village with high conflict) @ Rs.6000/- per lamp	1.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	3.0
b	Corpus Fund	8.0	-	-	-	-	-	-	-	-	-	8.0
	Sub Total & Total (3a +3b)	***9.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***11.00***
4	**Livelihood Development, Monitoring and Capacity Building**											
a	Eco-development Support FD,BDO & VAS (Livelihood development -fuel & fodder plots) -Four most Forest dependent villages	8.0	1.0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	15
b	Incidental Charges of the Monitoring Committee	0.75	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	3.45
c	Capacity Building / Skill Development training	2.0			1.0			1.0			1.0	5.00
	Sub Total & Total (4)	***10.75***	***1.30***	***1.05***	***2.05***	***1.05***	***1.05***	***2.05***	***1.05***	***1.05***	***2.05***	***23.45***
5	**Awareness & Education -Biodiversity Significance & Sustainable Use of Resource**											
a	School Level	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.0
b	Village Level	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.5
c	Gram Panchayat Level & Vetenary doctors, Chemists, Livestock keepers & Project Staff, Security guards	8.0	-	-	-	-	-	-	-	-	-	8.0
	Sub Total & Total (5)	***9.5***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***18.50***
6	**Wetland (habitat) Development**											
a	Mounds (4/3 Nos) & Artificial Dead Tree (4/3 Nos) (RCC)	4.5	-	-	-	-	-	-	-	-	-	4.5
b	Two Watch Towers Construction & Maintenance	5.0	-	-	-	0.5	-	-	-	0.5	-	6.0
c	Interpretation Centre Development & Maintenance	4.0	-	-	-	-	0.5	-	-	-	-	4.5
	Sub Total & Total (6)	***13.5***	***-***	***-***	***-***	***0.5***	***0.5***	***-***	***-***	***0.5***	***-***	***15.00***
7	**Research & Monitoring - Wildlife (Terrestrial and Wetland)**											
a	Population Status Assessment once in a year (FD) & Overall (FD& Wildlife Experts)	3.0	-	-	2.0	-	-	2.0	-	-	2.0	9.0

No	Activity	Year wise fund Requirement (in lakhs)										Modified Final
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
	Sub Total & Total (7)	*3.0*			*2.0*			*2.0*			*2.0*	*9.00*
	Grand Total (1+2+3+4+5+6+7)	97.95	08.35	07.60	12.65	08.10	08.50	12.65	07.60	08.10	12.65	184.15

Finacial Budget Endorsed by

Signature:

Divisional Forest Officer
Mirzapur Forest Division
UP Forest Department
Mirzapur

Finacial Budget Approved by

Signature:

PCCF Wildlife
UP State Forest Department
Lucknow

Chapter 5 – REFERENCE

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6. Annexures

Annexure 1. Overall status of Floral species - Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttrapradesh

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
1	**Acanthaceae**											
1	*Andrographis paniculata* Nees	Kalmegh	Herb	—		+		+				**
2	*Asteracantha longifolia* Nees	Talmakhana	Herb	—						+		**
3	*Blepharis repens* (Vahl) Roth		Herb	—	3			1	25	5	34	**
4	*Dipteracanthus patulus* (Jacq.) Nees		Herb	—						4	4	**
5	*Justicia spp.*		Herb	—			4			2	6	**
6	*Lepidagathis trinervis* Wall.		Herb	—		6		62	28	2	98	**
7	*Peristrophe bicalyculata* (Retz.) Nees	Atrilal , Chirchiri	Herb	—		3	35	8		16	61	**
2	**Agavaceae**											**
8	*Agave americana* L.	Hathiya chinghar, Rambans	Shrub	—			3				3	**
3	**Alangiaceae**											
9	*Alangium salvifolium* (L. f.) Wang.		Tree	—			2			12	14	**
4	**Alismataceae**											
10	*Sagittaria sagittifolia* L.,		Herb	—						+		**
5	**Amaranthaceae**											
11	*Achyranthes aspera* L.	Lather	Herb	—			29			7	36	**
12	*Amaranthus spinosus* L.	kateeli chaurai	Herb	—	+		+					**
13	*Amaranthus viridis* L.		Herb	—			3				3	**
14	*Celosia argentea* L.		Herb	—	2	9		2			13	**
15	*Digera muricata* (L.) Mart.		Herb	—			2				2	**
16	*Gomphrena globosa* L.		Herb	—						3	3	**
6	**Anacardiaceae**											
17	*Buchanania lanzan* Spreng.	Chiraunji	Tree	FD			+					FD*
18	*Lannea coromandelica* (Houtt.)		Tree	FD		8		5			13	FD*
19	*Mangifera indica* L.	Ama	Tree	FD			21				21	FD*
7	**Annonaceae**											
20	*Annona squamosa* L.	Shareefa	Small Tree	—	+	+				+		**
21	*Polyalthia longifolia* (Sonn.) Thw.	Ashok	Tree	—			1				1	**
8	**Apiaceae**											
22	*Daucus carota* L.	Gajar	Herb	—			+					**
23	*Foeniculum vulgare* Mill.	Saunf	Herb	—			+					**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
9	**Apocynaceae**											
24	*Alstonia scholaris* (L.) R. Br.	Saptaparni	Tree	—			+	+				**
25	*Carissa spinarum* L.		Shrub	FD	15		3	52	20	24	114	FD*
26	*Holarrhena antidysenterica* (Heyne ex Roth) Wall.	Kutaj	Tree	FD				62	2	20	84	FD*
27	*Ichnocarpus frutescens* (L.) R.Br.		Climber	FD		2		3			5	FD*
28	*Thevetia peruviana* (Pers.) Merr.	Pila Kaner	Shrub	—			+					**
29	*Wrightia tinctoria* R. Br.		Tree	—		1		5			6	**
10	**Araceae**											
30	*Amorphophallus campanulatus* (Roxb.) Bl. Ex Decne.	Sooran	Herb	—						+		**
11	**Arecaceae**											
31	*Borassus flabellifer* L.		Tree	—			+					**
32	*Caryota urens* L.		Tree	—			+					**
33	*Cocos nucifera* L.	Narial	Tree				+					**
34	*Phoenix humilis* L.		Tree	FD						2	2	FD*
12	**Asclepiadaceae**											
35	*Calotropis gigantea* (L.) R. Br.		Shrub	—	+		+					**
36	*Calotropis procera* (Ait.) R. Br.	Madar	Shrub	FD	1		2			2	5	FD*
37	*Telosma pallida* (Roxb.) Craib	Kusiyari	Climber	—		+		8	14	6	28	**
13	**Asteraceae**											
38	*Echinops echinatus* Roxb.		Under Shrub	FD					3	5	8	FD*
39	*Eclipta prostrata* (L.) L. Mant.		Herb	—						4	4	**
40	*Launaea procumbens* (Roxb.) Ram. & Raj.		Herb	—			7		2	4	13	**
41	*Oligochaeta ramosa* (Roxb.) Wagenitz		Herb	—			1				1	**
42	*Parthenium hysterophorus* L.	Gajar Ghas	Herb	—		8	67			19	94	**
43	*Sphacranthus indicus* L.	Mundi	Herb	—						+		**
44	*Tridax procumbensi* L.	Phulni	Herb	—	1		2	26	69	53	151	**
45	*Vernonia cinerea* (L.) Less.	Sahadaiya	Herb	—	15		24	82	122	60	303	**
46	*Xanthium strumarium* L.	Gokhur	Herb	—			4				4	**
14	**Balanitaceae**											
47	*Balanites aegyptiaca (L.) Del.*		Small Tree	—				2	+		2	**
15	**Bignoniaceae**											
48	*Haplophragma adenophyllum* (Wall. ex G. Don) Dop	Kath Sagon	Tree	FD			+	+				FD*

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
49	*Millingtonia hortensis* L. f.		Tree	—					+			**
50	*Stereospermum suaveolens* DC.		Tree	—						1	1	**
16	**Bombacaceae**											
51	*Bombax ceiba* L.		Tree	—			+					**
17	**Boraginaceae**											
52	*Coldenia procumbens* L.		Herb	—			2				2	**
53	*Heliotropium indicum* L.		Herb	—			1				1	**
54	*Heliotropium sp*		Herb	—				3	1		4	**
18	**Brassicaceae**											
55	*Brassica nigra* (Linn.)Kach.	Rai	Herb	—	+		+					**
56	*Raphanus sativus* L.	Murai	Herb	—			+					**
19	**Burseraceaae**											
57	*Boswellia serrata* Roxb.	Salai	Tree	FD				14			14	FD*
20	**Cactaceae**											
58	*Opuntia elatior Mill.*		Herb	—					+			**
21	**Caesalpiniaceae**											
59	*Bauhinia racemosa* Lam.	Kaliar	Tree	FD		1		7		1	9	FD*
60	*Bauhinia variegata* L.	Kanchaner	Tree	—		+		+				**
61	*Cassia fistula*L.	Amaltas	Tree	FD				4			4	FD*
62	*Cassia occidentalis* L.	Kasaundhi	Herb	FD		+				+		FD*
63	*Cassia siamea* Lam.	Sandan	Tree	FD					10		10	FD*
64	*Cassia tora* L.	Chakwar	Herb	—	33	2	2	36	74		147	**
65	*Delonix elata* (L.) Gamble	Gul Mahor	Tree	—				7			7	**
66	*Parkinsonia aculeata* L.		Small Tree	FD			+					FD**
67	*Peltophorum pterocarpum* (DC.) Backer ex Heyne		Tree	—			+		+			**
68	*Tamarindus indica* L.	Imli	Tree	FD	+		+					FD*
22	**Cannabinaceae**											
69	*Cannabis sativa* Linn.	Bhang	Herb	—			+					**
23	**Cannaceae**											
70	*Canna indica* L.		Under Shrub	—			+					
24	**Capparaceae**											
71	*Capparis sepiaria* L.		Straggling Shrub	FD				1	13	2	16	FD*
72	*Capparis Sp*		Under Shrub	—					2		2	**
73	*Capparis zeylanica* Linn.		Straggling Shrub	FD		3		5	5		13	FD*
74	*Cleome gynandra* L. var. *gynandra*		Herb	—		+						**
75	*Cleome viscosa* L.	Hurhur	Herb	—		+		+		+		**
76	*Maerua oblongifolia*		Woody	—		2					2	*8

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
	(Foeak.) A. Rich.		Twiner									
25	**Caricaceae**											
77	*Carica papaya* L.	Papaya	Tree	–			**5**				**5**	**
26	**Chenopodiaceae**											
78	*Atriplex hortensis* L.	Palakh	Herb	–			+					**
79	*Chenopodium album* L.	Bathua	Herb	–			**2**			**4**	**6**	**
27	**Combretaceae**											
80	*Terminalia arjuna* (Roxb.) W. & A.	Arjun Sadad	Tree	**FD**			**5**			**19**	**24**	**FD***
81	*Terminalia bellirica* (Gaerth) Roxb.	Baharai	Tree	**FD**			**1**				**1**	**FD***
28	**Commelinaceae**											
82	*Commelina benghalensis* L.		Herb	–			**19**				**19**	**
83	*Commelina diffusa* Burm. f.		Herb	–	**+**		**+**			**+**		**
29	**Convolvulaceae**											
84	*Convolvulus microphyllus* (Roth) Sieb. ex Spr.		Herb	–					**2**	**10**	**12**	**
85	*Evolvulus alsinoides* L.	Neel Shankh,Puspi	Herb	–	**17**	**15**		**52**	**29**	**6**	**119**	**
86	*Ipomoea carnea* Jacq. Subsp. *fistulosa* Mart. Ex Choisy		Stragglin g Shrub	–			**3**			**3**	**6**	**
87	*Ipomoea pes-tigridis* L.		Twining Herb	–				**2**			**2**	**
88	*Merremia dissecta* (Jacq.) Hall. f.		Twining Herb	–						**2**	**2**	**
89	*Merremia* Sp		Twining Herb	–			**31**	**7**	**4**		**42**	**
90	*Merremia tridentata* L.		Twining Herb	–					**3**		**3**	**
91	*Rivea hypocrateriformis* Choisy	Rivea	Climber	–		**5**			**1**	**1**	**7**	**
30	**Cucurbitaceae**											
92	*Citrullus colocynthis* (L.) Soland.	Indrayana	Climber	–	**+**					**+**		**
93	*Coccinia grandis* (L.) Voigt	Kundru	Climber	–				**+**				**
94	*Cucumis melo* L. *var. melo*	Kharbooja	Herb	–			**+**					**
95	*Cucumis prophetarum* L.		Climber	–		**+**			**+**			**
96	*Cucumis sativus* L.	Kheera	Climber	–			**+**					**
97	*Cucurbita maxima* Duch.	Kadhu	Climber	–			**+**					**
98	*Lagenaria siceraria* Stardl.	Lauki	Climber	–			**+**					**
99	*Luffa acutangula* L.	Jagli Torai	Climber	–						**4**	**4**	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
100	*Luffa cylindrica* (L.) M. J. Roem.	Torai	Climber	—			+					**
101	*Momordica charantia* L.	Karela	Climber	—			+					**
102	*Momordica dioica* Roxb.	Kheksa	Climber	—			+					**
103	*Trichosanthes dioica* Roxb.	Parval	Climber	—			+					**
31	**Cuscutaceae**											
104	*Cuscuta reflexa* Roxb.	Amerbel	Parasite	**FD**		+		+	+			**FD***
32	**Cyperaceae**											
105	*Cyperus compressus* L.		Sedge	—						+		**
106	*Cyperus rotundus* L.	Motha	Sedge	—			**2**				**2**	**
107	*Eleocharis sp*		Sedge	—						**28**	**28**	**
108	*Scirpus littoralis* auct.		Sedge	—						+		**
109	*Scirpus sp.*		Sedge	—						+		**
33	**Ebenaceae**											
110	*Diospyros melanoxylon* Roxb.	Tendu	Tree	—				**6**		**4**	**10**	**
34	**Ehretiaceae**											
111	*Cordia dichotoma* Forst.	Lisora	Tree	**FD**			+					**FD***
35	**Euphorbiaceae**											
112	*Chrozophora prostrata* Dalz.		Herb	—			**4**				**4**	**
113	*Chrozophora rottleri* (Geis.) Juss.		Herb	—			**8**				**8**	**
114	*Croton bonplandianum* Baill.		Herb	—	+					+		**
115	*Emblica officinalis* Gaertn.	Aawla	Tree	**FD**			**2**	**1**			**3**	**FD***
116	*Euphorbia hirta* L.	Doodhi	Herb	—	**5**	**7**	**2**			**7**	**16**	**
117	*Euphorbia microphylla* Roth		Herb	—	**3**			**8**			**11**	**
118	*Euphorbia milli* Ch.		Herb	—				+				**
119	*Euphorbia nivulia* Buch.-Ham.	Sehur	Shrub	**FD**			+					**FD***
120	*Euphorbia thymifolia* L.		Herb	—			**6**				**6**	**
121	*Jatropha curcas* L.		Shrub	—	**6**						**6**	**
122	*Kirganelia reticulata* (Poir.) Baill.		Shrub	—						**6**	**6**	**
123	*Phyllanthus fraternus* Webst.	Bhui Awala	Herb	—			**22**				**22**	**
124	*Putranjiva roxburghii* Wall	Putra jeevi	Tree	—				+				**
125	*Ricinus communis* L.	Rendi ,Arandi	Shrub	—			+					**
126	*Securinega virosa* (Roxb. ex Willd.) Pax & Hoffm		Shrub	**FD**	**2**		**5**	**6**	**3**	**12**	**28**	**FD***
36	**Fabaceae**											
127	*Abrus precatorius* L.	Gumachi,ratti	Climber	**FD**		**2**		+			**2**	**FD***
128	*Alysicarpus monilifer*		Herb	—	**11**	**6**		**67**	**24**	**16**	**124**	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
	(L.) DC. var. *monilifer*											
129	*Butea monosperma* (Lam.) Taub.		Tree	FD	32	16	8	22	70	12	160	**
130	*Cajanus cajan* (L.) Millsp.	Tuvar	Under Shrub	–			+					**
131	*Clitora ternatea* L.	Aprazita	Twiner	–				+				**
132	*Dalbergia paniculata* L.		Tree	–		+						**
133	*Dalbergia sissoo* Roxb.	Shishu	Tree	FD			19	+			19	FD*
134	*Derris indica* (Lam.) Bennet	kiramal,karanj	Tree	FD			+			+		FD**
135	*Indigofera linifolia* Retz.		Herb	–					6	4	10	**
136	*Mucana prurita* Hk. f.	kewanch	Climber	FD				+				FD*
137	*Rhynchosia minima* (L.) DC. *var. minima*		Climber	–	9	9		6	2	3	29	**
138	*Rhynchosia minima* L.		Twiner	–	14	6		10		7	37	**
139	*Rhynchosia Sp.*		Climber	–				+	+			**
140	*Tephrosia purpurea* (L.) Pers.	Sharpunkh	Herb	FD		2		2	3		7	FD*
37	**Flacourtiaceae**											
141	*Flacourtia indica* (Burm. F.) Merr.		Small Tree	FD	14	9	4	2	7		36	FD*
38	**Gentianaceae**											
142	*Conscora diffusa* L.		Herb	–						2	2	**
39	**Lamiaceae**											
143	*Hyptis suaveolens* (Linn.) Poir.		Herb	–	3	334	2	1068	32		1439	**
144	*Leucas cephalotes* Spreng.	Dronepushpi	Herb	–		+		+				**
145	*Mentha arvensis* Linn.	Pudeena	Herb	–			+					**
146	*Ocimum sanctum* Linn.	Tulsa	Herb	–			+					**
40	**Liliaceae**											
147	*Allium cepa* L.	Pyas	Herb	–			+					**
148	*Asparagus racemosus Willd.*	Satavari	Sarmentose Shrub	FD		2					2	**
149	*Drimia indica* L.	Jungli pyaz	Herb	–				4			4	**
41	**Loranthaceae**											
150	*Loranthus longiflorus* Desr	Vando	Parasite	–			+			+		**
42	**Lythraceae**											
151	*Ammannia baccifera* L.		Herb	–						+		**
152	*Lagerstroemia parviflora,* Roxb.		Tree	FD		7		36	5		48	FD*
153	*Lawsonia inermis* L.		Shrub	–		+						**
154	*Woodfordia fruticosa* Kurz		Shrub	FD				5			5	FD*
43	**Malvaceae**											
155	*Abelmoschus esculentus* (L.) Moench	Bhinda, Bhindo	Under Shrub	–			+					**
156	*Ceiba pentandra* (L.) Gaertn.		Tree	–			+					**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
157	*Hibiscus ovalifolius* (Forsk.) Vahl		Shrub	–				1			1	**
158	*Hibiscus rosa-sinensis* L.	Gurhal	Shrub	–			+					**
159	*Hibiscus sp*		Shrub	–			3				3	**
160	*Sida acuta* Burm. f.		Herb	–	1		2				3	**
161	*Sida cordifolia* L.	Bariyari	Herb	–	6		21	13	+	7	47	**
162	*Sida ovata* Forsk.		Herb	–			10		1		11	**
44	**Meliaceae**											
163	*Azadirachta indica* A. Juss.	Neem	Tree	FD	8	24	7	6	8	49	102	FD*
45	**Menispermaceae**											
164	*Cocculus hirsutus* (L.) Diels		Straggling Shrub	FD	18	17	4	17	25	13	94	FD*
165	*Cocculus pendulus*(Forst.) Diels		Straggling Shrub	–				2	7	1	10	**
166	*Tinospora cordifolia* Roxb.		Climber	–			1			5	6	**
46	**Mimosaceae**											
167	*Acacia auriculiformis* A. Cunn. ex Benth.	Sonjari	Tree	FD				+				FD*
168	*Acacia catechu* (L.F.) Willd.	Khair,Kattatha	Tree	FD	2	36	2	59	6		95	FD*
169	*Acacia concinna DC.*	Shikakai	Climber	–		3	6	26		15	50	**
170	*Acacia leucophloea* (Roxb.) Willd.		Tree	FD	1	3	4	2	9	17	36	FD*
171	*Acacia nilotica* (L.) Del. subsp. *indica*(Bth.) Brenan	Babul	Tree	FD	+		5	+		9	14	FD*
172	*Albizia lebbeck* (L.) Bth.	Shireesh,Chichola	Tree	FD			+					FD*
173	*Leucaena latisiliqua* (L.) Wt. & Arn.		Tree	–			17				17	**
174	*Pithecellobium dulce* (Roxb.) Bth.		Tree	FD				4		1	5	
175	*Prosopis juliflora* (Sw) DC.	Cathela	Shrub	–				+				**
47	**Molluginaceae**											
176	*Mollugo pentaphylla* L.		Herb	–						13	13	**
48	**Moraceae**											
177	*Artocarpus heterophyllus* Lamk.	Katahal	Tree	–			+					**
178	*Ficus benghalensis* L.	Bargad	Tree	FD			1	2			3	FD*
179	*Ficus mollis Vahl*		Tree	–		3		1		2	6	**
180	*Ficus racemosa* L.	Gular	Tree	FD			2			7	9	FD*
181	*Ficus religiosa* L.	Pipal	Tree	FD						1	1	FD*
182	*Morus alba* L.	Sahatoot	Tree	–			+					**
183	*Streblus asper* Lour.		Small Tree	FD				24	+			FD*
49	**Moringaceae**											

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
184	*Moringa concanensis* Nimmo		Tree	—				1			1	**
185	*Moringa oleifera* Lam.		Tree	FD				+				FD*
50	**Musaceae**											
186	*Musa paradisiaca* L.	Kela	Herb	—			5				5	**
51	**Myrtaceae**											
187	*Callistemon lanceolatus* Sweet.Eng.	Bottle Brush	Small Tree	FD				+				FD*
188	*Eucalyptus globulus* Labill.		Tree	—			9				9	**
189	*Psidium guajava* L.	Amrut	Tree	—			5				5	**
190	*Syzygium cumini* (L.) Skells	Jamun	Tree	FD			5				5	FD*
191	*Syzygium heyneanum* Wall. ex W. & A.	Kathjamun	Tree	FD						1	1	FD*
52	**Nyctaginaceae**											
192	*Boerhavia diffusa* L.	gadah-punna	Herb	—		6				4	10	**
193	*Bougainvillea spectabilis* Willd.		Stragglin g Shrub	—	+							**
53	**Oleaceae**											
194	*Jasminum multiflorum* (Burm. F.) Andr.	Chameli	Twining Shrub	—			+					**
195	*Jasminum sambac* Ait.	Mogro	Twining Shrub	—			+					**
54	**Oxalidaceae**											
196	*Oxalis corniculata* L.		Herb	—						+		**
55	**Papaveraceae**											
197	*Argemone mexicana* L.	Bharbhanda	Herb	—						4	4	**
56	**Pedaliaceae**											
198	*Sesamum indicum* L.	Til	Herb	—			+					**
57	**Periplocaceae**											
199	*Cryptolepis buchanani* Roem & Sch.		Woody Climber	FD			1	3			4	FD*
200	*Hemidesmus indicus* (L.) Schult.	Anantmulla	Twiner	—	2	18	4	39	18	21	102	**
58	**Poaceae**											
201	*Apluda mutica* L.		Grass	FD	45	42		64			151	FD*
202	*Aristida hystrix* L.		Grass	FD		18		16	69		113	FD*
203	*Bambusa arundinacea* (Retz.) Willd.	khokhla baus	Grass	FD		1	14	44	2	13	74	FD*
204	*Bothriochloa pertusa* (L.) A. Camus		Grass	FD		+		+				FD*
205	*Cenchrus ciliaris* L.		Grass	FD		4		5	4		13	FD*
206	*Cynodon dactylon* (L.) Pers.		Grass	FD	12		51			83	146	FD*
207	*Desmostachya bipinnata* (L.) Stapf		Grass	FD	42	6	109	187	8	32	384	FD*
208	*Dichanthium annulatum* (Forak.) Stapf		Grass	FD	45	11	85	24	8	40	213	FD*
209	*Eragrostis ciliaris* L.		Grass	—		48			30		78	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
210	*Eragrostis Sp.*		Grass	—			35			2	37	**
211	*Heteropogon contortus* (L.) P.Beauv. ex.R. & S.		Grass	FD	21						21	FD*
212	*Imperata cylindrica* (L.) Beauv		Grass	—						+		**
213	*Oplimenus* spp.		Grass	—						+		**
214	*Oryza sativa* L.		Grass	—			+					**
215	*Saccharum officinarum* L.	Ganna	Grass	—			+					**
216	*Saccharum spontaneum*L.		Grass	FD	+					+		FD*
217	*Sporobolus coromandelianus* (Retz.) Kunth		Grass	—					25	3	28	**
218	*Sporobolus sp*		Grass	—						1	1	**
219	*Triticum aestivum* L.	Gehu	Grass	—			+					**
220	*Vetiveria zizanioides* (L.) Nash		Grass	FD					2		2	**
221	*Zea mays* L.		Grass	—			+					**
59	**Polygonaceae**											
222	*Polygonum glabrum* Willd.		Herb	—						64	64	**
223	*Polygonum plebeium* R. Br.		Herb	—		4	2	4		17	27	**
60	**Portulacaceae**											
224	*Portulaca oleracea* L.	khatti chaulai	Herb	—			+			+		
225	*Portulaca quadrifida* L.		Herb	—			4				4	**
61	**Punicaceae**											
226	*Punica granatum* L.	Anar	Small Tree	—			1				1	**
62	**Rhamnaceae**											
227	*Zizyphus mauritiana* Lam.	Jherberi,Ber	Small Tree	FD		1	4	2			7	FD*
228	*Zizyphus nummularia* (Burm. F.) W. & A.	Jharberi,Jharbaila	Under Shrub	FD	8	12		20	25	11	76	FD*
229	*Zizyphus oenoplia* Mall.		Shrub	FD	16	33	2	+	18	1	70	FD*
230	*Zizyphus xylopyrus* Willd.	Ber	Shrub	FD	+	5	8	135	65	24	237	FD*
63	**Rubiaceae**											
231	*Adina cordifolia* (Willd. ex Roxb.) Benth. & Hook. f. ex Brandis	Haldu	Tree	FD				+				FD*
232	*Borreria articularis* (L.f.) F.N. Will.		Herb	—		23		29	20	4	76	**
233	*Ixora arborea* Roxb. Ex. Sm.		Tree	FD				2		7	9	FD*
234	*Mitragyna parvifolia* (Roxb.) Korth.		Tree	FD				1			1	FD*
235	*Morinda tomentosa* B.Heyne ex Roth		Tree	—						+		**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
236	*Oldenlandia corymbosa* L.		Herb	—						4	4	**
237	*Xeromphis spinosa* L.		Small Tree	—		7	1	4		3	15	**
238	*Xeromphis uliginosa* (Retz.) Maheshwari		Small Tree	—			4	3			7	**
64	**Rutaceae**											
239	*Aegle marmelos* (L.) Corr.	Bel	Tree	FD				5	1	1	7	FD*
240	*Citrus limon* (L.) Burm. f.	Leembu	Shrub	—			1				1	**
65	**Sapotaceae**											
241	*Madhuca indica* J. F. Gmel.	Mahua	Tree	FD			9			2	11	FD*
242	*Manilkara hexandra* (Roxb.) Dub		Tree	FD				+				FD*
66	**Scrophulariaceae**											
243	*Bacopa monnieri* (L.) Pennell	Jalneem	Herb	—						+		**
244	*Lindernia ciliata* (Colsm.) Penn.		Herb	—						5	5	**
245	*Lindernia oppositifolia* (Retz.) Mukerjee		Herb	—						3	3	**
67	**Simaroubaceae**											
246	*Ailanthus excelsa* Roxb.		Tree	FD			+					FD*
68	**Solanaceae**											
247	*Capsicum annuum var. acuminata* Fingerh.	Marcha	Herb	—			+					
248	*Datura innoxia* Mill.		Under Shrub	—			2				2	**
249	*Datura metel* L.	Dhaturo	Under Shrub	—					+			**
250	*Lycopersicon lycopersicum* (L.) Karst.	Tamater	Herb	—			+			+		**
251	*Physalis minima* L.	Tankari	Herb	—			2				2	**
252	*Solanum melongena* L. var. *insana* Prain	Ringna	Herb	—			+					**
253	*Solanum melongena* L. var. *melongena*	Bhanta	Herb	—			+					**
254	*Solanum nigrum* L.	Macoi	Herb	—	+					+		**
255	*Solanum surattense* Burm. f.	Bhatkataiya	Herb	—	4		4		2		10	**
256	*Withania somnifera* (L.) Kurz	Ashwagandha	Under Shrub	—			+		+			**
69	**Sterculiaceae**											
257	*Helicteres isora* L.		Shrub	FD				37		3	40	FD*
258	*Sterculia urens* Roxb.		Tree	FD		4		1			5	FD*
259	*Waltheria indica* L.		Under Shrub	—	7	7		3	5		22	**
70	**Tiliaceae**											
260	*Corchorus aestuans* L.		Herb	—			4				4	**
261	*Corchorus olitorius* L.		Herb	—			4			2	6	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
262	*Grewia flavescens* Juss.		Shrub	**FD**					**1**		**1**	**FD***
263	*Triumfetta rhomboidea* Jacq.		Herb	—	**5**		**10**	**7**	**2**	**7**	**31**	**
264	*Triumfetta rotundifolia* Lam.		Herb	—	**+**	**+**				**+**		**
71	**Ulmaceae**											
265	*Holoptelea integrifolia* (Roxb.) Planch.	Chilbil	Tree	**FD**		**2**	**1**	**2**	**5**	**12**	**22**	**FD***
72	**Verbenaceae**											
266	*Gmelina arborea* Linn.	Gmhar	Tree	**FD**		**+**						**FD***
267	*Lantana camara* auct. Non L.		Under Shrub	**FD**				**23**	**2**	**1**	**26**	**FD***
268	*Phyla nodiflora* (L.) Greene		Herb	—						**2**	**2**	
269	*Tectona grandis* L.f.	Sagon	Tree	**FD**								**FD***
73	**Violaceae**											
270	*Viola cinerea* Boiss.		Herb	—						**+**		**
74	Vitaceae											
271	*Cayratia carnosa* (Lam.) Gagnep.		Climber	—			**2**				**2**	**
Total				**82**	**429**	**803**	**838**	**2517**	**949**	**921**	**6457**	

D/DR- Dense Forest / Degraded Forest, WB/R -Water Body /Rivers, OS/WL- Open Scrub / Wasteland, AG/FL- Agriculture/ Fallow Land SAT Study Area Total , FD + = Species listed by Forest department and Present Study, ** Species Reported only by the present Study, OSR – Overall Species

Annexure 2. Overall List and Conservation Status of Herpetofauna of the Proposed Thermal Power Plant -WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family and Species name	Common Name	SA	FD	Conservation Status	
	AMPHIBIANS				**CAMP 1998**	**WPA 1972**
1	**Randidae**					
1	*Occidozyga cyanophlyctis*	Skittering Frog	30	**	LR-nt	IV
2	*Limnonectes limnocharis*	Indian Pond Frog	3	**	-	
3	*Hoplobatrachus tigerinus*	Indian Bull Frog	5	**	LC	IV
	REPTILES					
2	**Crocodylidae**					
4	*Crocodylus palustris*	Mugger / Marsh Crocodile	-	FD@	VU	Sch-I
3	**Gavialidae**					
5	*Gavialis gangeticus*	Gharial	-	FD@		Sch-I
4	**Trionychida**					
6	*Lissemys punctata*	Indian Flapshell Turtle	-	FD@	LR-nt	Sch-I
5	**Gekkonidae**					
7	*Hemidactylus flaviviridis*	Yellow Bellied House Gecko	-	FD@	LR-lc	
8	*Hemidactylus frenatus*	Asian House gecko	1	**	LR-lc	
6	**Lacertidae**					
9	*Ophisops leschenaultii*	Leschenault's Lacerta	17	**	LR-lc	
7	**Agamidae**					
10	*Calotes versicolor*	Indian Garden Lizard	35	FD+	LR-nt	
11	*Sitana ponticeriana*	Fan-Throated Lizard	4	**	LR-lc	
8	**Scincidae**					
12	*Mabuya carinata*	Common Keeled Grass Skink	2	**	LR-nt	
13	*Mabuya macularia*	Bronze Grass Skink	20	**	LR-lc	-
9	**Varanidae**					
14	*Varanus bengalensis*	Common Indian Monitor	1	FD+	VU	Sch-II
10	**Pythonidae**					
15	*Python molurus*	Indian Rock Python	-	FD@	LR-nt	Sch-IV
11	**Colubridae**					
16	*Ptyas mucosa*	Indian Rat Snake	1	FD+	LR-nt	Sch-II
17	*Xenochrophis piscator*	Checkered Keelback Water Snake	2	FD+	LR-lc	Sch-II
12	**Elapidae**					
18	*Bungarus caeruleus*	Common Indian Krait	-	FD@	LR-lc	Sch-IV
19	*Naja naja*	Spectacled Cobra	1	FD+	LR-nt	Sch-II
13	**Viperidae**					
20	*Daboia russelii*	Russell's Viper	-	FD@	LR-nt	Sch-II
	Total Species		**13**	**20**		

SAT Study Area Total , FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study

Annexure 3. Overall List and Conservation Status of Terrestrial Bird Species in the Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
1	**ACCIPITRIDAE**													
1	*Elanus caeruleus*-Black-shouldered Kite				-	1	-	2	3	3	**FD+**	**C**	R	LC
2	*Accipiter badius* - Shikra	1	1	2	2	1	-	1	4	6	**FD+**	**C**	R	**LC**
3	*Circaetus gallicus* Short-toed Snake Eagle	2	1	3							**	C	R	LC
4	*Butastur teesa* White-eyed Buzzard				-	-	-	1	1	1	**FD+**	**C**	R	**LC**
5	*Milvus migrans* Black Kite										FD@	**C**	R	**LC**
6	*Haliastur indus* Brahminy Kite										FD@	**C**	R	**LC**
7	*Gyps indicus* Long-billed Vulture										FD@	**C**	R	**CR**
8	*Sarcogyps calvus* Red-headed Vulture										FD@	**C**	R	**CR**
9	*Gyps bengalensis* White-rumped Vulture										**FD@**	**C**	R	**CR**
10	*Neophron percnopterus* Egyptian Vulture				-	-	-	1	1	1	**FD+**	**C**	R	**EN**
2	**ALAUDIDAE**													
11	*Eremopterix grisea Ashy*-crowned Sparrow Lark	6	11	17	-	3	7	1	11	28	**	I	R	**LC**
12	*Mirafra cantillans* Singing bush Lark	16	4	20	-	4	5	8	17	37	**	I	R	**LC**
13	*Ammomanes phoenicurus* Rufous-tailed Lark				-	1	-	2	3	3	**	I	R	**LC**
3	**APODIDAE**													
14	*Apus affinis* Little Swift				1	2	-	1	4	4	**	I	R	LC
4	**BUCEROTIDAE**													
15	*Ocyceros birostris* Indian grey Hornbill					1			1	1	FD+	F	R	Sch-I
5	**CAPRIMULGIDAE**													
16	*Caprimulgus asiaticus* Indian Nightjar	3		3	1	2	-	-	3	6	**FD+**	I	R	LC
17	*Caprimulgus indicus* Indian Jungle Nightjar										**FD@**			
18	*Caprimulgus affinis* Savanna Nightjar				1				1	1	**	I	R	LC
6	**CENTROPODIDAE**													
19	*Centropus sinensis* Greater Coucal				3	7	2	3	15	15	**	O	R	LC
7	**CISTICOLIDAE**													
20	*Prinia buchanani* Rufous-fronted Prinia				16	10	8	2	36	36	**	I	R	LC
21	*Prinia socialis* Ashy Prinia	4		4	1	-	1	2	4	8	**FD+**	I	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
22	*Prinia hodgsonii* Grey-breasted Prinia	3		3	2	9	4	-	15	18	**	I	R	LC
23	*Prinia inornata* Plain Prinia	11	2	13	1	-	1	-	2	15	**	I	R	LC
24	*Prinia sylvatica* Jungle Prinia	2	3	5	5	0	6	3	14	19	**	I	R	LC
8	**COLUMBIDAE**													
25	*Columba livia* Rock Pigeon	1		1	0	9	6	9	24	25	**FD+**	G	R	LC
26	*Streptopelia decaocto* Eurasian collared Dove				1	2	2	0	5	5	**FD+**	G	R	LC
27	*Streptopelia senegalensis* Laughing Dove	7	6	13	32	27	21	8	88	101	**	G	R	LC
28	*Streptopelia chinensis* Spotted Dove	33	16	49	14	6	8	5	33	82	**	G	R	LC
29	*Streptopelia tranquebarica* Red Collared Dove	20		20	5	4	0-	0	9	29	**	G	R	LC
30	*Treron phoenicoptera* Yellow-footed Green Pigeon	1	1	2	0	1	0	0	1	3	FD+	F	R	LC
9	**CORACIIDAE**													
31	*Coracias benghalensis* Indian Roller	2		2	1	4	3	4-	12	14	**FD+**	I	R	LC
10	**CORVIDAE**													
32	*Aegithina tiphia* Common Iora	1		1	2	7	0	0	9	10	**	I	R	LC
33	*Aegithina nigrolutea* Marshall's Iora				1	2	2	0	5	5	**	I	R	LC
34	*Pericrocotus cinnamomeus* Small Minivet				1	2	0	0	3	3	**	I	R	LC
35	*Corvus splendens* House Crow	3	1	4	4	0	0	2	6	10	**FD+**	O	R	LC
36	*Corvus macrorhynchos* Large-billed Crow	2		2	2	8	8	8	26	28	FD+	O	R	LC
37	*Dendrocitta vagabunda* Rufous Treepie	1		1	5	5	1	3	14	15	**	O	R	LC
38	*Dicrurus macrocercus* Black Drongo				4	7	4	7	22	22	**FD+**	I	R	LC
39	*Dicrurus caerulescens* White-billed Drongo	12	3	15	1	0	0	0	1	16	**	I	R	LC
40	*Terpsiphone paradisi* Asian Paradise Flycatcher				0	3	0	0	3	3	**	I	R	LC
41	*Oriolus oriolus* Eurasian Golden Oriole				1	3	1	3	8	8	**FD+**	O	R	LC
42	*Rhipidura aureola* White-browed Fantail				1	3	0	0	4	4	**	I	R	LC
43	*Tephrodornis pondicerianus* Common Woodshrike				1	0	0	0	1	1	**	I	R	LC
11	**CUCULIDAE**													
44	*Hierococcyx varius* Common Hawk Cuckoo										**FD@**	I	R	LC
45	*Eudynamys*	1		1	3	0	2	3	8	9	**FD+**	F	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
	scolopacea Asian Koel													
46	*Taccocua leschenaultii* Sirkeer Malkoha	2		2	0	0	1	0	1	3	**	O	R	LC
12	**FALCONIDAE**													
47	*Falco tinnunculus* Common Kestrel				-	1	-	-	1	1	**FD+**	C	R	LC
13	**HIRUNDINIDAE**													
48	*Hirundo concolor* Dusky Crag Martin				-	1	-	-	1	1	**	I	R	LC
49	*Riparia paludicola* Plain Martin				1	-	-	0	1	1	**	I	R	LC
50	*Hirundo smithii* Wire-tailed Swallow				-	0	-	1	1	1	**	I	R	LC
51	*Hirundo daurica* Red-rumped Swallow				0	-	4	0	4	4	**FD+**	I	R	LC
14	**LANIIDAE**													
52	*Lanius schach* Long-tailed Shrike	2		2	2	1	-	-	3	5	**	I	R	LC
53	*Lanius vittatus* Bay-backed Shrike	3	1	4	2	-	2	-	4	8	**	I	R	LC
54	*Lanius meridionalis* Southern Grey Shrike	1		1	1	-	-	-	1	2	**	I	R	LC
15	**MEGALAIMIDAE**													
55	*Megalaima zeylanica* Brown-headed Barbet				-	2	1	2	5	5	**	F	R	LC
56	*Megalaima haemacephala* Coppersmith Barbet				2	2	1	-	5	5	**	F	R	LC
16	**MEROPIDAE**													
57	*Merops orientalis* Green Bee-eater	10	2	12	8	16	6	2	32	44	**	I	R	LC
58	*Merops philippinus* Blue-tailed Bee-eater				2	-	-	-	2	2	**	I	R	LC
17	**MUSCICAPIDAE**													
59	*Phoenicurus ochruros* Black Redstart	1		1		1			1	2	**	I	WV	LC
60	*Cercomela fusca* Brown Rock-chat				-	-	1	-	1	1	**	I	R	LC
61	*Saxicoloides fulicata* Indian Robin	32	6	38	29	9	25	5	68	106	**	I	R	LC
62	*Copsychus saularis* Oriental Magpie Robin				-	4	-	-	4	4	**FD+**	I	R	LC
18	**NECTARINIDAE**													
63	*Dicaeum agile* Thick-billed Flowerpecker				0	4	2	1	7	7	**	N	R	**LC**
64	*Cinnyris asiaticus* Purple Sunbird	2		2	10	2	7	5	24	26	**	N	R	LC
19	**PASSERIDAE**													
65	*Passer domesticus* House Sparrow				-	3	-	-	3	3	**	G	R	LC
66	*Lonchura malabarica* Indian Silverbill				6	2	9	0	17	17	**	G	R	**LC**
67	*Amandava formosa* Green Avadavat				1	0	0	0	1	1	**	G	R	**LC**
68	*Amandava amandava* Red Avadavat										**FD@**	G	R	**LC**
69	*Petronia xanthocollis*				10	5	6	0	21	21	**	G	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
	Chestnut-shouldered Petronia													
70	*Anthus rufulus* Paddyfield Pipit				-	-	-	1	1	1	**	I	R	LC
71	*Ploceus philippinus* Baya Weaver		8	8	-	6	-	1	7	15	**FD+**	G	R	LC
20	**PHASIANIDAE**													
72	*Perdicula asiatica* Jungle Bush Quail	1		1	-	-	-	1	1	2	**FD+**	G	R	LC
73	*Coturnix coturnix* Common Quail										**FD@**	G	R	LC
74	*Gallus gallus* Red Junglefowl										FD@	O	R	LC
75	*Galloperdix spadicea* Red Spurfowl										FD@	G	R	LC
76	*Francolinus pondicerianus* Grey Francolin	9	7	16	4	-	7	4	15	31	FD+	G	R	LC
77	*Pavo cristatus* Indian Peafowl	3		3	1	10	4	-	15	18	FD+	O	R	Sch-I
78	*Francolinus pictus* Painted Francolin										FD@	G	R	LC
79	*Francolinus francolinus* Black Francolin										FD@	G	R	LC
21	**PICIDAE**													
80	*Dinopium benghalense* Black-rumped Flameback				-	1	-	-	1	1	**FD+**	I	R	LC
81	*Dendrocopos nanus* Brown-capped Pygmy Woodpecker				-	-	-	1	1	1	**	I	R	LC
82	*Dendrocopos mahrattensis* Yellow-crowned Woodpecker	1		1	1	-	-	-	1	2	**	I	R	LC
83	*Picus flavinucha* Yellow-napped Woodpecker										**FD@**			
22	**PITTIDAE**													
84	*Pitta brachyura* Indian Pitta				-	1	-	-	1	1	**	I	R	LC
23	**PSITTACIDAE**													
85	*Psittacula cyanocephaea* Blossom-headed Parakeet										**FD@**	F	R	LC
86	*Psittacula krameri* Rose-ringed Parakeet	1		1	2	3	2	7	14	15	**FD+**	F	R	LC
24	**PTEROCLIDIDAE**													
87	*Pterocles indicus* Painted Sandgrouse										FD@	G	R	LC
88	*Pterocles exustus* Chestnut-bellied Sandgrouse	2		2	-	4	-	-	4	6	FD+	G	R	LC
25	**PYCNONOTIDAE**													
89	*Pycnonotus cafer* Red-vented Bulbul	42	6	48	36	16	23	12	87	135	**FD+**	O	R	LC
26	**STRIGIDAE**													
90	*Glaucidium radiatum* Jungle Owlet										**FD@**	O	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
91	*Athene brama* Spotted Owlet	1		1	-	1	-	1	2	3	**	I	R	LC
92	*Strix leptogrammica* Brown-wood Owl										FD@			
27	**STURNIDAE**													
93	*Acridotheres tristis* Common Myna	5		5	2	11	8	4	25	30	**	O	R	LC
94	*Acridotheres ginginianus* Bank Myna				-	-	-	4	4	4	**			
95	*Acridotheres fuscus* Jungle Myna										FD@			
96	*Sturnus pagodarum* Brahminy Starling	3		3	2	6	-	3	11	14	**	O	R	LC
97	*Sturnus contra* Asian Pied Starling				-	7	-	4	11	11	**	O	R	LC
98	*Sturnus roseus* Rosy Starling	1		1						1	**	O	WV	LC
28	**SYLVIIDAE**													
99	*Orthotomus sutorius* Common Tailorbird	4		4	5	5	5	3	18	22	**	I	R	LC
100	*Turdoides caudatus* Common Babbler	7	2	9	4	7	1	-	12	21	**	O	R	LC
101	*Turdoides striatus* Jungle Babbler	3		3	8	9	9	14	40	43	FD+	O	R	LC
102	*Turdoides malcolmi* Large grey Babbler	20	13	33	8	19	15	24	66	99	**	O	R	LC
103	*Chrysomma sinense* Yellow-eye Babbler				5	3	-	1	9	9	**	I	R	LC
104	*Dumetia hyperythra* Twany bellied Babbler				-	-	-	1	1	2	**	I	R	LC
29	**TURNICIDAE**													
105	*Turnix suscitator* Barred Button Quail				1	-	-	-	1	1	**	G	R	LC
30	**UPUPIDAE**													
106	*Upupa epops* Common Hoopoe	3		3						3	**	I	R	LC
31	**ZOSTEROPIDAE**													
107	*Zosterops palpebrosus* Oriental White-eye				16	6	2	-	24	24	**	I	R	LC
	Total Species	**45**	**19**	**46**	**53**	**58**	**41**	**45**	**85**	**88**				
	Total Birds	291	94	385	281	302	233	181	997	1382				

D/DR- Dense Forest / Degraded Forest, WB/R -Water Body /Rivers, OS/WL- Open Scrub / Wasteland, AG/FL- Agriculture/ Fallow Land CT- Core Zone Total, BT – Buffer Zone Total, SAT Study Area Total , FG-Foraging Guild, MS- Migratory Status, CS- Conservation Status. FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study

Annexure 4. Overall List and Conservation Status of Aquatic Bird Species in the Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
1	**ANATIDAE**													
1	*Tadorna tadorna* Common Shelduck										**FD@**	**H**	WV	LC
2	*Anser indicus* Bar-headed Goose										**FD@**	**H**	WV	LC
3	*Sarkidiornis melanotos*										**FD@**	**H**	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
	Comb Duck													
4	*Anas poecilorhyncha* Spot-billed Duck										FD@	H	R	LC
5	*Anas crecca* Common Teal										FD@	H	WV	LC
6	*Nettapus coromandelianus* Cotton Pigmy-goose	0	0	0	0	52	0	0	52	**52**	FD+	H	M	LC
2	**ARDEIDAE**													
7	*Bubulcus ibis* Cattle Egret	0	0	0	0	102	4	0	106	**106**	FD+	I	R	LC
8	*Egretta garzetta* Little Egret	0	0	0	0	16	1	0	17	**17**	FD+	P	R	LC
9	*Mesophoyx intermedia* Intermediate Egret	0	0	0	0	5	1	0	6	**6**	**	P	WV	LC
10	*Casmerodius albus* Great Egret	0	0	0	0	16	0	0	16	**16**	**	P	WV	LC
11	*Ardea cinerea* Grey Heron										FD@	P	WV	LC
12	*Ardeola grayii* Indian Pond Heron	0	0	0	0	29	12	1	42	**42**	**	P	R	LC
13	*Nycticorax nycticorax* Black-crowned Night Heron	0	0	0	0	5	1	0	6	**6**	**	P	R	LC
14	*Butorides striatus* Little Heron	0	0	0	0	0	1	0	1	**1**	**	P	R	LC
3	**BURHINIDAE**													
15	*Burhinus indicus* Indian Stone-curlew	0	0	0	0	1	1	0	2	**2**	**	I	R	LC
4	**CERYLIDAE**													
16	*Ceryle rudis* Pied Kingfisher	0	0	0	0	1	1	0	2	**2**	**	P	R	LC
5	**CHARADRIIDAE**													
17	*Charadrius dubius* Little-ringed Plover	0	1	1	0	3	0	0	3	**4**	**	I	WV	LC
18	*Vanellus indicus* Red-wattled Lapwing	1	3	4	0	36	5	1	42	**46**	**	I	R	LC
19	*Vanellus malabaricus* Yellow-wattled Lapwing	0	1	1	0	1	3	0	4	**5**	**	I	R	LC
20	*Himantopus himantopus* Black winged Stilt	0	0	0	0	36	0	0	36	**36**	**	I	R	LC
6	**CICONIIDAE**													
21	*Anastomus oscitans* Asian Openbill	0	0	0	0	27	0	0	27	**27**	**	P	R	LC
22	*Mycteria leucocephala* Painted Stork	0	0	0	0	1	0	0	1	**1**	**	P	WV	LC
23	*Ciconia episcopus* Wooly-necked Stork	0	0	0	0	1	0	0	1	**1**	FD+	P	R	LC
24	*Ciconia ciconia* White Stork	0	0	0	0	2	0	0	2	**2**	**	p	WV	LC
7	**CORVIDAE**													
25	*Motacilla maderaspatensis* White-browed Wagtail	0	0	0	0	3	1	0	4	**4**	**	I	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
8	**DENDROCYGNIDAE**													
26	*Dendrocygna javanica* Lesser Whistling Duck	0	0	0	0	222	15	0	237	**237**	**	H	R	LC
9	**GLAREOLIDAE**													
27	*Cursorius coromandelicus* Indian Courser	0	1	1	0	7	0	0	7	**8**	**	I	WV	LC
10	**GRUIDAE**													
28	*Grus antigone* Sarus Crane										**FD@**	O	R	VU
11	**HALCYONIDAE**													
29	*Halcyon smyrensis* White-throated Kingfisher	0	0	0	0	2	2	1	5	**5**	**FD+**	P	R	LC
12	**JACANIDAE**													
30	*Hydrophasianus chirurgus* Pheasant tailed Jacana	0	3	3	0	16	4	0	20	**23**	**	I	R	LC
31	*Metopidius indicus* Bronze-winged Jacana	0	0	0	0	7	0	0	7	**7**	**	I	R	LC
13	**PASSERIDAE**													
32	*Motacilla cinerea* Grey Wagtail										FD@	I	WV	LC
14	**PHALACROCORACIDAE**													
33	*Phalacrocorax niger* Little Cormorant	0	0	0	0	17	2	0	19	**19**	**	P	R	LC
34	*Phalacrocorax fuscicollis* Indian Cormorant	0	0	0	0	30	0	0	30	**30**	**	P	R	LC
15	**PODICIPEDIDAE**													
35	*Tachybaptus ruficollis* Little Grebe	0	0	0	0	22	6	0	22	**22**	**	C	R	LC
16	**RALLIDAE**													
36	*Amaurornis phoenicurus* White-breasted Waterhen	0	0	0	0	3	0	0	3	**3**	**	0	R	LC
17	**SCOLOPACIDAE**													
37	*Tringa nebularia* Common Greenshank	0	0	0	0	1	0	0	1	**1**	**	I	WV	LC
38	*Limosa melanuroides* Black-tailed Godwit	0	0	0	0	1	0	0	1	**1**	**	I	WV	LC
39	*Gallinago gallinago* Common Snipe										**FD@**	I	WV	LC
18	**THRESKIORNITHIDAE**													
40	*Pseudibis papillosa* Black Ibis	0	0	0	0	2	0	0	2	**2**	**	O	R	LC
	Total Species	1	5	5	0	30	16	3	31	**31**				
	Total Birds	1	9	10	0	667	60	3	730	**740**				

D/DR- Dense Forest / Degraded Forest, WB/R -Water Body /Rivers, OS/WL- Open Scrub / Wasteland, AG/FL- Agriculture/ Fallow Land CT- Core Zone Total, BT – Buffer Zone Total, SAT Study Area Total , FG-Foraging Guild, MS- Migratory Status, CS- Conservation Status. FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study

Annexure 5. Overall List and Conservation Status of Mammals of the Proposed Thermal Power Plant -WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family & Scientific Names	Common name	SAT	FD	Conservation Status	
					CAMP 1998	WPA Anon 1972
1	**Cercopithecidae**					
1	*Macaca mulatta*	Rhesus Macaque	-	FD@	LC	Sch.II
2	*Semnopithecus entellus*	Common /Hanuman Langur	4(6)	FD+	LR-nt	Sch.II
2	**Cervidae**					
3	*Cervus unicolor*	Sambar	-	FD@	LC	Sch.III
4	*Muntiacus muntjak*	Indian Muntjac	-	FD@	LR-cd	Sch.III
5	*Axis axis*	Spotted Deer	*	FD+	-	Sch.III
3	**Bovidae**					
6	*Boselaphus tragocamelus*	Nigai	172(16)	FD+	LR-cd	Sch.III
7	*Tetracerus quadricornis*	Four Horned Antelope	6	FD+	LR-cd	Sch.III
8	*Gazella bennettii*	Indian Gazelle	-	FD@	LR-lc	Sch.I
4	**Suidae**					
9	*Sus scrofa*	Wild Pig	32	FD+	LR-	Sch.III
5	**Ursidae**					
10	*Melursus ursinus*	Sloth Bear	2	FD+	VU	Sch.II
6	**Canidae**					
11	*Canis aureus*	Jackal	49(1)	FD+	LR-lc	Sch.II
12	*Canis lupus*	Wolf	-	FD@	LR-nt	Sch.I
13	*Cuon alpinus*	Wild Dog	-	FD@	EN	Sch I
14	*Vulpes bengalensis*	Indian Fox	7	FD+	LR-nt	Sch.II
7	***Hyaenidae***					
15	*Hyaena hyaena*	*Striped Hyena*	8	FD+	LR-nt	Sch.III
8	**Felidae**					
16	*Felis chaus*	Jungle Cat	30	FD+	LR-nt	Sch-II
17	*Panthera pardus*	Common Leopard	3	FD+	VU	Sch.I
18	*Caracal caracal*	Caracal	-	FD@	LR-nt	Sch.I
9	**Mustelidae**					
19	*Melivora capensis*	Honey Badger	-	FD@	LR-lc	Sch-I
20	*Lutrogale perspicillata*	Smooth-coated Otter	-	FD@	VU	Sch.II
10	**Viverridae**					
21	*Paradoxurus hermaphroditus*	Common Palm Civet	1	**	LC	Sch.II
11	**Herpestidae**					
22	*Herpestes edwardsii*	Common or Grey Mongoose	4	FD+	LR-lc	Sch.IV
23	*Herpestes smithii*	Ruddy Mongoose	2(3)	**	LR-lc	Sch.IV
12	**Leporidae**					
24	*Lepus nigricollis*	Indian Hare	92	FD+	LR-lc	Sch.IV
13	**Soricidae**					
25	*Suncus murinus*	House Shrew	-	FD@	LC	
26	*Crocidura attenuata*	Grey Woodland Shrew	-	FD@	LC	
14	**Sciuricidae**					
27	*Funambulus pennantii*	Five-striped Palm Squirrel	(7)	FD+	LR-lc	Sch.IV
15	**Muridae**					
28	*Bandicota indica*	Large Bandicoot-rat	-	FD@	LR-lc	
29	*Tatera indica*	Indian Gerbil	68	**	LR-lc	Sch.V
30	*Rattus rattus*	Black Rat	-	FD@	LR-lc	Sch.IV
31	*Golunda ellioti*	Indian Bush Rat	1	**	-	-
32	*Mus booduga*	Little Indian Field Mouse	19	FD+	LR-lc	

S.no.	Family & Scientific Names	Common name	SAT	FD	Conservation Status	
					CAMP 1998	WPA Anon 1972
16	**Vespertiliondae**					
33	*Scotoecus pallidus*	Yellow Desert Bat	-	FD@	LR-lc	
	Total no. of species		19	33		

SAT Study Area Total , FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study

कार्यालय प्रमुख वन संरक्षक, वन्य जीव, उत्तर प्रदेश, लखनऊ।

पत्रांकः— /26—11 (वेल्सपन एनर्जी) लखनऊ, दिनांकः अक्टूबर, 15 2014,

सेवा में,

मुख्य वन संरक्षक,
मीरजापुर क्षेत्र,उ0प्र0
मीरजापुर।

विषयः— ग्राम ददरी खुर्द, तहसील—सदर, जनपद मीर्जापुर में मेसर्स वेल्सपन एनर्जी यूपी प्राइवेट लि0 द्वारा 2X660 एम0डब्लू0 सुपर क्रिटिकल कोल आधारित थर्मल पावर प्लान्ट की स्थापना के सम्बन्ध में प्रस्तुत Biodiversity Assessment and Preparation of Conservation Management Plan(including wildlife) के अनुमोदन के सम्बन्ध में।

सन्दर्भः— 1—आपका पत्रांक 1151/मी0 क्षे0/33 दिनांक 18—09—2014।
2—प्रभागीय वनाधिकारी, मीरर्जापुर वन प्रभाग, मीर्जापुर का पत्रांक 995/33—वेल्सपन दिनांक 09—09—2014।

महोदय,

कृपया उपरोक्त सन्दर्भित पत्रों से प्रेषित विषयक प्रस्ताव का अवलोकन करें। उल्लेखनीय है कि ग्राम ददरी खुर्द, तहसील—सदर, जनपद मीर्जापुर में, मेसर्स वेल्सपन एनर्जी यूपी, प्राइवेट लि0 द्वारा 2X660 एम0 डब्लू0 सुपर क्रिटिकल कोल आधारित थर्मल पावर प्लान्ट की स्थापना के सम्बन्ध इस कार्यालय के पत्रांक 272/26—11(वेल्सपन) दिनांक 24—06—2014 से वांछित आख्या के क्रम मे प्रभागीय वनाधिकारी, मीरजापुर वन प्रभाग, मीरजापुर द्वारा पत्रांक 995/33—वेल्सपन दिनांक 09—09—2014 से स्पष्ट किया गया है कि प्रश्नगत परियोजना कैमूर वन्य जीव विहार, मिर्जापुर की सीमा से लगभग 25 किमी0 दूर मीरर्जापुर वन प्रभाग क्षेत्रान्तर्गत प्रस्तावित है। परियोजना की स्थापना व कार्यान्वयन के सम्बन्ध में प्रस्तावक विभाग द्वारा 10 वर्षों हेतु प्रभाग के पादप व जन्तु जगत के संरक्षण उनसे प्रासंगिक विषयों के सन्दर्भ में प्रस्तुत Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) में 184.15 लाख रूपये का प्राविधान किया गया है। उक्त के सम्बन्ध परीक्षण व वांछित आख्या के क्रम में आपके पत्रांक 1151/मी0 क्षे0/33 दिनांक 18—09—2014 से प्रश्नगत Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) से सहमति के साथ प्रतिहस्ताक्षरित कर अनुमोदन हेतु प्रस्तुत किया गया है।

अतः आपके पत्रांक 1151/मी0 क्षे0/33 दिनांक 18—09—2014 द्वारा की गयी संस्तुति के क्रम में प्रस्तुत Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) निम्न शर्तो के अधीन अनुमोदित कर संलग्न किया जाता है।

1— उक्त Biodiversity Assessment and Preparation of Conservation Management Plan (including wildlife) में वन्य जीवों के संरक्षण हेतु प्रस्तावित कार्यो का कार्यान्वयन सुनिश्चित

करने हेतु उक्त प्रबन्ध योजना में उल्लिखित Monitoring Committee का गठन कर जिसका अनुमोदन मुख्य वन संरक्षक, वन्य जीव पश्चिमी क्षेत्र, उ0प्र0, कानपुर से प्राप्त करना होगा।

2– जनपद मिर्जापुर व सोनभद्र में कैमूर वन्य जीव विहार क्षेत्र में व सन्निकट आरक्षित वन क्षेत्रों में विचरण करने वाले काले हिरन (Black Buck) के विस्तृत अध्ययन व संरक्षण हेतु एक कार्ययोजना वन्य जीव संस्थान देहरादून से तैयार करवा कर मुख्य वन्य जीव प्रतिपालक, उ0प्र0 को प्रस्तुत करना होगा।

भवदीय,

(डा0 रूपक डे)
प्रमुख वन संरक्षक, वन्य जीव,
उत्तर प्रदेश, लखनऊ।

पत्रांक 389 /उक्तदिनांकित।
प्रतिलिपिः–निम्नांकित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. मुख्य वन संरक्षक, (मध्य क्षेत्र), भारत सरकार केन्द्रीय भवन पॉचवा तल, सेक्टर एच अलीगंज, लखनऊ।
2. मुख्य वन संरक्षक, (वन्य जीव) पश्चिमी क्षेत्र उ0प्र0, कानपुर।
3. प्रभागीय वनाधिकारी, मिर्जापरु वन प्रभाग, मिर्जापरु।
4. प्रभागीय वनाधिकारी, कैमूर वन्य जीव प्रभाग, मिर्जापुर।
5. मुख्य प्रबन्धक, मेसर्स वेल्सपन एनर्जी यूपी प्राइवेट लि0 मिर्जापुर।

(डा0 रूपक डे)
प्रमुख वन संरक्षक, वन्य जीव,
उत्तर प्रदेश, लखनऊ।

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FORWARD

Welspun Energy UP Private Limited (WEUPPL) proposes to setup a Greenfield Coal based Thermal Power Plant (TPP) of 1320 MW (2x660 MW) capacity at Dadri Khurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh. As per the Environmental Impact Assessment (EIA) Notification dated 14th September 2006 as well as its amendment thereafter on 1st December 2009, the proposed thermal power plant project falls under 'Category A' with project or activity type number '1(d)', which requires preparation of EIA Report to get Environmental Clearance (EC) from the Ministry of Environment and Forests (MoEF), New Delhi.

In addition to the EIA study, as part of the Environment Clearance (EC) of MoEF, New Delhi, the project proponent (WEUPPL) need to carryout Ecological and Biodiversity status assessment study to identify endangered (Schedule I species) species and prepare Conservation and Management Plan for the same.

In this context, Green Future Foundation (GFF), New Delhi was given consultancy to carry out the biodiversity assessment study covering the project site and 10km radius buffer. This report discuss the biodiversity status covering major floral and faunal groups in terms of species richness, diversity, distribution and abundance specific to core and buffer zones of the study area. In addition, presence of ecologically sensitive areas were also identified. Based on this, species specific conservation and management plans were suggested for threatened/endangered biota, which include habitat improvement plans suggested under green belt development program to support the threatened fauna and enhance the overall biodiversity of the project study area.

Date:

Authorized Signature
(Project -In-charge)

CHAPTER 1- PROJECT INTRODUCTION

1.1. AN OVERVIEW OF PROJECT PROPONENT

Welspun Energy UP Private Limited (WEUPPL) is a Special purpose Vehicle (SPV) of Welspun Energy for developing the proposed 2x660 MW coal based power plant based on supercritical technology.

VISION OF WEUPPL

"Looking at the growing energy needs of Uttar Pradesh, Welspun Energy Limited envisages initiating a 2 x 660 MW thermal power plant in Mirzapur. This will help the state of Uttar Pradesh to minimize its energy deficit and contribute towards making India energy independent. Environment safety and community interest are paramount to us in this endeavor. We are using super critical technology, which will minimize adverse impact to the environment. We are committed to improving the lives of the local people by generating direct/ indirect employment in this region and would be investing in their health &education. We endeavor to provide the community a sustainable and secure future."

Welspun Energy, an integral part of the Welspun Group, established to setup over 5,000 MW commercial thermal power plants over the next three years in various states of India. It would also fulfill its commitment towards a green and clean energy setting up solar, hydro, biomass and wind energy power generating facilities.

Welspun Group ranks amongst India's fastest emerging conglomerates with an enterprise value of ` 15,000 Crores. Welspun Stahl Rohren, the flagship company of the group is the world's 2nd largest pipe producer. With proven capabilities in steel, steel pipes, power generation and home textiles, Welspun have global presence in over 50 countries. The group enjoys strong relationship with marquee clients including most of the Fortune 100 Companies.

The company started its activity in 1995 with Hsaw pipe manufacturing facility of 30,000 TPA at Dahej, Gujarat. The company also manufactures steel plates cum coil at its recently commissioned facility at Anjar, Gujarat. Welspun is accredited with over 50 oil and gas majors of the world and among one of the few preferred vendors across the globe.

1.2. RATIONLAE OF THE STUDY

Welspun Energy UP Private Limited (WEUPPL) proposes to setup a Greenfield Coal based Thermal Power Plant (TPP) of 1320 MW (2x660 MW) capacity at Dadri Khurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh.

As per the Environmental Impact Assessment (EIA) Notification dated 14th September 2006 as well as its amendment thereafter on 1st December 2009, the proposed thermal power plant project falls under '**Category A**' with project or activity type number '1(d)', which requires preparation of EIA Report to get Environmental Clearance (EC) from the Ministry of Environment and Forests (MoEF), New Delhi.

The EIA report was prepared as per the Terms of Reference (ToR) issued by MoEF, vide letter no. J-13012/12/2011-IA. II (T) dated 15th June, 2011 and submitted. In addition to the EIA study, as part of the Environment Clearance (EC) of MoEF, New Delhi, the project proponent (WEUPPL) need to carryout Ecological and Biodiversity status assessment study to identify endangered (Schedule I species) species and prepare Conservation and Management Plan for the same.

In this context, **Green Future Foundation (GFF), New Delhi** was given consultancy to carry out the ecological study in and around the proposed project site covering 10km radius. This study aimed to identify the presence of threatened biota (flora and fauna), assess their status and provide conservation and management plan for the endangered or Schedule I species of Wildlife Protection act (1972) reported in the project study area.

1.3. PROJECT DETAILS

The proposed coal based power plant is of 1320 MW capacity will comprise of two units of 660 MW capacity each, based on super-critical technology. The project utilize domestic coal from NCL/SECL /CCL / or Imported Coal from Indonesia as primary fuel. The plant will be designed for base load operation with a plant design life of about 25 years. The land requirement for the project is 875 acres including power plant, ash pond and other auxiliaries and the estimated cost of the project is about Rs 7500 Crores.

1.3.1 Location of the Project

The proposed plant site is located at Dadri Khurd village in Mirzapur Sadar tehsil, Mirzapur district in Uttar Pradesh. Varanasi town is located at a distance of about 50 km from the proposed plant site, whereas the district head-quarter of Mirzapur is located at a distance of about 18 km from the proposed plant site. The details of environmental setting are given in **Table-1.1**. The index map of the project site is shown in **Figure-1.1**.

1.3.2. Access to the Site

The State Highways, SH-5 and NH-7 run at a distance of 1.5 km, SW and 10 km, N respectively from the proposed plant boundary. The nearest railway link is located at Sakteshgarh Railway Station & Sarsongram Railway Station at a distance of 15.5 km, E-NE & 15.5 km, E respectively from the project site. The nearest airport to the project site is located in Varanasi.

1.3.3 Environmental Setting of the Project Site

The Upper Khajuri Dam is at a distance of 5.5 km, NW and Ganga River is flowing at a distance of 17.0 km, N from the project site. However, the project area is devoid of any major stream meeting these water bodies. There are no protected areas as per Wild Life Protection Act 1972 like biospheres, tiger reserves, wildlife sanctuaries, Natural parks in the 10 km radius of the study area. The project area falls under Seismic Zone-III as per Indian Standards, IS: 1893-2000.

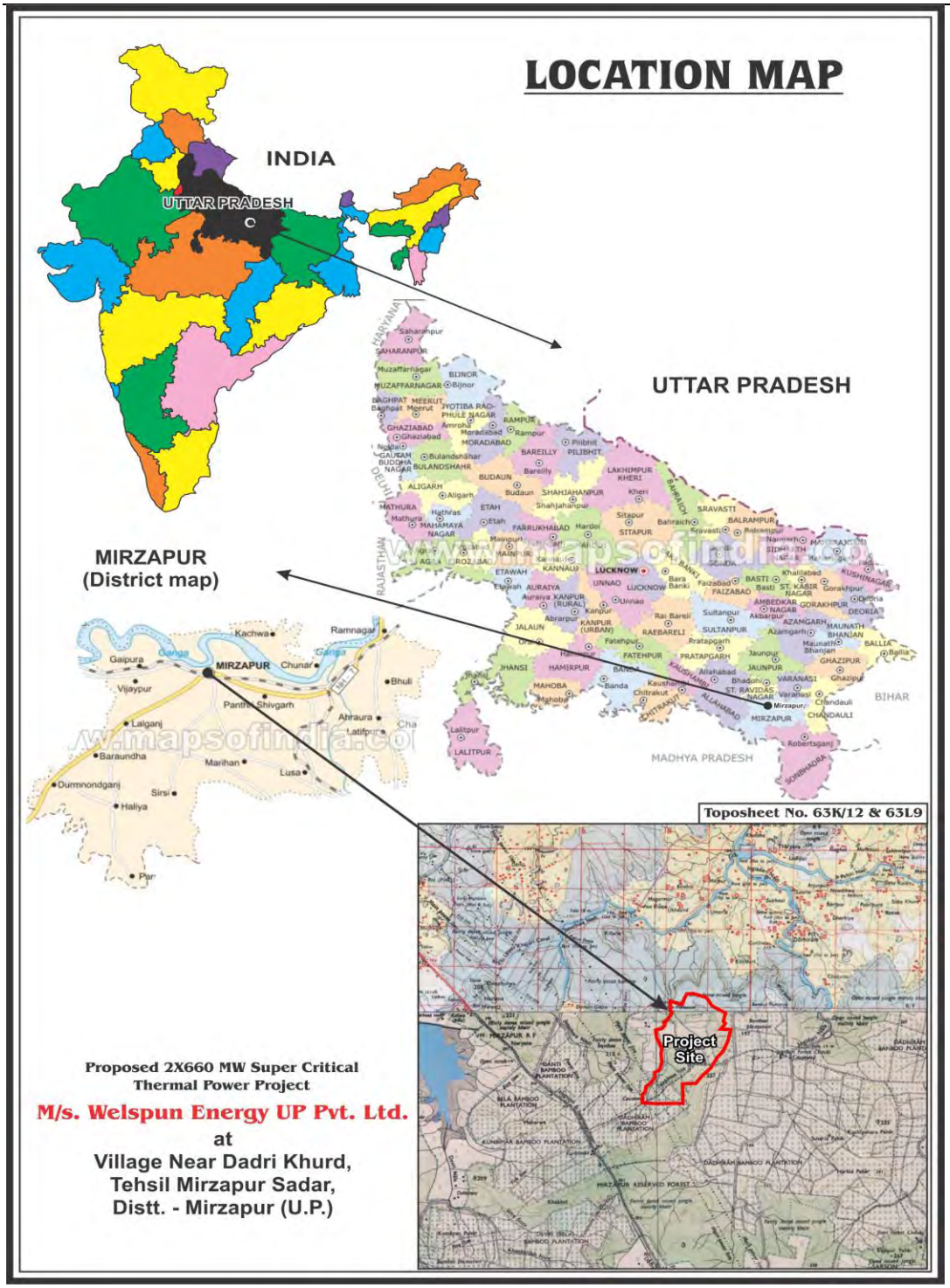
Table 1.1 Environmental Setting around 10-km radius of WEUPPL Project site

Sr. No	Particular	Details		
1	Location	Dadri Khurd Village, Mirzapur Sadar Tehsil, Mirzapur District, Uttar Pradesh		
2	**Coordinate Range**	**Sr. No.**	**Latitude**	**Longitude**
a	Plant Boundary	1	25° 00' 16.887"N,	82° 40 29.204"E
		2	24° 59' 45.117"N,	82° 41 03.728"E
		3	24° 58' 41.858"N,	82° 40 23.802"E
		4	24° 58' 41.645"N,	82° 39 50.425"E
		5	24° 59' 08.278"N,	82° 40 00.404"E
		6	24° 59' 44.581"N,	82° 40 00.552"E
b	Ash Dyke Area (within plant boundary)	A	82° 40' 27.5"E	25° 0' 14.5"N
		B	82° 40' 57.8"E	24° 59' 57.1"N
		C	82° 40' 43.5"E	24° 59' 54.8"N
		D	82° 40' 8.2"E	24° 59' 46.8"N

Sr. No	Particular	Details		
		E	82° 40' 13.7"E	25° 0' 7.5"N
c	Chimney	C	82°40'26.15" E	24°59'35.08"N
3	Toposheet No.	63 K/12 & 63 L/9		
4	Site elevation	180 m above Mean Sea Level (MSL)		
5	Topography	Slightly undulating		
6	Climatic Conditions : IMD, Varanasi, Pre- Monsoon season	Mean Minimum Temperature: 12.1°C Mean Maximum Temperature: 37.6°C Predominant Wind Direction: W Relative Humidity: At 8:30 hrs: 31 % to 61% and at 17:30 hrs: 14 % to 45 % Rainfall: 47.5 mm		
7	Climatic conditions at site (monitored during Pre Monsoon season, 2011)	Mean Minimum Temperature:11.6°C Mean Maximum Temperature: 42.0°C Predominant Wind Direction: W Relative Humidity: At 8:30 hrs: 32 % to 62 % and at 17:30 hrs: 16 % to 48 % Rainfall: 0 mm		
8	Nearest Habitations (Population as per Census-2001 Data)	Dadri Khurd (Population : 09) Dadri Gahira (Population : 48)		
9	Present land use at the site	Mostly barren		
10	Nearest Major Roads/ Highway	State Highway, SH-5 (1.5 km, SW) National Highway, NH-7 (10.0 km, NNE)		
11	Nearest Railway Line	Broad Gauge Railway line of Northern Railways (NR)		
12	Nearest Railway Station	Sakteshgarh R.S. (15.5 km, ENE) Sarsongram R.S. (15.5 km, E)		
13	Nearest Airport	Varanasi (50 km, NNE)		
14	Nearest Seaport	Haldia		
15	Nearest Town	Mirzapur –District Headquarters (18 km, NW)		
16	Nearest water bodies	Jamtlhwa Nadi (2.0 km, N) Jogiadar Nadi (2 kms, NE) Pahiti Nadi (3.75 kms, NE) Upper Khajuri Dam (4 km, W) Ganga River (17 km, NE)		
17	Eco sensitive Zone (National Part, Wildlife Sanctuary, Biosphere reserve wildlife corridors etc.) Within 10 km radius of the project site.	No Eco sensitive Zone viz. National Park, Wildlife Sanctuary, Biosphere reserve, Wildlife corridors and Protected Forest falling with the 10 km radius of the project site.		
18	Reserved/Protected forests	Danti RF (on northern side of project site) Mirzapur RF (on southern side of project site) Bahati RF(6.0 km in SW) Karaunda RF (5 km, SW) Patehra RF(5.0 km in SW) Malua RF (8.5 km in SW) Chandlewa Khurd RF (6.0 km in NNE) Nanauti RF (7 km in E) Golhanpur RF (6.5 km in E) Sarson RF (5.5 km in SE)		

Sr. No	Particular	Details
19	Areas susceptible to natural hazards (earthquakes, erosion, flooding or extreme or adverse climatic conditions)	None within 10 km radius study area
20	Archaeologically important places as per Archeological Survey of India Records	None within 10 km radius study area
21	Existing Industries	None within 10 km radius study area
22	Seismic Zone	Zone-III as per IS:1893-2000

Note: All distances mentioned above in parenthesis are aerial distances



Source: WEUPPL

Map 1.1. Location details of the Proposed Thermal Power plant - WEUPPL

1.4. IMPORTANCE OF THE PROJECT

Though there has been substantial growth in power sector infrastructure in India, the power supply position is still characterized by shortages, both in terms of demand met during peak periods and the overall energy supply. Many parts of the country continue to reel under severe power shortages. The all India region-wise forecast for electrical energy requirement and peak demand scenario fare presented in **Table-1.2**.

Table 1.2. Long term forecast of power demand

Sr. No	Region	Electrical Energy Requirement (TWh)			Peak Electric Load (GW)		
		2011-12	2016-17	2021-22	2011-12	2016-17	2021-22
1	Northern	294.8	411.5	556.8	48.1	66.6	89.9
2	Western	294.9	409.8	550.0	47.1	64.3	84.8
3	Southern	253.4	380.1	511.7	40.4	60.4	80.5
4	Eastern	111.8	168.9	258.2	19.1	28.4	42.7
5	North-Eastern	13.3	21.1	37.0	2.5	3.8	6.2
6	**All India**	968.7	1392.1	1914.5	152.7	218.2	298.3

Source: "Long Term Forecast at Power Station Bus Bars", 17th Electric Power Survey (EPS) of India, Central Electricity Authority (CEA)

The economic growth of any country depends upon the availability and consumption of energy. The level of development of a country is measured in terms of per capita energy consumption. Presently India's per capita energy consumption at 717 KWh/year (during 2007-08), which is less than that of other developing countries like China (1891) and Malaysia (1000). The per capita energy consumption of the developed countries is very much higher like United States of America (13338), Sweden (16665) and Canada (18117).

World average per capita energy consumption is 2500 kwh/year. The present installed capacity in India is around 1,49,111 MW as on 31st May, 2009 and requires significantly more generating capacity to match the pace of development taking place in the country as well to bridge the gap between demand and supply. Government is aiming to increase the present installed capacity to 200,000 MW by 2012 and aiming per capita energy consumption of 1000 kwh/year. The investment from public and private sector for capacity addition shall help the nation to achieve the energy availability.

The Central, State and Private contribute to the availability of power in the country. State owns a share of about 52%, central own a share of about 33% of installed capacity and the rest 15% by private sector. Major contribution of energy came from thermal (64%) followed by Hydel energy (25%). Ministry of Power has estimated that by the year 2012, India's peak demand would be 152,746 MW with energy requirement of 975 Billion Unit (BU).

1.4.1. Power Development Scenario-11th Plan Period

As per the "5th National Power Plan (2002-2012)" prepared by CEA, a need based installed capacity of the order of 2,12,000 MW is required by the end of 11th plan based on demand projections of 17th Electric Power Survey (EPS). The primary resources for electric power generation are water, fossil fuel (coal, lignite, oil and natural gas) and nuclear energy. These would continue to serve as major sources of power generation in the long run, though various forms of renewable sources viz, wind, bio-mass, tides, etc., will also contribute to meeting the demand.

As per Central Electricity Authority's (CEA) projection for the 11th Plan (2007-2012), the capacity addition requirement is 78,578 MW comprising 16,627 MW of hydro, 58,571 MW of thermal and 3,380 MW of Nuclear. Out of the total thermal capacity of 58,571 MW, the coal/lignite based capacity shall be 53,930 MW. This implies that the capacity addition has to be about 10,786 MW per annum through coal / lignite alone

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1.4.2. Power Development Scenario-Beyond 11th Plan

The Indian Power System requirement had been assessed to need a hydro power and thermal/nuclear power mix in the ratio of 40:60 for flexibility in system operation depending on typical load pattern. The motion to achieve this mix and to accelerate the hydro electric power generation of 50,000 MW has already been initiated by Government of India (GOI).

CEA has identified new hydro schemes aggregating to a capacity of 30,000 MW for yielding benefits during the 12th Plan period (2012-2017). These schemes have been identified based on their present status as available with the CEA. Nuclear Power Corporation has planned to add nuclear power projects aggregating to 12,000 MW to be commissioned in year 2012-2017.

A capacity addition of 21180 MW has been achieved during 10th plan and 78578 MW is assessed as required during the 11th plan. However, it may be noted that the proposed capacity addition in the 11th Plan is three and a half times of that achieved in the 10th Plan, which is rather very ambitious.

As per CEA/Planning Commission, a tentative capacity addition of 82,200 MW has been envisaged for the 12th Plan. This comprises of 30,000 MW hydro, 40200 MW thermal and 12000 MW of Nuclear power plants Considering the slippages in the past, and keeping in view the huge power generation capacity requirement to be added during the 11th and 12th

Plan periods, an urgent need is felt for a large scale thermal power development programme in an environment friendly manner.

All the three sectors namely Central, State and Private contribute to the availability of power. On the consumption side, industrial sector is the principal consumer of electricity followed by agricultural and domestic sector. The domestic sector shows the highest growth rate in electricity consumption in the recent past and electricity consumption in the agricultural sector has been rising at the rate of 7 to 8 percent due to government's policy of supplying heavily subsidized power to the farmers and massive rural electrification.

The rapid pace of all round developments of the states in the region due to globalization of economy has seen the states in the region to be a few of the highest power consuming states in the country. The power demand and availability figures of the state exhibit a wide uncovered margin calling attentions of the SEB's to accelerate the pace of growth in this core sector. With the present trend of growth rate ranging around 7-9% for the past two decades, the concern of State Government in the region can be gauged from the urgency with which they are exploring all possible means of augmenting the generating capacity.

The power scenario in the region during 10th and 11th Five Year Plans has been discussed in detail and need for the proposed station is studied in the backdrop of past and future power demands, viz, present and future generation capacities planned for bridging the gap.

1.4.3. Justification of Project

The actual growth in industrial, agricultural and domestic demand will establish that there is a considerable shortfall in the installed capacity, demand and energy availability as on date. This shortfall will continue even after the commissioning of the proposed power plants in various parts of the State. As Uttar Pradesh is the most preferred State for industrialization, the industrial demand for power will be ever increasing.

In order to narrow down the bridging gap between supply and demand, the proposed capacity addition by 2x660 MW TPP which will yield benefits in the 12th Plan gets justified due to projected deficit in the Northern Region.

With open access of the transmission lines now available and power trading possible, the merchant power plants can sell electricity to registered power traders, who will in turn identify buyers for the power. Under such a favorable condition, putting up of a thermal power plant by WEUPPL is justified.

CHAPTER 2: ECOLOGICAL STUDY APPROACH AND METHODOLOGY

2.1. SCOPE OF WORKS

In order to assess the overall status of biological environment of pre-project scenario and status of threatened biota and prepare Conservation and Management Plan for schedule I species the following scope of works have been formulated and studied.

FLORA

- **Assess the status of major floral components of all the terrestrial habitats within the study area (10km radius buffer) of the proposed thermal power plant.**
- **Collection and compilation of secondary information on the status of floral components and habitats from the concerned stakeholders – Forest department and others.**
- **Identification and listing of floral species of conservation significance (Rare, Endangered and Threatened - RET species) accordance with WCMC and BSI in the study area.**

FAUNA

- **Assess the status of major faunal groups (amphibians, reptiles, terrestrial and aquatic birds and mammals) within the study area (10km radius buffer) of the proposed thermal power plant.**
- **Collection and compilation of secondary information on the status of faunal groups and habitat from the concerned stakeholders – Forest department and others.**
- **Identification and listing of faunal species of conservation significance (RET species) in accordance with IUCN / WPA – 1972 act of MoEF in the study area.**

HABITAT

- **Identification of ecologically sensitive area (Protect Area: Sanctuary, National Parks, Biosphere Reserve, pertaining to Faunal diversity) exist in the vicinity of the (Within 10 km Radius) study area**

MANAGEMENT PLAN

- **Provide conservation and management plan to improve the habitat quality of the project area to enhance the overall biological diversity (Flora & Fauna) on need basis**
- **Suggest conservation and management plan for the critically endangered & endangered (schedule I) species if any reported within the study area**

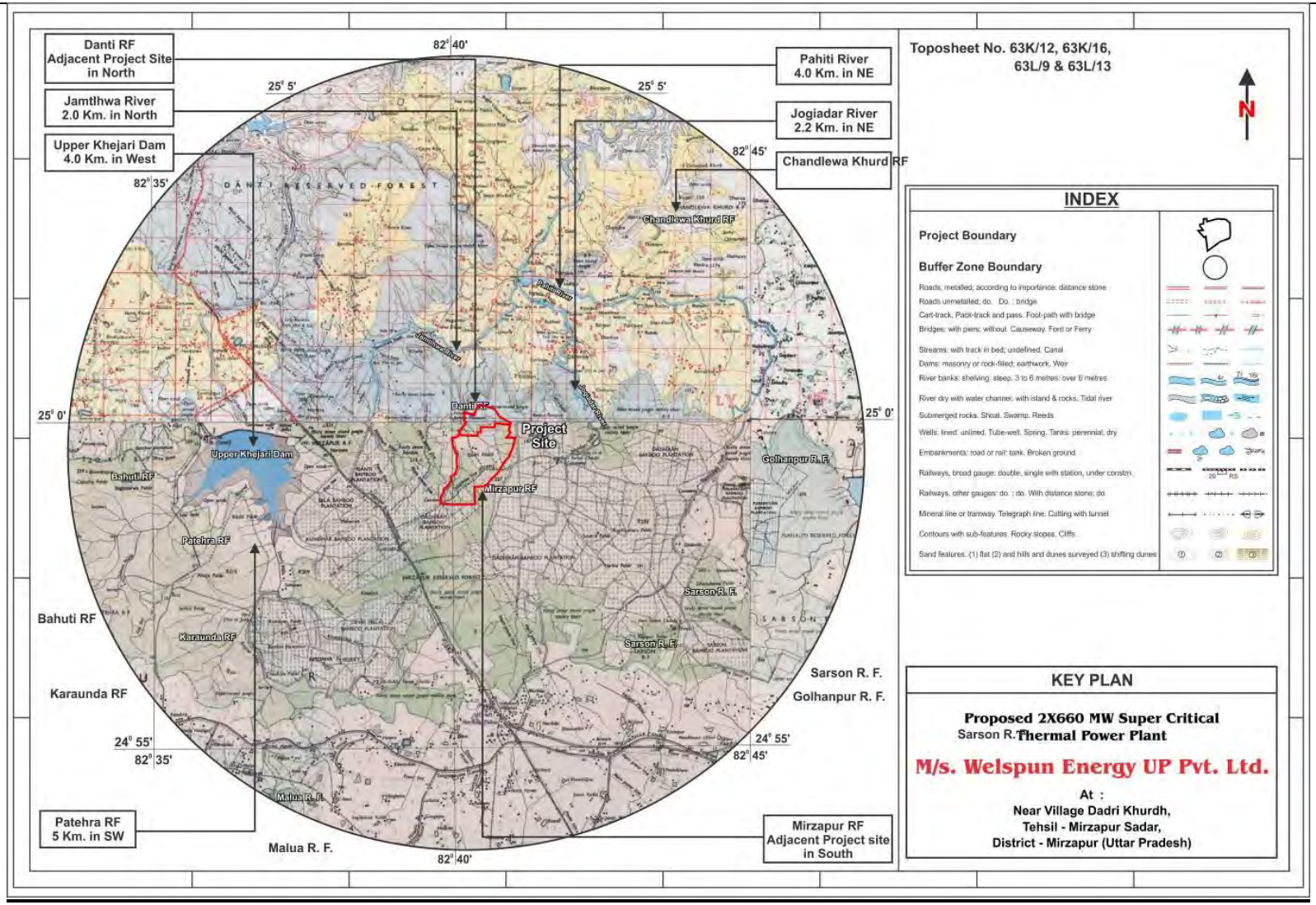
2.2. PROJECT STUDY AREA.

The proposed power plant will have two units with a total power generation capacity of 1320 MW. The land requirement for the project is 875 acres (354.11ha) including power plant, ash pond and other auxiliaries. The proposed plant site is located at Dadri Khurd village in Mirzapur Sadar tehsil, Mirzapur district in Uttar Pradesh. The details of environmental setting are given in **Table-1.1**. The index map of the project site is shown in **Figure-1.1**. The geographical co-ordinates of the proposed plant site on Survey of India (SOI) toposheet No. 63K/12 & 63 L/9 falls between 24°58'41.6"to 25°0'16.8" N Latitudes and 82°39'50.4"E to 82°41'03.7"E longitudes (**Figure 2.1**)

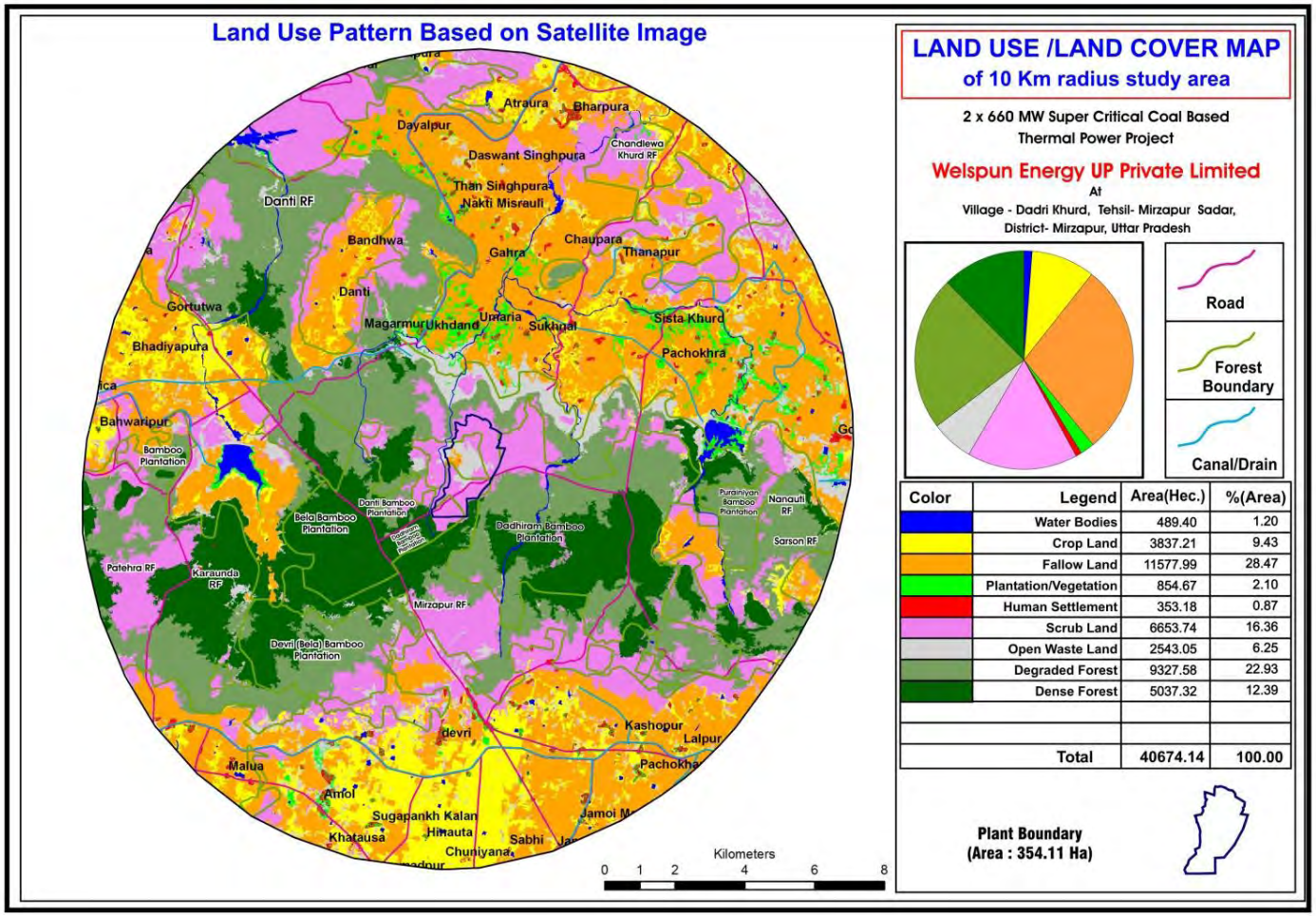
In addition to the 875 acres (354.11 ha) land of the project site, area of 10 km radius from the boundary of the plant site has been taken as buffer zone which covers the total extend of 40674.14 ha. The breakup of the land use and land cover showed nine types of land use and land cover. Among the land use maximum extent of 11,577.99 ha fall under fallow land followed by 9327.58 ha of degraded forests and they contribute 28.47 and 22.93% of the total respectively. Adding the dense forest, overall the study area comprises 14364.90 ha of forest land which shares 35.32% of the land use of the study area **Table 2.1. & Figure 2.2.**

Table 2.1. Land Use /Land cover details of the Study area - WEUPPL

S.no.	Land Use/Land Cover	Area (in Ha)	% (Area)
1	Water bodies	489.40	1.20
2	Crop land	3837.21	9.43
3	Fallow land	11577.99	28.47
4	Plantation /Vegetation	854.67	2.10
5	Human settlement	353.18	0.87
6	Scrub land	6653.74	16.36
7	Open waste land	2543.05	6.25
8	Degrade forest	9327.58	22.93
9	Dense forest	5037.32	12.39
	Total	**40,674.14**	**100.00**



Map 2.1. Study Area Map of the Thermal Power Plant Project (10 km radius) - WEUPPL



Color	Legend	Area(Hec.)	%(Area)
	Water Bodies	489.40	1.20
	Crop Land	3837.21	9.43
	Fallow Land	11577.99	28.47
	Plantation/Vegetation	854.67	2.10
	Human Settlement	353.18	0.87
	Scrub Land	6653.74	16.36
	Open Waste Land	2543.05	6.25
	Degraded Forest	9327.58	22.93
	Dense Forest	5037.32	12.39
	Total	40674.14	100.00

Map. 2.2 Land use land cover map of the proposed project study area

2.3. STUDY APPROACH AND METHODOLOGY

2.3.1. Study Plan

In order to understand the ecological status of different habitats and the status of biodiversity in and around the proposed Thermal power plant project area of WEUPPL, field work was carried out between April 2012 and June 2012 (**Table 2.2).**

Table 2.2: Field Survey and Report Preparation Schedule

Month	Broad level approach
April 2012	Reconnaissance of the Existing Environmental Setup of the proposed Thermal Power Plant project (WEUPPL) study area with project proponents. Collection of project related secondary information from the project proponent, government departments (forest Dept) and other stakeholders Review of literature – scientific publications
May 2012	Field work and data collection pertaining to different scope of works formulated for the biological components covering flora, fauna and habitat
June 2012	Data analysis and report preparation and submission of draft report
July 2012	Submission of final report

2.3.2. Macro level Approach

2.3.2.1. Reconnaissance Survey

- Rapid survey of project area was carried out to identify and understand the existing biological environments and different land use/land cover of the proposed thermal power plant project study area (10 km radius)

- Interaction and discussion was held with the project proponents (WEUPPL) to understand and get the firsthand information about the project and associated activities.

2.3.2.2. Secondary data collection

- Project related secondary information from the project proponent in the form of base maps and technical reports with brief project technical details were collected.
- Project related information specific to project study components (flora, fauna and habitats) were collected from different stakeholders (State Forest departments, Revenue Dept etc).

- Scientific information available in the form of published papers, reports, books, State flora were collected from the in house facilities and other sources like institutions and e-facilities.

2.3.2.3. Delineation of the Study Area

The study area was delineated into two zones: **Core zone** – which includes the project area i.e., the area, earmarked for the proposed thermal power plant project and associated activities – 875 acres.

Buffer zone; which includes the adjacent land area of 10 km radius from the boundary of the project site or Core zone. Based on the availability and heterogeneity of the land use and land cover or habitat types, field based primary data were collected.

2.3.3. Micro level Approach- Field Data Collection

Micro level approach involves mainly the field based primary data collection using standard field techniques on different components of the scope of works. Field data collection mainly includes aquatic micro biota status (phyto and zooplankton) and terrestrial biodiversity status assessment of major habits of floral species such as trees, shrubs, Climbers, herbs and grass. Faunal diversity was assessed by inventorying and quantifying the major faunal groups like: amphibians, reptiles, birds (both aquatic and terrestrial) and mammals.

2.3.3.1. Aquatic Micro biota (Planktons)

Phytoplankton: The water samples were collected from three locations from each dam site. The samples were collected from 10 cm depth below the water surface. Polythene bottles of different capacity were used for collection of water samples. All sampling bottles were soaked in 10% Nitric acid solution for 24 hrs and then rinsed with distilled water before use. The samples were subjected to phytoplankton and zooplankton analysis using following techniques. The Lackey Drop (micro-transect) Count Method (Lackey, 1938; Edmonson, 1969) is used for obtaining counts of phytoplankton.

Zooplankton: Around 20-50 L of water is passed through plankton net (mesh size 50 μm) to concentrate zooplankton. The entire water is centrifuged, decanted and concentrated to make 1 ml volume for observation in S-R (Sedgwick-Rafter) counting cell. The zooplankton is counted in 10x magnification. For studying community structure, the species are grouped in taxonomic classes and percentages of groups are calculated from total counts of sample.

2.3.3.2. Floral Status

- Status of floral species was assessed in the representative habitat types like; forest, agriculture/fallow land, scrub land and water bodies/wetlands (river, streams and dams) existing in the study area.

- Quantitative data were collected using standard Quadrat methods (Circular plot) following Mueller-Dombois and Ellenberg 1967, Kershaw 1973.

- Status of tree, shrub and annuals (grass and herb) was quantified using circular plots of different sizes of 15m, 8m radius and 2 x 1m ^{2} plots respectively.

- List of plant species ascertained from the concerned State Forest Department (Mirzapur Division) was compiled and included in the annexure along with filed data to give near complete floral list of the study area.

2.3.3.3. Faunal Status

Herpetofauna

- Intensive search was made along the hedges of all the aquatic habitats to list the amphibians and relative abundance will be discussed.

- Status of reptiles was assessed using Intensive Time Constrained Search Method covering different micro habitats (Welsh, 1987., Welsh and Lind. 1991).

Birds

Avifaunal status was assessed both in terrestrial and aquatic habitats

- Total count or flock count method was adopted to assess the status of aquatic birds in selected water bodies of the project area (Sridharan 1989, Bhupathy 1991., Thompson 2002 and Steinkamp *et al.,* 2003).

- Point Centre Count and perambulation techniques were applied to assess the status of terrestrial birds (Hutto *et al*., 1986, Bibby *et al.,* 1992, Rosenstock *et at*., 2002).

- Additional effort was made to locate/identify the presence of any breeding/nesting sites / roosting sites of avifauna.

Mammals

- Status and distribution of different mammalian fauna was quantified using direct count covering all the terrestrial habitats of the project area adopting Line transect/road count -Burnham *et al.* 1980, Sale and Berkmuller 1988, Rodgers 1991)(**Plate 1**).

- In addition circular (50m Radius) plots were laid in each sampling location and searched for indirect evidences (pellets, dungs, droppings, scats and other tracks and signs) which would provide relative abundance of presence of mammalian fauna (Thompson *et al*., 1989, Daniels 1992, Henke and Knowlton 1995, Allen *et al*., 1996).

- In addition, presence of different faunal species was also be ascertained and substantiated by interviewing the local people with the pictorial representation and discussion with local experts

- Secondary information collected from the state forest department was incorporated in the list along with field data to give the near complete list of all the major faunal groups.

2.3.3.4. Statues of Rare Endangered and Threatened (RET) Flora & Fauna

- List of threatened flora and fauna of the project study area was prepared and quantified based on the primary field data. Final list was prepared with the comparison of secondary information collected from the DFO office (Mirzapur Forest Division). Baseline information were also reviewed the status of the existing threatened species within the study area by refereeing the authorized references (Anon -IWPA 1972, WCMC 1994, IUCN 2010).

2.3.3.5. Habitat

- Habitat structure and quality covering all the forests were studied using authorized maps (So I) and field survey.

- Baseline primary data collected were used to discuss the overall habitat quality

- Identification of ecologically sensitive area and wildlife corridor based on secondary resources and map work

Plate 1. Field Data Collection in different habitats

	
Floral survey - Open Scrub forest	**Survey in *A.Cathechu* forest**
	
Data collection – Open mixed forest	**Data collection –riverine habitat**
	
Checking micro-habitat for Amphibians	**Checking Micro habitat for Reptiles**
	
Data collection – wetland (Dam Site)	**Data collection – wetland habitat**

2.4. ANALYTICAL ASPECTS

2.4.1. Species Diversity

For studying community structure for flora, terrestrial and aquatic birds, the species were grouped into taxonomic classes and percentage of groups were calculated from total counts of sample. The diversity was calculated for each community using Shannon Wiener Diversity Index (SWDI).

$$d = -\sum_{i=1}^{n} (ni/N).\log_2(ni/N)$$

Where,
n = number of species
N = total number of individuals of all species
ni = number of individuals of "i" th species
d = Shannon Wiener Diversity Index

Where proportion is obtained by dividing the number of individuals of a species by total number of individuals of all species for which $\log_2$ proportion is obtained by Index table (Shannon and Weaver, 1963).

2.4.2. Important Value Index -IVI

The following formula was used to estimate the IVI

Abundance:

Abundance of a species is determined as the number of individuals per sample plot.

$$\text{Abundance} = \frac{\text{Total number of individuals of a species}}{\text{No. of plots in which the species occurred}}$$

Density

Density is defined as the number of individuals of a species in a unit area and is an expression of the numerical strength of a species in a community. The density was calculated from the data sampled using the formula

$$\text{Density} = \frac{\text{Total number of individuals}}{\text{Total number of quadrates studied}}$$

Relative Density

Relative density (RD) is the study of numerical strength of a species in relation to total number of all species and is calculated as:

$$\text{Relative Density} = \frac{\text{Number of Individuals of a species X100}}{\text{Number of Individuals of all species}}$$

Dominance & Relative Dominance (Basal area and Relative Basal Area):

The basal area and the relative basal area were calculated with the diameter of the stem at breast height using the following formula.

$$\text{Basal Area} = \frac{(GBH)\,2}{4\pi}$$

$$\text{Relative Basal Area (Dominance)} = \frac{\text{Total basal area of Individuals}}{\text{Total basal area of all species}} \text{ X100}$$

Frequency, density, dominance and importance value index (IVI) of all woody species were determined according to Misra (1968) and Muller-Dombois and Ellenberg (1974). Basal area, relative density, relative frequency, relative dominance and importance value indices were calculated following the formulae of Curtis and Cottam (1962), where:

- Basal area (m^2) = area occupied at breast height (1.3 m) = (π X $(dbh/2)^2$)
- Relative density = number of tree of species / total number of trees
- Relative frequency = number of times the species occurs / total number of species
- Relative dominance = total basal area of a species / total basal area of all species

Importance value index (IVI) = sum of (relative density + relative frequency + relative dominance).

2.4.3. Relative Important Index

Relative important value index is nothing but the added value of only Relative Frequency and Relative Density estimated for RVI. This index was used only for the status assessment of woody shrub species

2.5. SAMPLING DETAILS – FLORA AND FAUNA

2.5.1. Sample Locations

Under the biological components study a total of 22 locations were surveyed in the core zone (Plant site) which includes eight, 5 locations agriculture/fallow land and 16 in scrub/waste land habitats. In case of buffer zone, out of 94 sampling locations, 27 were surveyed in forests, 16 in the agriculture habitats, while three dam sites and 17 sites along the riverine and stream were surveyed. All the three dam sites were also studied for aquatic fauna and flora. Overall 116 locations were intensively surveyed under this study (**Table 2.3, Map 2.3**).

Table 2.3. Number of locations surveyed in different habitats in the project study area

Habitats	Core Zone	Buffer Zone	Study Area
Forest	NA	27	27
Agriculture/Fallow Land	5	16	21
Scrub/wasteland	17	31	48
Water bodies/Wetland (dams & rivers)	NA	20	20
Total	**22**	**94**	**116**

2.5.2. Sample Plots

Within those 116 sampling locations, different sizes of sampling plots were laid to quantify different habits of floral and taxas of faunal species and details are discussed below.

2.5.2.1. Aquatic Ecology

For the study of aquatic ecology total 3 sampling locations were identified. All three samples were taken from dam sites. The dams are situated away from any pollution sources. Some agricultural fields were observed around the dam sites. Since all the rivers and streams are ephemera with only small puddles of water available, only the three dams which had more water was sampled. The details of sampling locations are given below

D1 (Dam 1): Upper Khajuri Dam (UKD) 3 samples, D2 (Dam 2): Lower Khajuri Dam Location (LKD), D3 (Dam 3): Kathua Bandh Location (KBD)

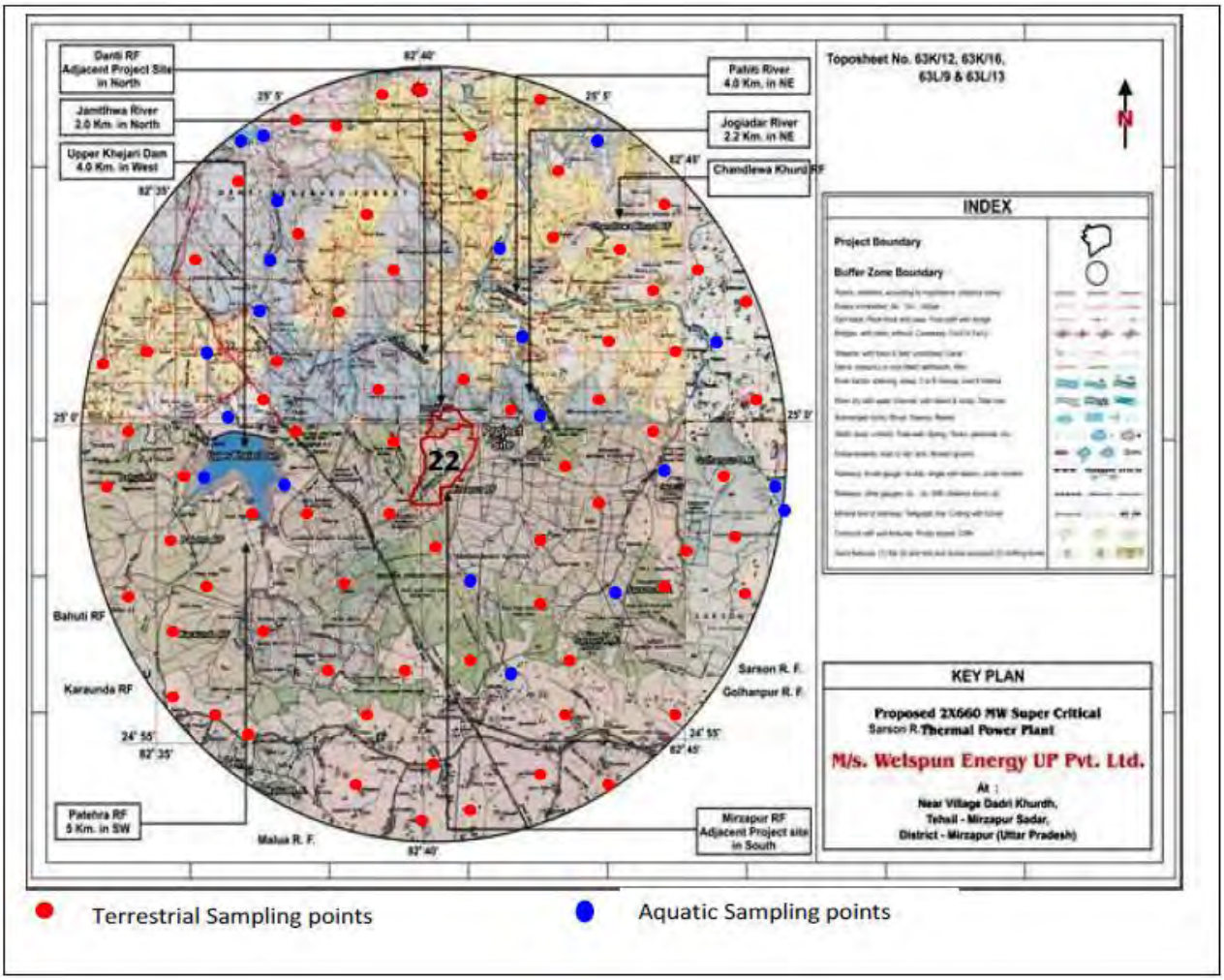
2.5.2.2. Flora

To quantify floral status, a total of 116 x 15 m radius circular plots (22 core zone and 94 buffer zone) were laid and within the sample plots matured tree species > 20 cm gbh were identified and their numbers counted. Within the 15m radius circular plots, 8m radius and 1x1m squire plots were nested to quantify each class of shrub and annuals (herbs, sedges

and grasses).

2.5.2.3. Herpetofauna

A total of 22 and 94 circular plots of 25 m radius were laid and intensively searched all the micro habitats for herpetofauna in both Core and Buffer zones respectively.



Map 2.3. Map showing the sampling locations

2.5.2.4. Birds

To quantify terrestrial birds, 116 x 100m radius Point centre quadrates were used including core and buffer zones. Total count and flock count techniques were used to quantify the aquatic bird species during different times of the study period. A total of 3 dam sites (two

sample in each) and 14 locations along the two river/streams were identified and surveyed for aquatic birds in the buffer zone. Since the core zone / plant site not having any water body aquatic bird survey was not possible

2.5.2.5. Mammals

A total of 116 x 50m radius plots were intensively searched for indirect evidences of mammalian fauna. In addition, roads crisscrossing the project area were traveled exclusively during early morning and late evenings for the direct sightings of mammalian fauna. Details of number of sample plots laid to assess the floral and faunal diversity status are given in **Table 2.4 & Map 2.3.**

All the nomenclature and scientific names have been referred from standard flora for plants and pictorial guides for fauna (Herpetofauna - Daniel J.C. 2002, Birds: Ali, S. 2002, Grimmett, et al.,2006., Mammals: Prater. 2005).

Table 2.4: Details of Sample Plots Used to Assess Floral and Faunal Status: WEUPPL Study Area - Mirzapur, Uttar Pradesh

Components	Plot size	Core Zone	Buffer Zone	Study Area
Planktons			3 Dam sites	
Plants	**Trees: 15** m Radius circular plot	22	94	116
	Shrub: 8 m Radius circular plot	22	94	116
	Herbs & Grass: 1m x1m plots	22	94	116
Herpetofauna	25 m Radius circular plot	22	94	116
Birds	**Terrestrial:** Point centre quadrate method 100 m radius	22	94	116
	Aquatic: Total count and flock count	o	20 (6 in three dams & 14 in rivers)	
Mammals –	**Indirect evidences: 50** m Radius circular plot	22	94	116

CHAPTER 3: BASE LINE STATUS OF BIODIVERSITY

3.1 BIODIVERSITY STATUS

This chapter discuses the ecological status of biota (Flora and Fauna) of the Thermal Power Plant of WEUPPL **(875 acres or 354.11 ha) and 10 km radius of the project study area (40674.14 ha)** in terms of biodiversity covering different life forms of plant species (tree, shrub, herb, grass and others) and major faunal groups (amphibians, reptiles, terrestrial birds, aquatic birds and mammals). Aquatic biology included listing of phyto and zooplanktons of three dam sites and other faunal groups (amphibians and aquatic birds) discussed under major faunal species status. The baseline status of biota (plant and animals) is discussed at three levels; **1. Core zone:** *i.e.,* only the plant area, 2. **Buffer zone** i.e., area of 10 km radius from the core zone boundary **3. Study area:** i.e., overall combining of the status of both core and buffer zones.

3.2 STUDY HABITATS AND COMPONENTS

The Survey of India 1:50,000 Topo sheets: # 63L/9, - covers the Core Zone or Plant site, and 63K/12, 63L/13 and 63K/16 cover 10 km radius Buffer zone. Though the study area has been identified 9 land use patterns (**Table 2.1**), however, since delineation of the study area into more sub-habitat types likely to dilute the biodiversity values, they have been grouped into four major habitat types such as: Forest (Dense forest, Degraded forest, Plantation forest) Agricultural land (agro-ecosystem/agriculture fallow land), wetlands (includes riverine habitats and Dams and Scrub land (Open waste land and scrub land) for the ecological study. Since human habitation was influenced by the agricultural area list of common tree species was prepared and rest of the faunal groups reported were included in the agriculture habitat (**Table 3.1 & Plate 2**).

Table 3.1. Land Use /Land cover and details: WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Land Use/Land Cover	Study Habitats
1	Water bodies	Wetland
2	Agriculture or Crop land	Agriculture/agro ecosystem
3	Fallow land	
4	Scrub land	Scrub Land
5	Open waste land	
6	Degraded forest	Forest Ecosystem
7	Dense forest	
8	Plantation /Vegetation	
9	Human settlement **	

Plate 2. Major Habitat Types of the project study Area

	
Open Scrub/waste land	**Open forest – Zizyphus thorn forest**
	
Dense forest – *Lannea coromandelica*	**Bamboo plantation**
	
Dense forest – *Boswellia serrata*	**Riverine Habitat - *Terminalia arjuna***
	
Seasonal Stream- puddle of water	**Wetland habitat – Dam site**

3.3. BASELINE STATUS- AQUATIC ECOLOGY

3.3.1. Phytoplankton

The phytoplankton community in the study area comprised of three major classes namely Chlorophyceae, Bacillariophyceae and Cyanophyceae. In total 19 taxa were recorded at different sites during the study period **(Table 3.2.)**. Chlorophyceae and Bacillariophyceae were the most dominant group observed in the study area. Some dominant species observed in all the sampling locations were *Chlamydomonas cingulata, Ankistrodesmus falcatus Anacystis spp., Fragilaria capucina, Cosmarium spp., Pediastrum spp., Scenedesmus spp. etc.* The result shows that the fresh water sources found in the study area are without any contamination. The species shows that there is lowest to medium level impact of pollution present in the study area**.**

Table 3.2. Taxa recorded at different Dam sites: Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S. No.	Species Observed	Sampling Sites		
		UKD	LKD	KBD
1	*Rhopalodia gibba*	+	-	-
2	*Navicula radiosa*	+	++	+
3	*Cymbella cistula*	-	+	+
4	*Nitzschia frustulum*	++	++	-
5	*Surirella striatula*	-	-	+
6	*Synedra ulna*	+++	++	+
7	*Tabellaria fenestrate*	+	-	-
8	*Chlamydomonas cingulata*	++	++	+
9	*Ankistrodesmus falcatus*	+++	+	++
10	*Fragilaria capucina*	+	++	++
11	*Cyclotella Stelligera*	++	++	-
12	*Euglena spp.*	+	++	+
13	*Anabaena spp.*	+++	-	++
14	*Anacystis spp.*	++	+	++
15	*Oscillatoria spp.*	+	++	-
16	*Ulothrix spp.*	-	+	++
17	*Cosmarium spp.*	++	+	+++
18	*Pediastrum spp.*	+	++	++
19	*Scenedesmus spp.*	+++	+++	+

UKD-Upper Khajuri Dam, LKD- Lower Khajuri Dam, KBD- Kathua Bandh,
Abundance Category: +=Low, ++=Moderate, +++=High

3.3.2. Zooplankton

Zooplankton, comprised of a total six taxa recorded from the study area **(Table 3.3)** and has shown the presence of two taxa of Rotifer *(Keratella valga and Brachionus bidentata)*, three taxa of Copepoda *(Nauplius* larva, *Diatomus spp.* and *Cyclops vicinus*) and one taxa of Cladocera (*Daphnia magna)*. Zooplankton were observed in all the sampling locations.

Table 3.3. Taxa recorded at different Dam sites: Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S. No.	Species Observed	Sampling Locations		
		UKD	LKD	KBD
1	*Brachionus bidentata*	++	+	+
2	*Nauplius larva*	+++	++	+++
3	*Daphnia magna*	+	-	+
4	*Keratella valga*	++	-	++
5	*Cyclops vicinus*	+++	+++	+++
6.	*Diatomus spp.*	+	+	-

UKD-Upper Khajuri Dam, LKD- Lower Khajuri Dam, KBD- Kathua Bandh, Abundance Category: +=Low, ++=Moderate, +++=High

3.3.3. Aquatic plants

Aquatic plants are also referred as hydrophytes or aquatic macro-phytes. In the study area some hydrophytes were observed during the survey, these are *Azolla spp., Wolffia spp., Spirodella spp.* and *Lemna spp.* These are free floating hydrophytes observed on water surface. These groups of are very important for survival of the fishes and some of the birds that depend on planktons and indirectly the survival of many fish eating water birds present in these water bodies.

3 .4 STATUS OF FLORA

3.4.1 Taxonomical status, species richness and diversity of Plant Species

Core Zone: Core zone i.e., the proposed Plant unit area showed species richness of 87 of 74 genera and 36 families. Among the habitats, 61 plant species were reported from open scrub area followed by 48 from the agriculture habitat with the species diversity of H' 2.08 and H' 3.11 in OS/WL and AG/FL areas respectively (**Table 3.4**). Out of the 87 species only 19 species are trees and the list of core zone do not have any threatened or endangered flora

Buffer Zone: The large extent of 10 km radius of the buffer zone reported 259 species of plants come under 203 genera and they belong to 74 families. The agriculture/fallow land habitat recorded maximum of 140 species of 116 genera belongs to 57 families. Forest habitat was identified 96 species of plants fall under 80 genus and 42 families. Due to moisture availability and record of 52 species of herbs in agriculture habitat showed domination of floral species. Added, dryness of forest area and separation of riverine habitat of forested area reasoned for comparatively lower species richness. The estimated diversity for forest and agriculture was 2.71 and 3.58 respectively (**Table 3.4**). The wetland/riverine

habitat (WB/R) was identified with 111 plant species and diversity of H' 3.81, which was the higher that the other habitats of the buffer zone. Minimum of 67 species were recorded from the open scrub/wasteland habitat. Overall the buffer zone covering large extent of area reported 259 plant species with diversity of H'3.77 (**Table 3.4**).

Study Area: Status of floral species in the proposed Thermal power plant of WEUPPL project study area, which include core and buffer zones reported an overall species richness of 271 species of plants belong to 212 genera and 74 families. (**Table 3.4**) Species list with their life forms and common names are given in **Annexure 1**.

Table 3.4: Taxonomical Status of Floral Species - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OSWL	AGFL		
Family	33	26	36	42	52	35	57	74	74
Genus	54	40	74	80	99	57	116	203	212
Species	61	48	87	96	111	67	140	259	271
Species Diversity	2.08	3.11	3.24	2.71	3.81	3.28	3.58	3.77	3.76

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , Ct- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.4.2 Habit

Core Zone: In case of core zone annuals (herb and grass) showed high richness (42 species) followed by tree species (19 species, including small and large tree species) and they contributed 48 % and 22 % respectively. Shrub (Woody and small shrub) reported with 14 species and they contributed 16% followed by twiners and creepers 12 species (**Table 3.5**). Though the core zone reported 87 floral species, the annuals which include grass, herbs (44 species) and twiners and creepers (12 species) shared overall 61 % of the habit types. Hence the record of only 12 tree species indicate poor canopy vegetation cover in the project site.

Buffer Zone: Overall the buffer zone recorded 259 species, of which maximum of 116 species were annuals (herb and grass) and shared 44. 79 % followed by trees 76 species with 29% (including small and large tree). Woody climbers, Creepers and Twiners contributed a total of 24 species and shared 9% of the list. Shrub habit (woody and small shrub) dominated second and reported 37 species with the share of 14.29% **(Table 3.5**).

Study Area: Inclusive of both the core and buffer zone, a total of 271 species were reported

for the entire study area and dominated by 44% of annuals (herbs and grass) with 118 species, followed by 29% of tree species (79). Only two species of parasitic species were reported in the study area (**Table 3.5**).

Table 3.5: Habit/life form Status of Floral Species - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Habit/Life form	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OSWL	AGFL				
Herb	17	19	31	35.63	23	22	49	52	96	37.07	97	35.79
Grass	8	6	11	12.64	7	8	10	9	20	7.72	21	7.75
Sedge	0	0	0	0.00	0	0	4	1	5	1.93	5	1.85
WC/C/TW	10	4	11	12.64	12	6	9	12	24	9.27	26	9.59
Woody Shrub	6	9	12	13.79	12	9	11	17	26	10.04	30	11.07
Small Shrub	2	2	2	2.30	2	7	3	5	11	4.23	11	4.06
Small Tree	4	2	4	4.60	6	3	2	6	10	3.86	10	3.69
Large Tree	13	6	15	17.24	33	11	22	37	66	25.10	69	25.46
Parasite	1	0	1	1.15	1	1	1	1	2	0.77	2	0.74
Total	61	48	87	100.00	96	67	111	140	260	100	271	100.00

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.4.3. Status of Woody shrubs –RVI

Status of woody shrub was assessed based on Relative Value Index. It is similar to IVI but only total values of Relative frequency and Relative density which reflects the abundance and distribution status.

Core Zone: Core zone reported only 11 species woody shrubs of that *Zizyphus xylopyrus, Zizyphus oenoplia and Cocculus hirsutus* were dominated with 50%, 44% and 32% of RVI values and were first three in order of ranking respectively. Other eight species secured less than 30 % of RVI, therefore only three woody shrubs were dominant in the core zone, which are very common species (**Table 3.6**).

Buffer Zone: Out of 24 woody shrubs reported for the study area 22 species were identified and enumerate from the different habitats of the buffer zone. Among the species, *Zizyphus xylopyrus* topped in the rank and secured 62.49% of RVI followed by *Carissa congesta* and *Cocculus hirsutus* in the second and third position with 29% and 20% of RVI respectively. *Zizyphus nummularia*, *Securine gavirosa, Helicteres isora,* were the other three species secured more than 10% of RVI while rests of 16 species estimated RVI less than 10%. Thus it showed the study area dominated with few woody shrubs (**Table 3.6**).

Overall Status: Based on top six ranking species of core zone, since they secured more than 10% of RVI and top 10 species of buffer zone (leaving *Lantana camara* as it is an exotic species) a cumulative list of 11 species shared 45.83 of the total list of shrub species and 6 species were common between the zones. These species due to their high population and wider distribution in nature they are promising species to consider for habitat restoration program to develop ground vegetation cover, which would arrests soil erosion and also provide forage for browsers (ungulates) of the study area (**Table 3.6**).

Table 3.6: Relative Value Index (RVI) of Common and Wild Woody Shrub species - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Common Woody Shrub species	Core Zone				Buffer Zone				SPS
		RF	RDN	RVI	RO	RF	RDN	RVI	RO	
1	*Zizyphus xylopyrus*	19.23	30.66	49.89	1	25.95	36.54	62.49	1	*
2	*Zizyphus oenoplia*	21.15	23.11	44.27	2	3.05	3.31	6.36	9	*
3	*Capparis spp.*					0.76	0.31	1.08	18	
4	*Zizyphus nummularia*	19.23	9.43	28.66	4	7.63	8.82	16.45	4	*
5	*Cocculus hirsutus*	15.38	16.51	31.89	3	10.69	9.29	19.98	3	*
6	*Capparis sepiaria*					4.58	2.52	7.10	8	*
7	*Capparis zeylanica*	3.85	1.42	5.26	7	4.58	1.57	6.15	10	*
8	*Grewia Sp.*					0.76	0.16	0.92	19	
9	*Securine gavirosa*	1.92	0.94	2.87	9	7.63	4.09	11.73	5	*
10	*Helicteres isora*					3.82	6.30	10.12	6	*
11	*Agave americana*					0.76	0.47	1.24	17	
12	*Carissa congesta*	5.77	7.08	12.84	6	12.98	15.59	28.57	2	*
13	*Lantana camara*					3.05	4.09	7.15	7	
14	*Waltheria indica*	7.69	6.60	14.30	5	2.29	1.26	3.55	12	*
15	*Cocculus pendulus*					3.82	1.57	5.39	11	*
16	*Hibiscus sp*					0.76	0.47	1.24	17	
17	*Woodfordia fruticosa*					1.53	0.79	2.31	14	
18	*Calotropis procera*	1.92	0.47	2.39	10	1.53	0.63	2.16	15	
19	*Kirganeli areticulata*					0.76	0.94	1.71	16	
20	*Ipomoea carnea Subsp. Fistulosa*					1.53	0.94	2.47	13	
21	*Citrus limon*					0.76	0.16	0.92	19	
22	*Hibiscus ovalifolius*					0.76	0.16	0.92	19	
23	*Jatropha curcas*	1.92	2.83	4.75	8					
24	*Asparagus racemosus*	1.92	0.94	2.87	9					
Total species		**11**				**22**				**11**

RF- Relative Frequency, RDN – Relative Density, RVI –Relative Value Index, SA- Study Area, RO - Rank Order, * SP – Selected species

3.4.4. Status of Common Tree species

List of common tree species was prepared simply listing of tree species found in and around the human habitation. This list identified overall 31 species of 27 genera and they belong to

16 families. Among the species 26 were large tree species rests are small trees. Within the list 11 species were selected as domestic use values as fruit trees and suggested for plantation in and around the any residential area proposed to develop under this project **Table 3.7.** These fruit bearing trees are likely to provide food for many bird species. This list also includes some wild tree species commonly found in and around the human habitations.

Table 3.7: Common Tree Species reported in and around the habitation -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family & Species name	Local Name	Size	SP
1	**Anacardiaceae**			
1	*Mangifera indica* L.	Ama	L	*
2	**Annonaceae**			
2	*Annona squamosa* L.	Shareefa	S	*
3	**Apocynaceae**			
3	*Alstonia scholaris* (L.) R. Br.	Saptaparni	S	
4	**Arecaceae**			
4	*Cocos nucifera* L.	*Narial*	L	*
5	*Borassus flabellifer* L.		L	
5	**Caesalpiniaceae**			
6	*Cassia fistula*L.	Amaltas	L	
7	*Cassia siamea* Lam.	Sandan	L	
8	*Delonix elata* (L.) Gamble	Gul Mahor	L	
9	*Parkinsonia aculeata* L.		S	
10	*Peltophorum pterocarpum*		L	
11	*Tamarindus indica* L.	Imli	L	*
6	**Euphorbiaceae**			
12	*Emblica officinalis* Gaertn.	Aawla	S	*
7	**Fabaceae**			
13	*Dalbergia sissoo* Roxb.	Shishu	L	
14	*Derris indica* (Lam.) Bennet	kiramal,karanj	L	
8	**Meliaceae**			
15	*Azadirachta indica* A. Juss.	Neem	L	
9	**Mimosaceae**			
16	*Albizia lebbeck* (L.) Bth.	Shireesh, Chichola	L	
17	*Leucaena latisiliqua* (L.) Wt. & Arn.		L	
18	*Pithecellobium dulce* (Roxb.) Bth.		L	
10	**Moraceae**			
19	*Artocarpus heterophyllus* Lamk.	Katahal	L	*
20	*Ficus benghalensis* L.	Bargad	L	
21	*Ficus religiosa* L.	Pipal	L	
11	**Moringaceae**			
22	*Moringa oleifera* Lam.		L	*
12	**Myrtaceae**			
23	*Eucalyptus globulus* Labill.		L	
24	*Psidium guajava* L.	Amrut	S	*
25	*Syzygium cumini* (L.) Skells	Jamun	L	*
26	*Syzygium heyneanum* Wall. ex W. & A.	Kathjamun	L	*
13	**Rutaceae**			
27	*Aegle marmelos* (L.) Corr.	Bel	L	*

S.no.	Family & Species name	Local Name	Size	SP
14	**Sapotaceae**			
28	*Madhuca indica* J. F. Gmel.	Mahua	L	
29	*Manilkara hexandra* (Roxb.) Dub		L	
15	**Simaroubaceae**			
30	*Ailanthus excelsa* Roxb.		L	
16	**Verbenaceae**			
31	*Tectona grandis* L.f.	Sagon	L	

L-Large tree , S- Small Tree , SP –Selected Species

3.4.5. Status of Wild Tree Species

Status of wild tree species was discussed based on Important Value Index (IVI) estimated by combining Relative frequency (RF), Relative density (RDN) and Relative Dominance (RDO) considering only the matured trees of more than 20cm GBH.

Core Zone: Though the core zone showed high species richness of overall 87 species, it reported only 19 tree species (Table 3.5) and within these only 12 wild tree species were reported as large tree2 (> 20cm GBH). Among the 12 species, *Ficus mollis Vahl (IVI 75%)* ranked 1st followed by *Butea monosperma (*55%), *Acacia cathechu (*44%) and *Flacourtia indica (34%)* and they estimated IVI value of more than 30%. These species were dominant in terms of their wider distribution; more in number and larger in size in the study area. *Zizyphus mauritiana, Lagerstroemia parviflora, Sterculia urens*, *Bauhinia racemosa,* were dominated in the second level with higher than 10% of IVI ***(*Table 3.8**).

Out of the 19 species reported in the core zone only 12 were of matured trees with more than 20 cm GBH. Among these species *Ficus mollis Vahl (IVI 75%)* ranked 1st followed by *Butea monosperma (*55%), *Acacia cathechu (*44%) and *Flacourtia indica (34%)* and they estimated IVI value of more than 30%. Rest of the nine species were estimated IVI value less than 30 % and it shows their poor distribution, density and dominance.

Buffer Zone: Out of 76 tree species reported in the buffer zone, 39 species identified in the forest habitat while maximum of 43 species were reported in agriculture habitat which had few wild tree species. Overall the larger buffer zone listed 24 large trees with >20cm GBH. Among the species *Terminalia bellerica (33%), Ficus mollis (33%), Butea monosperma (32%), Acacia cathechu (21%), Acacia leucophloea (15%),* reported as top five ranking species and they secured more than 15% of IVI values. *Madhuca indica, Terminalia arjuna, Lagerstroemia parviflora* were dominated as second level with more than 10% IVI values.

Study area: Including both the core and buffer zones, a cumulative list of 27 trees were assessed IVI value since they had GBH > 20cm. The species which are secured more than 10% of IVI in core and buffer zones were selected as potential and promising tree species for habitat improvement and any greenbelt development programs. This list include a total of 13 tree species and among those, *Acacia cathechu, Ficus mollis*, *Butea monosperma, Lagerstroemia parviflora* were found dominated in both the zones (**Table 3.8**).

Table 3.8: Status of wild Tree species based on IVI index- Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttrapradesh

S.no.	Wild/Forest Tree species	Core Zone				RO	Buffer Zone				RO	SP
		RF	RDN	RDO	IVI		RF	RDN	RDO	IVI		
1	*Acacia nilotica*						3.27	2.31	0.58	6.16	12	
2	*Aegle marmelos*						1.96	1.16	0.10	3.22	19	
3	*Cassia fistula*						1.31	0.66	0.01	1.98	23	
4	*Dalbergia sissoo*						0.65	3.14	2.00	5.79	14	
5	*Emblica officinalis*						1.31	0.50	0.33	2.13	21	
6	*Ficus benghalensis*						1.31	0.50	7.84	9.64	9	
7	*Ficus racemosa*						3.27	1.49	1.21	5.96	13	
8	*Ficus religiosa*						0.65	0.17				
9	*Madhuca indica*						3.27	1.82	8.32	13.41	6	*
10	*Syzygium cumini*						1.96	0.83	4.34	7.12	11	
11	*Syzygium heyneanum*						0.65	0.17	1.19	2.01	22	
12	*Acacia cathechu*	16.67	24.36	2.58	43.61	3	9.80	11.06	0.26	21.12	4	*
13	*Terminalia arjuna*						3.27	3.96	4.23	11.46	7	*
14	*Ficus mollis*	2.08	1.92	70.69	74.70	1	1.96	0.50	30.11	32.56	2	*
15	*Butea monosperma*	20.83	30.77	3.13	54.73	2	12.42	18.48	0.26	31.16	3	*
16	*Holoptelea integrifolia*	4.17	1.28	2.08	7.53	11	5.23	3.30	0.03	8.56	10	
17	*Stereospermum suaveolens*						0.65	0.17				
18	*Ixora arborea*						1.31	1.49				
19	*Acacia leucophloea*	4.17	2.56	0.60	7.33	12	9.80	5.28	0.07	15.15	5	*
20	*Flacourtia indica*	18.75	14.74	0.03	33.52	4	3.92	2.15				*
21	*Mitragyna parvifolia*						0.65	0.17	0.27	1.09	24	
22	*Xeromphis uliginosa*						1.31	1.16				
23	*Bauhinia racemosa*	2.08	0.64	8.02	10.74	9	2.61	1.32				*

S.no.	Wild/Forest Tree species	Core Zone				RO	Buffer Zone				RO	SP
		RF	RDN	RDO	IVI		RF	RDN	RDO	IVI		
24	*Holarrhena antidysenterica*						6.54	13.86				
25	*Zizyphus mauritiana*	8.33	6.41	1.01	15.76	5	2.61	0.99	0.18	3.79	17	*
26	*Xeromphis spinosa*	4.17	4.49	0.003	8.66	10	1.96	1.32				
27	*Lannea coromandelica*	6.25	5.13	0.52	11.90	8	1.96	0.83	0.71	3.50	18	*
28	*Diospyros melanoxylon*						2.61	1.65				
29	*Lagerstroemia parviflora*	8.33	4.49	2.84	15.66	6	4.58	6.77	0.09	11.43	8	*
30	*Terminalia belerica*						0.65	0.17	32.61	33.43	1	*
31	*Leucaena latisiliqua*						0.65	2.81				
32	*Alangium salvifolium*						1.31	2.31				
33	*Boswellia serrata*						1.31	2.31	1.47	5.09	15	
34	*Wrightia tinctoria*	2.08	0.64				1.31	0.83	0.31	2.45	20	
35	*Sterculia urens*	2.08	2.56	8.51	13.16	7	0.65	0.17	3.48	4.29	16	*
36	*Streblus asper*						0.65	3.96				
37	*Balanites aegyptiaca*						0.65	0.33				
	Total no large tree species	**12**					**24**				**27**	**13**

RF-Relative frequency, RDN- Relative density, RDO-Relative dominance, IVI – Important Value Index, RO – Rank order. SP – Selected species

3.4.6. Status of crop Species

As per the secondary sources, Major crops of the study area cultivated during monsoon period (Kharif crop) and in winter months (Rabi crop) include:

Rabi: Wheat, gram, Pea, Arhar, Barley, Lentil and Mustard etc.

Kharif: Paddy, Gingili, Minor millet, Rapseed, Black gram, Millet, Smaller millet, Green gram and Ground nut.

However, during the study, the list of crop species was prepared based on the casual observation while collecting data in and around the agriculture habitat. Based on the survey a total of 39 species were reported in the study area which were cultivated as major and minor crops, while some species were reported as hedge cultivation in small extent of areas. Based on their use value they have been grouped into five categories.

Among these, three species fall under grain crops, 18 vegetable crops, 11 species of fruit crops, two timber crops, five cash crops. Among the grain crops wheat, paddy, tuvar, millets, grams and ground nut are cultivated extensively as major crops species. Vegetable crops include 18 species; however, bhindi, tamater, chilli, muri and ringna were commonly cultivated as minor vegetable crops. All the 11 species of fruit crops are grown in small areas along the agricultural hedges and mainly for local use. All the five commercial crops are cultivated extensively and they form major income of the local agriculturalists **(Table 3.9)**. *Tectona grandis* and Dalbergia sissoo are the wild timber species, but few trees grown along the agriculture edges in addition to extensive plantation of sissoo under forest plantation.

Since the land use of the core zone has only open scrub/wasteland and agriculture /fallow land and absence of perennial water sources, no intensive agriculture takes place within it.

Table 3.9: List of Agriculture and Commercial Crop Species Reported - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttrapradesh

S. No	Species Name	Family	Common Name	Habit
1	**Grain Crops**			
1/1	*Cajanus cajan*	Fabaceae	Tuvar	Under Shrub
2/2	*Oryza sativa*	Poaceae	Rice	Grass
3/3	*Triticum aestivum*	Poaceae	Gehu	Grass
2	**Vegetable Crops**			
4/1	*Abelmoschus esculentus*	Malvaceae	Bhindi, Bhindo	Under Shrub
5/2	*Allium cepa*	Liliaceae	Pyas	Herb
6/3	*Amorphophallus campanulatus*	Araceae	Sooran	Herb
7/4	*Atriplex hortensis*	Chenopodiaceae	Palak	Herb
8/5	*Capsicum annum*	Solanaceae	Green chili	Herb
9/6	*Cucumis sativus*	Cucurbitaceae	Kheera	Climber
10/7	*Cucurbita maxima*	Cucurbitaceaea	Kaddu	Climber
11/8	*Daucus carota*	Apiaceae	Gajar	Herb
12/9	*Lagenaria siceraria*	Cucurbitaceae	Lauki	Climber
13/10	*Luffa cylindrica*	Cucurbitaceae	Torai	Climber
14/11	*Lycopersicon lycopersicum*	Solanaceae	Tamater	Herb
15/12	*Momordica charantia*	Cucurbitaceae	Karela	Climber
16/13	*Momordica dioica*	Cucurbitaceae	Kheksa	Climber
17/14	*Moringa oleifera*	Moringaceae		Tree
18/15	*Raphanus sativus*	Brassicaceae	Muri	Herb
19/15	*Solanum melongena* var. *melongena*	Solanaceae	Bhanta	Herb
20/17	*Solanum melongena* var. *insana*	Solanaceae	Ringna	Herb
21/18	*Trichosanthes dioica*	Cucurbitaceae	Parval	Climber
3	**Fruit Crops**			
22/1	*Aegle marmelos*	Rutaceae	Bel	Tree

S. No	Species Name	Family	Common Name	Habit
23/2	*Annona squamosa*	Annonaceae	Shareefa	Small Tree
24/3	*Artocarpus heterophyllus*	Moraceae	Katahal	Tree
25/4	*Carica papaya*	Caricaceae	Papita	Small tree
26/5	*Citrus limon*	Rutaceae	Nimbu	Woody shrub
27/6	*Cocos nucifera*	Arecaceae	Narial	Tree
28/7	*Cucumis melo var. melo*	Cucurbitaceae	Kharbooja	Herb
29/8	*Emblica officinalis*	Euphorbiaceae	Aawla	Tree
30/9	*Mangifera indica*	Anacardiaceae	Ama	Tree
31/10	*Musa paradisiaca*	Musaceae	Kela	Herb
32/11	*Punica granatum*	Punicaceae	Anar	Small Tree
4	**Timber Crops**			
33/1	*Dalbergia sissoo*	Fabaceae	Shishu	Tree
34/2	*Tectona grandis*	Verbenaceae	Sagvan, Sag	Large Tree
5	**Cash/Commercial Crops**			
35/1	*Brassica nigra*	Brassicaceae	Rai	Herb
36/2	*Foeniculum vulgare*	Apiaceae	Saunf	Herb
37/3	*Ricinus communis*	Euphorbiaceae	Rendi ,Arandi	Shrub
38/4	*Saccharum officinarum*	Poaceae	Ganna	Grass
39/5	*Sesamum indicum*	Pedaliaceae	Til	Herb

3.4.7. Overall Species Richnes

During this study a total of 271 plant species of different habits were reported within the study area and they belong to 212 genus and 74 families. The forest department list showed only 82 species of 63 genus and 34 families. All the species given in the forest department list were reported in the sampling plots of the study area and no new species added in the cumulative list. Since the study reported diverse floral species it added 189 species to the forest list. Overall species richness of the study area stands as in case of the study list (**Table 3.10 & Annexure 1**).

Table 3.10: Overall Species Richness of Flora -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	74	34	
Genus	212	63	
Species	271	82	

3.5 STATUS OF FAUNA

This section includes the discussion of major faunal groups like; amphibians, reptiles, birds (terrestrial and aquatic) and mammals. Among the groups, due to taxa specific nature of life, direct sightings of herpetofauna and mammalian fauna was always lower than the avifauna,

which is more active and mobile. Therefore status of herpetofauna and mammal groups were discussed only at species richness and abundance levels based on actual number of animals and indirect evidences recorded for those groups respectively.

3.5.1 Status of Herpetofauna

3.5.1.1 Taxonomical status and Species Richness – Amphibians

Core Zone: In the core zone, i.e., the proposed Thermal Power Plant –, WEUPPL project site no amphibians were reported, which was due to absence of water source and all the small seasonal water bodies were dry (**Table 3.11**).

Buffer Zone: In case of overall buffer zone (OBZ), which is largest extent of area included water bodies/ rivers and agricultural land with water reported three species of amphibians. Maximum of three species were identified from water bodies/rivers, while two species were recorded in agriculture/fallow lands (**Table 3.11**).

Study Area: Since there were was no amphibians recorded in the core, the overall status of the study area was same as in case of buffer zone (**Table 3.11)**.

Table 3.11: Taxonomical Status of Amphibians-Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	0	0	0	0	1	0	1	1	1
Genus	0	0	0	0	3	0	2	3	3
Species	0	0	0	0	3	0	2	3	3

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.1.2 Abundance Status – Amphibian

Core Zone: No amphibians were reported from the core zone.

Buffer Zone: In the buffer zone, where three species were recorded, Skittering Frog (*Occidozyga cyanophlyctis)* accounted for 30 frogs, which formed 79% of the total 38 reported (**Table 3.12**).

Study Area: Since no amphibians were recorded in the core zone the abundance status of amphibians in the study area was the same as in the buffer zone (**Table 3.12**). Overall the amphibian richness and abundance was poor in the study area.

Table 3.12: Abundance Status of Amphibians -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.No	Family & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
	Randidae										
1	*Limnonectes limnocharis*	Cricket Frog	0	0	0	0	3	0	0	3	3
2	*Hoplobatrachus tigerinus*	Indian Bull Frog	0	0	0	0	3	0	2	5	5
3	*Occidozyga cyanophlyctis*	Skittering Frog	0	0	0	0	23	0	7	30	30

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.1.3 Taxonomical Status and Species Richness – Reptiles

Core Zone: Reptilian status in the core zone was represented by only three species belonging to three genera and three families, with two species each found in open scrub/waste land and agriculture /fallow land (**Table 3.13**).

Buffer Zone: In buffer zone nine species of reptiles were recorded, which belonged to eight genera and six families. Among these nine species, maximum of seven species were recorded in water bodies/ river followed by forest (five species) and open scrub/wasteland (four species) others (**Table 3.13**).

Study Area: The overall richness in the study area, that includes both the core and buffer zones, showed that 10 species were recorded in the area (**Table 3.13**).

Table 3.13: Taxonomical Status of Reptiles -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	2	2	3	4	4	3	3	6	7
Genus	2	2	3	5	6	3	3	8	9
Species	2	2	3	5	7	4	3	9	10

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.1.4 Abundance status – Reptiles

Core Zone: In the core zone a total of only seven individuals were recorded of which Garden Lizard (*Calotes versicolor)* was with four individuals followed by Leschenault's Lecertid (*Ophisops leschenaultii*) (two) and Spectacled Cobra (*Naja naja*) (one individual) that was recorded only in the core zone. Maximum of five individuals were recorded in open scrub/waste land (**Table 3.14**). On the whole, the core zone showed poor richness and population /abundance.

Buffer zone: Abundance status of the buffer zone resulted in enumeration of 77 animals of nine species. Among the species, *Calotes versicolor* recorded a maximum of 31 individuals followed by Bronze grass skink - *Mabuya macularia* (20) and *Ophisops leschenaultii* (15) and these species contributed 86 % of the total abundance. There was not much variation among different species in terms of abundance in the buffer zone (**Table 3.14**).

Study Area: The overall abundance status for the study area was 84 individuals with 92% of the total abundance of reptiles found in the buffer zone. The overall status of different species in the study area also showed that *Calotes versicolor* (35 individuals), Bronze *Mabuya macularia* (20) and *Ophisops leschenaultii* (17) were with more individuals (**Table 3.14**). This clearly shows the low richness and abundance of reptiles in the study area.

Table 3.14: Abundance Status of Reptiles -Proposed Thermal Power Plant –WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.No	Family & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
1	**Agamidae**										
1	*Calotes versicolor*	Indian Garden Lizard	3	1	4	9	6	10	6	31	35
2	*Sitana ponticeriana*	Fan-throated Lizard	0	0	0	3	1	0	0	4	4
2	**Lacertidae**										
3	*Ophisops leschenaultii*	Leschenault's Lacerta	2	0	2	6	1	8	0	15	17
3	**Scincidae**										
4	*Mabuya macularia*	Bronze Grass Skink	0	0	0	2	6	1	11	20	20
5	*Mabuya carinata*	Common Keeled Grass Skink	0	0	0	0	1	1	0	2	2
4	**Gekkonidae**										
6	*Hemidactylus frenatus*	Asian House Gecko	0	0	0	0	0	0	1	1	1
5	**Varanidae**										
7	*Varanus bengalensis*	Common Indian Monitor	0	0	0	1	0	0	0	1	1
6	**Colubridae**										
8	*Ptyas mucosa*	Rat Snake	0	0	0	0	1	0	0	1	1
9	*Xenochrophis piscator*	Checkered Keelback	0	0	0	0	2	0	0	2	2
7	**Elapidae**										
10	*Naja naja*	Spectacled Cobra	0	1	1	0	0	0	0	0	1
Overall			**5**	**2**	**7**	**21**	**18**	**20**	**18**	**77**	**84**

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total, * information from Local People / Forest Staff

3.5.1.5. Overall Species Richness

During the study, including amphibian and reptiles a total of 13 herpetofauna were reported from the study area. The State Forest Department list reported 12 species of reptiles (no amphibian in the list) belonging to 12 genera and 10 families. Inclusive of three species of amphibian and five reptiles that were exclusively recorded during this study, the seven reptile species recorded exclusively by the Mirzapur Forest Division and five species common to the present study and Forest Department list, the cumulative list resulted with 20 species of 18 genera and 13 families for the Mirzapur Forest area (**Table 3.15 & Annexure 2**).

Table 3.15: Overall Species Richness of Herpetofauna-Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	8	10	13
Genus	12	12	18
Species	13	12	20

3.5.2. Status of Avifauna- Terrestrial

3.5.2.1 Taxonomical Status, Species Richness and Diversity

Core zone: Status of birds assessed within the core zone, which had only open scrub / wasteland and agriculture / fallow land habitats, reported a total of 46 species belonging to 35 genera of 22 families and with estimated diversity of H'=3.1. Among the two habitats, the status was more in open scrub /wasteland (45 species, H'=3.1) compared to 19 species (H'=2.6) in the agriculture/ fallow land (**Table 3.16**).

Buffer Zone: The buffer zone area covers the large extent of forest habitat and it had in total 85 terrestrial bird species that come from 63 genera and 30 families with maximum of 58 species from the forest in and around the wetland/river habitat followed by 53 in forest, 45 in agriculture and 41 in open scrub / wasteland. The overall species diversity estimated was H'=3.7, and contributed 97% of the total species listed (88 species) in the study area (**Table 3.16**).

Study Area: Including the core and buffer zones, the proposed project study area reported 88 species of 65 genera and 31 families. In the entire study area terrestrial birds were with an estimated species diversity of H' =3.7, which is of moderate to high level **(Table 3.16).**

Table 3.16: Taxonomical Status of Terrestrial Birds species -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	21	12	22	24	28	20	22	30	31
Genus	34	16	35	37	49	32	38	63	65
Species	45	19	46	53	58	41	45	85	88
Species Diversity	3.1	2.6	3.1	3.2	1.5	2.8	3.3	3.7	3.7

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.2. Abundance Status

Core zone: A total of 385 birds of 46 species were reported from the core zone and it formed only 28% of the total birds counted in the sampling points of the study area. Among the two habitats, open scrub / wasteland recorded 291 birds of 45 species and they accounted for 76% of birds of the core zone while agriculture / fallow land contributed 24% (**Table 3.17**)

Buffer zone: Within the buffer zone, 997 birds were counted of 85 species. Among the habitats, the vegetation in and around the wetland / rivers recorded 302 birds followed by forest (281 birds) and open scrub / wasteland (233 birds) and they contributed to 30%, 28% and 23% respectively to the overall buffer zone. The contribution of agriculture / fallow land habitat was 43 species and 181 birds with 18% (**Table 3.17**).

Study area: Overall 1382 terrestrial birds of 88 species were counted in the study area (**Table 3.17**). However, number of birds enumerated in the study area seems to be low.

3.5.2.3. Abundance Category Status

Abundance status of bird species in the study area was further categorized into five classes based on the number of birds reported in each species. The category wise status is discussed for all the zones.

Core zone: within the core zone, among the two habitats, 93% of the species in the open scrub / wasteland belonged to very low category, while in the agriculture / fallow land all species (19 species) were of very low category, thus reflecting very low abundance of terrestrial birds (**Table 3.17**).

Buffer Zone: The area of 10km radius reported 85 species, however 76 species (89%) fall under very low category while five species were low. None of the species were found to be under very high abundance categories (**Table 3.17**) Only two species, Red-vented Bulbul (*Pycnonotus cafer* -87 birds) and Laughing Dove (*Streptopelia senegalensis* -88 birds) were found to be abundant with 75-100 birds (**Annexure 3**).

Study area: Since both core and buffer zones, had more species with less than 25 birds, the overall status reflected that 95 % of species fall under very low and low categories. This study showed that though the study area reported 88 birds species, majority of them were found to be in low numbers (**Table 3.17**). Only 6 % of species such as Spotted Dove (*Streptopelia chinensis* -82 birds), Large-grey Babbler (*Turdoides malcolmi* – 99 birds) and Laughing Dove (*Streptopelia senegalensis* -101 birds), Indian Robin (*Saxicoloides fulicata* -106 birds), Red-vented Bulbul (*Pycnonotus cafer*-135 birds) fall under high and very high categories respectively, which are common bird species (**Annexure 3**).

Table 3.17: Abundance Status of Terrestrial Bird- Proposed Thermal Power Plant –WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Total Species	45	19	46	53	58	41	45	85	88
Total Birds	291	94	385	281	302	233	181	997	1382
R %	**75.6**	**24.4**	**100**	**28.2**	**30.3**	**23.4**	**18.1**	**100**	
	Abundance Category								
Very Low 1-25 birds	42 (93.3)	19 (100)	42 (91.3)	50 (94.3)	57 (98.3)	41 (100)	45 (100)	76 (89.0)	73 (83.9)
Low 26-50 birds	3 (6.7)	--	4 (8.7)	3 (5.7)	1 (1.7)	--	--	5 (6.1)	10 (11.4)
Medium 50-75 birds	--	--	--	--	--	--	--	2 (2.4)	
High 75-100	--	--	--	--	--	--	--	2 (2.4)	2 (2.3)
Very high >100	--	--	--	--	--	--	--	--	3(3.4)

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.4. Foraging Status

Foraging guild status was assessed by grouping them based on the major food items the birds feed. Foraging status generally reflects the availability of major and diverse habitat types in the study area. A total of six foraging guilds were identified among all species identified in the study area.

Core Zone: Among the 46 species reported insectivores dominated with 44% (20 species) followed by omnivore (12 species and 26%), Granivores were represented by eight species and formed 17% of the total species recorded (**Table 3.18**).

Buffer Zone: Out of 85 species, 43 species were insectivores forming 51% that contributed the maximum, followed by omnivores and granivores each with 15 and 14 species respectively shared 18% and 17% of the total. Frugivores represented only by six species contributed 7% to the foraging guild (**Table 3.18**).

Study Area: On the whole the study area, that included both the core and buffer zones, was dominated by insectivores (50%) and omnivores (18%), this could be due to domination of insect and extent of forest habitat in the buffer zone. Since the study area had agriculture / fallow land, granivores was also found represented by 14 species, which formed 16% of the overall list (**Table 3.18**).

Table 3.18: Foraging Status of Terrestrial Bird- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Foraging Guilds	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Omnivore	12	4	12	26.1	12	12	11	12	15	17.7	16	18.2
Carnivore	2	2	2	4.3	1	3	0	4	5	5.9	6	6.8
Insectivore	**20**	**8**	**20**	**43.5**	**27**	**27**	**17**	**18**	**43**	50.6	44	50.0
Granivore	7	4	8	17.4	9	10	7	6	14	16.5	14	15.9
Frugivore	3	1	3	6.5	3	5	4	3	6	7.1	6	6.8
Necterivore	1	0	1	2.2	1	1	2	2	2	2.4	2	2.3
Total	45	19	46	100	53	57	41	45	85	100	88	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.5. Migratory Status

Core Zone: Among the 46 terrestrial bird species recorded in the core zone, majority of them were resident species, which formed 96% (44 species), while only two species were found to be migrant (**Table 3.19**).

Buffer Zone: In this zone except for one winter visitor rest of the 84 species were residents (**Table 3.19**).

Study Area: Overall the study area supported more local or resident species (86 species & 98%) than the migrant species (two species & 2%) **Table 3.19**. This is because the study was conducted during summer season and does not cover the winter season which is the period when migrants are more.

Table 3.19: Migratory Status of Terrestrial Bird- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Migratory status	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Resident	43	19	44	95.7	53	57	41	45	84	98.8	86	97.7
Winter Migrant	2	--	2	4.3	--	1	--	--	1	1.2	2	2.3
Vagrant	--	--	--	--	--	--	--	--	--	--	--	--
Summer visitor	--	--	--	--	--	--	--	--	--	--	--	--
Total	45	19	46	100	53	58	41	45	85	100	88	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.2.6. Overall Species Richness

This study reported presences of 88 terrestrial avifauna within the study area of 65 genera and 31 families. The State Forest Department working plan of Mirzapur forest division had listed 47 species belonging to 40 genera and 20 families, which is for the entire Mirzapur forest landscape. Based on these two lists, the cumulative estimate of species was 107 in and around the Mirzapur forest areas belonging to 76 genera and 31 families (**Table 3.20**). This study added 60 species that were not listed by the forest department and 19 species reported only by the forest department **while** 28 species found to be common to both, forest department and present study (**Annexure 3**).

Table 3.20: Overall Species Richness of Terrestrial Birds in the Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	31	20	31
Genus	65	40	76
Species	88	47	107

3.5.3. Status of Avifauna – Aquatic

3.5.3.1. Taxonomical Status, Species Richness and Diversity

Core Zone: The core zone, which had no permanent water bodies, reported only five aquatic bird species belonging to four genera and three families. This zone estimated low species diversity of 1.4 (**Table 3.21**).

Buffer Zone: This larger extent of buffer zone reported only 31 species and they belong to 28 genera and 16 families. Among the four habitats, wetland / riverine habitat reported maximum of 30 species, while the open scrub / wasteland recorded 16 species. The total species diversity estimated for the buffer zone was H'=2.5 (**Table 3.21**)

Study Area: All the 31 aquatic bird species recorded in the buffer zone that included the five species recorded in the core zone, depicts the richness of the study area. Even though the study area had three dam sites and network of river and streams (Nullahs), due to survey in summer and ephemeral in nature of the streams and river, this study reported very low species richness and diversity estimated was moderate of H'=2.5 (**Table 3.21**).

Table 3.21:Taxonomical Status of Aquatic Birds species -Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	1	3	3	0	16	10	3	16	16
Genus	1	4	4	0	27	15	3	28	28
Species	1	5	5	0	30	16	3	31	31
Species Diversity	0	1.5	1.4	0	2.4	2.3	1.1	2.5	2.5

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.2. Abundance Status

Core Zone: Comparatively being a small area, the core zone recorded a total of only 10 aquatic birds, which formed only 1% of the total 740 birds counted in the study area. Since there was no permanent aquatic system in the core area and it being summer and dry, the number of birds recorded were very low with all five species with a total abundance of nine birds recorded from agriculture / fallow land, while the other habitat the open scrub/ wasteland harbored only one species with one bird (**Table 3.22).**

Buffer Zone: In this zone 730 birds were recorded of which the wetland / riverine habitat accounted for 91% of the abundance. This was followed by open scrub / wasteland (8%) and agriculture / fallow lands that contributed less than 1% (**Table 3.22**).

Study area: In spite of the presence of diverse habitats in the study area, like dense and open forests, agriculture and network of rivers and few dam sites, the overall estimation of 740 aquatic birds showed low abundance in the study area (**Table 3.22).**

3.5.3.3. Abundance Category Status

Core Zone: In the core zone, all the five species recorded were under very low abundance category thus showing the low or no availability of the aquatic system (**Table 3.22 & Annexure 4**).

Buffer Zone: In total 31 species were recorded in this zone of which 90% of the species were in very low and low abundance category, with only two species that formed only 7% falling under very high abundant category. Lesser Whistling Duck (*Dendrogyna javanica*- 237 birds) and Cattle Egret (*Bubulcus ibis* -106 birds) were the two species fall under very high category (**Table 3.22 & Annexure 4**).

Study Area: Due to low species richness of aquatic birds, and all species recorded in the buffer zone that included the species reported from core zone, the overall status of the study area was same as the buffer zone (**Table 3.22 & Annexure 4**).

Table 3.22: Abundance Status of Aquatic Bird in Proposed Thermal Power Plant –WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Total Species	1	5	5	0	30	16	3	31	31
Total Birds	1	9	10	0	667	60	3	730	740
R %	**10**	**90**	**100**	**0**	**91.4**	**8.2**	**0.4**	**100**	100
	Abundance Category								
Very Low 1-25 birds	1 (100)	5 (100)	5 (100)	--	22 (73.3)	16 (100)	3 (100)	22 (71.0)	22 (71.0)
Low 26-50 birds	--	--	--	--	5 (16.7)	--	--	6 (19.3)	6 (19.3)
Medium 50-75 birds	--	--	--	--	1 (3.3)	--	--	1 (3.2)	1 (3.2)
High 75-100					0	--	--	0	--
Very high >100	--	--	--		2 (6.7)	--	--	2 (6.5)	2 (6.5)

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.4. Foraging Status

Core Zone: All five aquatic bird species recorded in the core zone were insectivores. Absence of aquatic systems reflecting the low aquatic bird richness. All five species were found in agriculture / fallow land while one species from open scrub / wasteland (**Table 3.23**).

Buffer Zone: Among the 31 species recorded in this zone 14 were piscivore species, which formed 45% of all foraging guilds, followed by insectivores (12 species- 39%). However, omnivore (three species) and herbivores (two species) were also present they formed comparatively very low proportion (**Table 3.23**).

Study area: Since the all guilds and richness status found in the core zone was among that recorded in the buffer zone, the overall guild status was same as that reported for the buffer zone, with piscivore and insectivores forming the major guilds (**Table 3.23**) .

Table 3.23: Foraging Status of Aquatic Birds- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Foraging Guilds	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Omnivore	--	--	--	--	--	3	1	--	3	9.7	3	9.7
Carnivore	--	--	--	--	--	-	--	--	--	--	--	--
Herbivore	--	--	--	--	--	2	1	--	2	6.4	2	6.4
Insectivore	1	5	5	100	--	12	6	1	12	38.7	12	38.7
Granivore	--	--	--	--	--	--	--	--	--	--	--	--
Frugivore	--	--	--	--	--	--	--	--	--	--	--	--
Piscivore	--	--	--	--	--	13	8	2	14	45.2	14	45.2
Total	1	5	5	100	--	30	16	3	31	100	31	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.5. Migratory Status

Core Zone: Of the five species reported in the core zone, three (60%) were residents and two (40%) species was winter visitors (**Table 3.24**). The winter visitor recorded were in breeding plumage, which would probably stay back or migrate late, however it is a rare phenomenon.

Buffer zone: Out of 31 species recorded in this zone, 23 were residents, while eight species belonged to winter migrant and they shared 74% and 26% respectively of the total species recorded (**Table 3.24**). The winter visitors were the ones that had some individuals that stay back or migrate late.

Study area: Even though the study area had aquatic habitats like river, dam and village ponds, as sampling was done in summer and the season when no winter visitor is present, the study area reported low migratory species (eight species forming 26%) compared to 23 species of residents (74%) (**Table 3.24**).

Table 3.24: Migratory Status of Aquatic Birds- Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Migratory status	Core Zone		CT	R%	Buffer Zone				BT	R%	SAT	R%
	OS/WL	AG/FL			D/DFR	WB/R	OS/WL	AG/FL				
Resident	1	3	3	60	--	22	15	3	23	74.2	23	74.2
Winter Migrant	--	2	2	40	--	8	1	--	8	25.8	8	25.8
Vagrant	--	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--	--
Summer visitor	--	--	--	--	--	--	--	--	--	--	--	--
Total	1	5	5	100	--	30	16	3	31	100	31	100

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.3.6. Overall Species Richness

During this study 31 species of aquatic avifauna were reported in the study area. The list of state forest department showed 14 species belonging to 13 genera under seven families. The combined list gave a total of 40 species of 35 genera and 18 families. This overall list included nine species that was reported only by the forest department that were not sighted during this study and 26 species recorded during this study that were not listed in the working plan of the forest department, on addition to five species that were common to both (**Table 3.25 & Annexure 4**). Overall status of aquatic avifauna was found to be moderate to low in the study area.

Table: 3.25: Overall Species Richness of Aquatic Birds -Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	16	7	18
Genus	28	13	35
Species	31	14	40

3.5.4. Status of Mammals

3.5.4.1. Taxonomical status of Mammals

Core Zone: Core zone reported 11 mammalian species and each belong to 11 separate genera and eight families, which was the same as in the open scrub / waste land, one among the two habitat types sampled in the core zone. Agriculture / fallow land recorded nine species of nine genera and seven families (**Table 3.26**).

Buffer Zone: Overall buffer zone recorded 18 mammalian species each belonging to 18 separate genera and 13 families. Among the habitats forest area reported maximum of 15 species of 15 genera and 12 families, followed by water bodies / rivers (13 species), open scrub / wasteland (nine) and agriculture / fallow land (eight species) (**Table 3.26**).

Study Area: The overall list of mammalian fauna of the study area includes species recorded in both the core and buffer zones. This showed that in total 19 species belonging to 18 genera and 13 families (**Table 3.26**).

Table 3.26: Taxonomical Status of Mammals -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Family	8	7	8	12	10	8	7	13	13
Genus	10	9	10	15	13	9	8	18	18

Parameters	Core Zone		CT	Buffer Zone				BT	SAT
	OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
Species	10	9	10	15	13	9	8	18	19

OSWL- Open Scrub & Waste Land, AG/FL – Agriculture & Fallow Land, D/DFR - Forest, WB/R – Water bodies and Rivers , CT- Core Zone Total, BT – Buffer Total, SAT- Study Area Total

3.5.4.2. Abundance status – Mammals

Core Zone: The project area had 10 species and none of the species were sighted directly. In total 184 evidences of these species were recorded in the core zone. Based on indirect evidences Nilgai (*Boselaphus tragocamelus*) (65 evidences - pellets) was found to be more followed by Indian Hare (*Lepus nigricollis*) (53 evidences - pellets & tracks) and Indian Gerbil (*Tatera indica*) (23 evidences - holes & tracks), while other species were less abundant, and reported less than 15 evidences. Among the habitat types, open scrub / waste land reported more evidences with Nilgai, Indian Hare and Indian Gerbil being more common (**Table 3.27**).

Buffer Zone: overall buffer zone area confirmed the presence of 18 species based on 33 direct sightings of animals and 316 indirect evidences. The abundance status showed dominance of Nilgai (107 indirect evidences & 16 direct sightings), followed by Indian Gerbil (45 evidences) Indian Hare (39 evidences), Jackal (38 indirect evidences & one direct evidence), Wild Pig (28 evidences) and Jungle Cat (28 evidences). Among the habitat types, forest area recorded 133 evidences and 27 direct sightings of 15 mammal species followed by open scrub / wasteland with 92 evidences and 19 direct sightings of nine species, water bodies / rivers with 57 evidences and five direct sightings and agriculture / fallow lands reported the least abundance of mammals (**Table 3.27 & Annexure 5**).

Study Area: Within the study area that includes core zone and 10 km radius buffer, in total 500 evidences and 33 direct sightings of 18 mammalian species were reported. Among these species Nilgai, Indian Hare, Indian Gerbil, Jackal, Wild Pig and Jungle Cat were with more abundance, which is based mainly on indirect evidences. Of the 33 direct sightings, Nilgai (16 direct sightings) and Five-striped Palm Squirrel (Funambulus pennantii) (seven direct sightings) accounted for 70% of the direct sightings. Though the study area reported 19 species of mammalian fauna, direct sightings of only five species, with maximum sightings of only 16 Nilgai indicate, low population /abundance status in spite of presence of large extent of forest area in the buffer zone (**Table 3.27 & Annexure 5**).

Table 3.27: Abundance Status of Mammals of the Proposed Thermal Power Plant -WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Families & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
1	**Cercopithecidae**										
1	*Semnopithecus entellus*	Common Langur	0	0	0	3	1	0(6)		4(6)	4(6)
2	**Cervidae**										
2	*Axis axis*	Spotted Deer	0	0	0	*	0	0	0	*	*
3	**Bovidae**										
3	*Boselaphus tragocamelus*	Nilgai	47	18	65	60(3)	14	25(13)	8	107(16)	172(16)
4	*Tetracerus quadricornis*	Four Horned Antelope	0	0	0	6	0	0	0	6	6
4	**Suidae**										
5	*Sus scrofa*	Wild Pig	3	1	4	14	12	2	0	28	32
5	**Ursidae**										
6	*Melursus ursinus*	Sloth Bear	0	0	0	1	1	0	0	2	2
6	**Canidae**										
7	*Canis aureus*	Jackal	7	4	11	11(1)	12	10	5	38(1)	49(1)
8	*Vulpes bengalensis*	Indian Fox	1	3	4	1	2	0	0	3	7
7	***Hyaenidae***										
9	*Hyaena hyaena*	Striped Hyena	3	1	4	3	0	1	0	4	8
8	**Felidae**										
10	*Felis chaus*	Jungle Cat	2	0	2	16	5	5	2	28	30
11	*Panthera pardus*	Common Leopard	0	0	0	0	3	0	0	3	3
10	**Viverridae**										
12	*Paradoxurus hermaphroditus*	Common Palm Civet	0	0	0	1	0	0	0	1	1
11	**Herpestidae**										
13	*Herpestes edwardsii*	Common or Grey Mongoose	2	2	4	0	0	0	0	0	4
14	*Herpestes smithii*	Ruddy Mongoose	0	0	0	0	1(3)	0	1	2(3)	2(3)
12	**Leporidae**										
15	*Lepus nigricollis*	Indian Hare	29	24	53	9	3	24	3	39	92
13	**Sciuricidae**										
16	*Funambulus pennantii*	Five-striped Palm Squirrel	0	0		0(3)	0(2)		0(2)	0(7)	0(7)
14	**Muridae**										

S.no.	Families & Species Name	Common Name	Core Zone		CT	Buffer Zone				BT	SAT
			OS/WL	AG/FL		D/DFR	WB/R	OS/WL	AG/FL		
17	*Tatera indica*	Indian Gerbil	17	6	23	9	1	23	12	45	68
18	*Golunda ellioti*	Indian Bush Rat	0	0	0	1	0	0	0	1	1
19	*Mus booduga*	Little Indian Field Mouse	4	10	14	0	2	2	1	5	19
Overall			**115**	**69**	**184**	**135(7)**	**57(5)**	**92(19)**	**32(2)**	**316(33)**	**500(33)**

FR- Forest, AG-Agriculture, WE-Wetland, CT- Core Zone Total, RH- Riverine Habitat, BT – Buffer Zone Total, SAT Study Area Total ; NOs in parenthesis indicates "Direct Sightings" of animals, * information - Locals / Forest Staff

3.5.4.3. Overall Species Richness

During the present study 18 mammalian fauna were reported from the project study area. The State Forest Department Working Plan, which is for a larger mainly the forest under Mirzapur division, listed a total of 29 mammal species belonging to 28 genera of 15 families. Based on the study four species *viz.* Indian Gerbil (*Tatera indica*), Indian Bush Rat (*Golunda ellioti*) Ruddy Mongoose (*Herpestes smithii*) and Common Palm Civet (*Paradoxurus hermaphroditus*) were added to the list, which gave a cumulative list of 33 species of 31 genera and 16 families in Mirzapur division forest areas (**Table 3.28** & **Annexure 5**)

Table 3.28: Overall Species Richness of Aquatic Birds -Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Parameters	Study Area List	State Forest Department Mirzapur Division	Overall
Family	13	15	16
Genus	18	28	31
Species	19	29	33

3.6 STATUS OF THREATENED BIOTA (Flora & fauna)

3.6.1. Threatened Plant

During the study within the sampling location a total of two plant species were reported as threatened and those species include *Terminalia arjuna* (24 trees) and *Boswellia serrata* (14 trees) reported in the buffer zone of the study area fall under threatened category (vulnerable) according to WCMC 1994 (**Table 3.29 & Annexure 1**). None of these species were reported from the core zone. *Terminalia arjuna* was mainly reported along the riverine and stream habitats while *Boswellia serrata* was reported in the forest patches of moderately undulating terrine. These species were brought under threatened category due highly restricted distribution and high cutting pressure in general. However, in the study area they were found in few patches of forest habitat which are far from the proposed project site.

Terminalia arjuna was included in the proposed plantation list since it secured 7th rank in IVI value of wild tree species and in addition *Boswellia serrata* (15th rank in IVI **Table 3.8**) was also suggested to grow in the plantation to enhance their population.

Table 3.29: Status of Endangered Flora - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

Species & common name and Habits	Project Study Area		Dharmjaygarh-Forest Division
	Core	Buffer	
Terminalia arjuna (arjun) - Large Tree)		24	@
Boswellia serrata – Salai (Large Tree) Iai		14	@

3.6.2. Status of Threatened Animals

3.6.2.1 Herpetofauna

Amphibians: Among the three species of amphibians reported within the study area none of them fall under the threatened category of IUCN and Schedule I of Indian Wildlife Protection Act (1972).

Reptiles: Out of 10 species of reptiles reported in the study, only one IUCN Red List species Common Monitor Lizard (one individual) was reported from the forest in the buffer zone area further it fall under schedule II list of IWPA (1972). The other two species Gharial (*Gavialis gangeticus*) and Indian Flapshell Turtle (*Lissemys punctata*) both Schedule I species, were listed by the forest department, which is for the entire Mirzapur forest division and were not recorded during this study within the study area(**Table 3.30 & Annexure 2)**.

Table 3.30: Status of Endangered (Schedule I) Herpetofauna- Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Species & Common Name	Project Study Area		Mirzapur Forest Division
		Core	Buffer	
1	*Crocodylus palustris*- Mugger / Marsh Crocodile	-		FD@
2	*Gavialis gangeticus*- Gharial	-		FD@
3	*Lissemys punctata*- Indian Flapshell Turtle	-		FD@
34	*Varanus bengalensis*- Common Monitor Lizard	-	Sch II	FD+

FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department

3.6.2.2. Avifauna

Terrestrial birds: Among terrestrial birds, however six RET species of birds were found or reported to occur in the Mirzapur forest division, that included four vultures of which three

were had been listed as Critically Endangered, while one Egyptian Vulture (*Neophron percnopterus*) has been listed as endangered IUCN 2011.2, and two species (Indian Peafowl - *Pavo cristatus* and Indian Grey Hornbill - *Ocyceros birostris*) list as Schedule I in the IWPA 1972. Among these RET species, Egyptian Vulture (one individual- buffer zone), Indian Peafowl (three individual in core zone & 15 in buffer zone) and Indian Grey Hornbill (one bird in buffer zone) were recorded during this study, but their abundance was very low (**Table 3.31**). Other three vultures of critically endangered were not reported within the study area during this study. Conservation status of all the bird species is given in **Annexure 3**

Aquatic birds: There were no RET species of aquatic birds reported during the present study, but the forest department list, which is for the entire Mirzapur forest division that covers a large landscape reported the presence of Sarus Crane that list as vulnerable in IUCN Red List IUCN 2011.2 (**Table 3.31)** and conservation status is given in **Annexure 4.**

Table 3.31: Status of Endangered (Schedule I) Avifauna - Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttrapradesh

Species Name	Project Study Area		Mirzapur Forest Division
	Core	Buffer	
Aquatic Birds			
Grus antigone Sarus Crane	Nil	Nil	FD
Terrestrial birds			
Gyps indicus Long-billed Vulture	Nil	Nil	FD
Gyps bengalensis White-rumped Vulture	Nil	Nil	FD
Sarcogyps calvus Red-headed Vulture	Nil	Nil	FD
Pavo cristatus- Indian Peafowl	3	15	FD
Neophron percnopterus Egyptian Vulture	Nil	1	FD

3.6.2.3 Mammals

Based on the present study (19 species) and the list of forest department, a total of 33 mammalian fauna is reported from the Mirzapur forest division. This study reported only three Schedule I (WPA -1972) and IUCN Red List species of mammalian fauna in the study area, while the forest department list had six species more as Schedule I, which was for the entire Mirzapur forest Division. However none of the species had any quantitative information. Common Leopard, Sloth Bear and Four Horned Antelope were recorded based on very few indirect evidences, that to only in the buffer zone. Only two scats of common leopard, one dropping, and one track of Sloth Bear and six pellet groups of Four Horned Antelope were recorded in the study area during this study that to in the forest area of buffer zone (**Table 3.32).** Conservation status of all the mammalian fauna is given in

Annexure 5.

Table 3.32: Status of Endangered (Schedule I) mammalian fauna - Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Species Name	Project Study Area		Mirzapur Forest Division
		Core	Buffer	
1	*Gazella bennettii*- Indian Gazelle	-	-	FD
2	*Tetracerus quadricornis*-Four Horned Antelope		6 IE	FD
3	*Melursus ursinus*- Sloth Bear	-	2 IE (Sch I)	FD
4	*Canis lupus*- Wolf			FD
5	*Cuon alpinus*- Wild Dog			FD
6	*Panthera pardus*- Common Leopard		3 IE (Sch I)	FD
7	*Caracal caracal*-Caracal			FD
8	*Lutrogale perspicillata*-Smooth-coated Otter			FD
9	*Melivora capensis*-Honey Badger			FD

IE – Indirect Evidences, FD – Forest Department List

3.7. HABITAT ECOLOGY – STUDY AREA

Though the study area has been identified with nine land use patterns (**Table 2.1**), they have been grouped into four major habitat types such as: Forest (Dense forest, Degraded forest, Plantation forest) Agricultural land (agro-ecosystem/agriculture fallow land), wetlands (includes riverine habitats and Dams and Scrub land (Open waste land and scrub land) for the ecological study (**Table 3.1**).

3.7.1. Forest

The forest types within the study area fall under tropical dry deciduous and moist mixed deciduous forest. Forests of the study can be divided into four major types based on the domination of floral composition.

1. Fairly dense mixed forest dominated by bamboo plantation with *Zizyphus species (Zizyphus mauritiana). Bauhinia racemosa, Dalbergia sissoo, Cassia fistula and Holarrhena antidysenterica are other tree species scatterdly found in this forest.*

2. Open mixed forest dominated by *Acacia catechu* with Zizyphus. These forest patches are found in flat terrain. Other forest two types include *Lannea coromandelica and Boswellia serrata* dominated forests and mainly found on moderately undulating hillocks.

3. Riverine forest; this forest types found along the major river systems and mainly dominated by *Terminalia arjuna, Syzygium cumini, Terminalia belerica, Holoptelea integrifolia and Mitragyna parvifolia*

A total of 11 reserved forest area located within 10 km radius of the project site /study area

and their location details are given **Table 3.33 & Map 2.1)**.

Table 3.33. Details of Reserved forests located within 10 km radius of the project site: Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Name of RF	Distance from forest boundary	Direction
1	Danti RF	Adjacent to the project site	N
2	Barkachha RF	8.5 km	NW
3	Mirzapur RF	Adjacent	S
4	Sarson RF	5.5 km	SE
5	Malua RF	8.5 km	SW
6	Karaunda RF	5 km	SW
7	Patehra RF	5 km	SW
8	Bahuti RF	6.5 km	W
9	Newaria RF	10 km	SW
10	Nanuti RF	7 km	E
11	Golhanpur RF	6.5 km	E

3.7.2. Open scrubland

Open scrub land is one of the habitat types of the study area come under forest as well as revenue land. This scrub land is dominated by all the Zizyphus species with scattered tree species mainly dominated by stunted growth of *Butea monosperma, Wrightia tinctoria, Bauhinia racemosa, Balanites aegyptiaca and Aegle marmelos* are found scatterdly

3.7.3. Wetland/ river and streams

Aquatic habitat is concerned there three dam sites are located within 10 km radius of the project sites namely Upper Khajuri dam, Lower Khajuri dam and Kathua Bandh are located 4, 9 and 10 km distance, and west, North and East directions of the project site respectively (**Map 2.1**)

Added, three river systems namely Jamtlhwa river (2 km N), Pahiti river (4 km NE) and Jogidar River (2.2 km NE) flowing south to north cutting across the 10 km radius study area and join (Map 2.1). These, river systems are highly seasonal and therefore not supporting diverse aquatic fauna and flora. The perennial River Ganga located 17km in the NE of the project site.

3.7.4. Agriculture habitat

One of the major habitat types of the study area is Agriculture lands (agro-ecosystem) covers a total of 3837.21 ha of the area. This habitat identified 140 floral species with

adjacent fallow lands. Added, 39 species major, minor, fruit and vegetable crops reported form this habitat with 45 species of terrestrial birds.

3.8. ECOLOGICALLY SENSITIVE ECOSYSTEMS

All the 11 forests are located within the study area fall under Reserved forest category while none of the water bodies (dams and rivers) have been designated as important wetland habitat of the state and/or national. Added, the study area has not having any breeding and feeding grounds of aquatic avifauna. Except the above said habitat types with overall biodiversity of low to moderate level, the project study area do not have any Protected Areas such as: wildlife sanctuary, national park, biosphere reserve and tiger and elephant reserves within 10 km radius.

3.9. WILDLIFE CORRIDOR

Overall the study reported 19 species of mammalian faun during the study period within 10 km radius. The forest department list prepared for the entire Mirzapur forest division showed presence of 29 species and cumulative species list reached to 33 species. However, during the study the abundance status of faunal group showed low status with only 500 indirect evidences and 33 direct sightings with maximum of 16 nilgai (**Table 3.28**). This clearly indicates that, the forest area do not reported and larger group of faunal species and their regular movement cutting across the project site and within the study area to move between two forest ranges. Hence, no wildlife corridors exist within 10 km and well beyond the project study area. Some of the faunal species reported in study area are given in plate (**Plate 3,4 5,6 & 7**).

Plate 3. Herpetofauna reported in the project study area

	
Skittering Frog	**Indian Bull Frog**
	
Indian Garden Lizard	**Fan-Throated Lizard**
	
Bronze Grass Skink	**Common Keeled Grass Skink**
	
Leschenault's Lacerta	**Asian House gecko**

Plate 4. Terrestrial birds of the study area

	
Ashy-crowned Finch Lark	**Asian Pied Starling**
	
Greater Cocual	**Indian Roller**
	
Large grey Babbler	**Yellow footed Green Pigeon**
	
Yellow wattled Lapwing	**Long tailed Shrike**

Plate5. Aquatic birds of the study area

Bronge winged Jacana

Cattle Egret

Intermediate Egret

Lesser Whistling Duck

White Stork

Black wined Stilt

Indian Pond Heron

White-throated Kingfisher

Plate 6. Track and signs of some mammalian fauna reported in the project study area

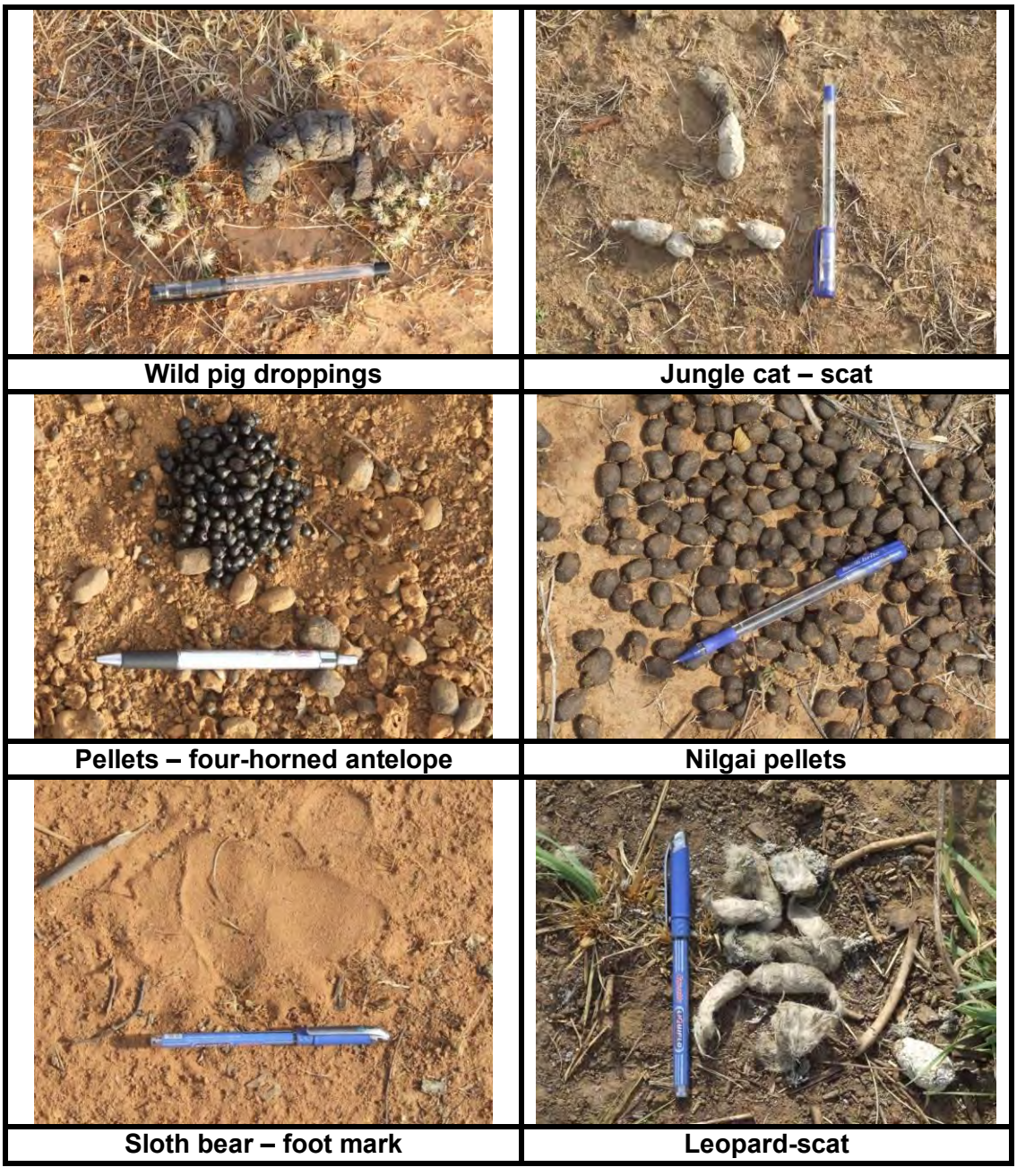
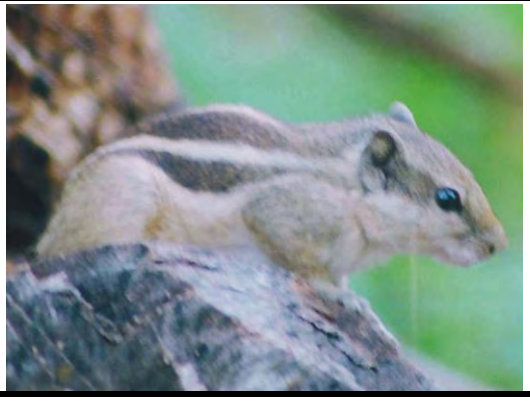


Plate 7 Mammalian fauna sighted in the study area

	
Common langurs	**Jackal**
	
Nilgai	**Five-striped Palm Squirrel**

Chapter 4. ECO-MANAGEMENT & WILDLIFE CONSERVATION PLAN

4.1 MANAGEMENT PLAN

One of the operating principals in Environmental Impact Assessment is to suggest Environmental Management Plan (EMP) in general and Conservation Plan for the threatened biota reported in the study area which is an appropriate follow-up process, involved monitoring, management, and evaluation that are based on the significance of potential effects. It also provides opportunity for making future improvements in project related activities. Further it is a follow up activity of the EIA study in order to improve the ecological and environmental integrity in and around the proposed project area.

4.2 ECO – MANAGEMENT

There are many scientific studies discussed the performance specific plant species at population and species level which can be related to pollution (Mansfield, 1976., Sanders 1976., Scholz, 1981 and Garsad and Rutter 1982). Therefore, plant species act as bio-monitoring agent to monitor the air environment as well as to keep and maintain the project environ healthy. The two areas of air pollution by gases and by dust need to be urgently attended to, using plants. Such treatments have numerous benefits, especially social and ecological aspects (Chapherkar 1994).

With the above understanding of the role of plant species as bio-filter to control air pollution and changes likely to occur in the ambient air quality of the area in and around the project, appropriate plant species (mainly tree species) have been suggested considering the area/site requirements and needed performance of specific species.

Under Eco-management Plan Three types of plantations have been suggested which include:

1. Greenbelt development along the boundary of the project site with wild tree species (refer Table 4.1)
2. Greenbelt development within the project site with common and wild tree species(refer Table 4.2)

3. Plantation for habitat improvement and to facilitate forage availability for major faunal species especially for the RET species of the project study area (refer Table 4.2, 4.3, 4.4)
4. Plantation for fodder resource development (refer Table 4.5)

4.2.1. Greenbelt - project boundary

In order to enhance and maintain the ambient air quality of project area during the construction and operational phase of the project the following list of wild tree species have been suggested to develop greenbelt along the boundary of the project site (**Table 4.1**).

Table 4.1: List of Wild Tree species suggested – Greenbelt along the boundary of the project site- Proposed Thermal Power Plant –, WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Wild/Forest Tree species	Common Name	IVI RO		DC #	FR
			CZ	BZ		
1	*Acacia nilotica*	Babul			6.12	
2	*Aegle marmelos*	Bel, Bili Patra, Bili			18.9	*
3	*Cassia fistula*	Amaltas			23.03	*
4	*Dalbergia sissoo*	Shesham			17.02	
5	*Ficus benghalensis*	Gular/Pipal			7.72	*
6	*Ficus religiosa*	Pipal			12.94	*
7	*Madhuca indica*	Mahua		6		
8	*Syzygium cumini*	Jamun			14.39	*
9	*Acacia cathechu*	Khair,	3	4		
10	*Terminalia arjuna*	Arjun Sadad		7	30.54	
11	*Ficus mollis*		1	2		*
12	*Butea monosperma*	Kesudo	2		24.44	
13	*Holoptelea integrifolia*	Chilbil			35.01	
14	*Acacia leucophloea*	Shoe Babool		5		
15	*Flacourtia indica*		4			
16	*Bauhinia racemosa*	Kaliar	9			
17	*Zizyphus mauritiana*	Jherberi	5			*
18	*Lannea coromandelica*		8			
19	*Lagerstroemia parviflora*		6	8		
20	*Terminalia belerica*	Bahrai		1		
21	*Sterculia urens*		7			
22	*Tectona grandis*	Teak, Sagon			14.94	
23	*Albizia lebbeck*	Siris			18.3	
24	*Melia azedarch*	Bakani Nim			31.77	
25	*Boswellia serrata*			15		
26	*Pithecolobium dule*				19.21	*
	Total species		**13**		**14**	**8**

CZ-Core Zone, BZ-Buffer Zone. IVI RO – Important Value Index Rank Order,

DC- % of Dust control efficiency, FT-Fruit Trees, # Source-Anon

The list of plant species suggested includes the following criteria.

- **A total of 26 tree species suggested for greenbelt development of that 13 species selected based on the species secured more than 10% of IVI values because they are ecologicaly potential to show high survival and growth rate.**
- **This list also include 14 tree species which are potential to control dust emission and thereby maintain the ambient air quality of the area in and around the proposed project site.**
- ***Terminalia arjuna, Melia azedarch, Holoptelea integrifolia*, *Butea monosperma* and Cassia fistula are the tree species control dust emission more that 20% and therefore the project environment likely to have low dust pollution**
- **Some fruit trees (8 species) were in the selection list to attract specifically frugivore birds of the study area.**
- ***Terminalia arjuna and Boswellia serrate are* threatened plant species of the study area included in the list to improve the local population status.**

4.2.2. Greenbelt- Within Project site

The proposed project planned to have different structures like; power plant, godown, Coal yard, administrative premises, colony area, school, hospital or health centre etc. In order to improve the quality of ambient air quality and control other pollutions (gas and noise) and maintain the visual quality many tree species of wild, common and species of aesthetic values are suggested under this plantation program (**Table 4.2**)

Table 4.2. List tree species suggested to develop greenbelt – within the project site area

S.no.	Scientific Name	Common & Local Name	NC@	OGE@	%of DC #	Locations				
						1	2	3 &4	4	5
1	*Acacia nilotica (W)*	Babul,			6.12	*				
2	*Aegle marmelos (W)*	Bel,	*		18.9	*				
3	*Albizia lebbeck (W)*	Siris, Karo Sirish	*	+	18.3	*	*			
4	*Annona squamosa (C)*	Sugar apple, Jamfal			12.09			*	*	*
5	*Azardirachta indica (c)*	Neem	*	+	25.54	*	*	*	*	*
6	*Bauhinia variegata (W)*	Kanchnar			18.58	*	*	*		
7	*Butea monosperma (W)*	Kesudo	*		24.44	*	*			
8	*Cassia fistula (W)*	Amaltas			23.03	*	*	*	*	*
9	*Dalbergia sissoo (W)*	Shesham			17.02	*	*			
10	*Delonix regia (c)*	Gulmohar			18.05		*	*	*	*
11	*Diospyros melanoxylon (w)*	Thendu	*			*	*			

S.no.	Scientific Name	Common & Local Name	NC@	OGE@	%of DC #	Locations				
						1	2	3 &4	4	5
12	*Ficus benghalensis (C)*	Banyan, Vad	*		7.72		*	*	*	*
13	*Ficus recemosa (W)*	Gular	*			*				
14	*Ficus religiosa (C)*	Pipal	*	+	12.94	*	*	*	*	
15	*Hibiscus rosa- sinensis (c)*	Gurhal, Jasund			21.09			*	*	*
16	*Holoptelea integrifolia* (W)	Chilbil			35.01	*	*			
17	*Leucaena leucocephala (W)*	Shoe Babool, Liso bavar			11.24	*	*			
18	*Mangifera indica (C)*	Mango, Aam			12.25			*	*	*
19	*Manilkara zapota* (C)	Chikkoo			16.39			*	*	*
20	*Melia azedarch (W)*	Melia, Bakani Nim	*	+	31.77	*	*			
21	*Phoenix dactylifera (C)*	Khajoor	*	+	32.07		*	*		
22	*Polyalthia longifolia (C)*	Ashoka,	*	+	29.84		*	*	*	*
23	*Pongamia Pinnata (C)*		*					*	*	*
24	*Syzygium cumini (W)*	Jamun,	*		14.39	*	*	*	*	*
25	*Tamarindus indica L. (W)*		*			*				
26	*Tectona grandis (W)*	Teak, Sagon			14.94		*	*		
27	*Termanilia catappa (C)*	Desi Badam			30.12			*	*	*
28	*Terminalia arjuna (W)*	Arjun	*	+	30.54	*	*			
29	*Terminalia bellirica (W)*	Baharai	*			*				
	Total		16	7	24	**18**	**18**	**16**	**13**	**11**

@ CN –Control Noise level, OGE – Absorb Gas emission (+ So_2), Source of Plant Species: (Saxena 1991),
 # Source –Anon 2007 , Location: 1- Industrial or Plant areas, 2 –Roads, 3&4 Residential, 5-Schools, 6- Health centre

The list of plant species suggested includes the following criteria.

A total 29 tree species of were suggested under this greenery development programs keeping the proposed diverse structures likely to developed within the project area and they include 12 common and 17 wild species.

This cumulative list includes 24 species which performs the bio-filter role to control dust emission due to project activities, while 16 species control noise and 7 species absorb gas emission.

A total 0f 18 species each was suggested in and around the industrial areas and along the road sides to reduce all the pollution problems

Sixteen to 11 species were suggested to grow areas of office, school, residential and health centre which are common, fruit bearing and also produce colourful flowers to maintain the aesthetic and visual value of the area.

Cassia fistula (yellow), Delonix regia (Orange), Bauhinia variegata (purple), Hibiscus rosa-sinensis (Red) Pongamia Pinnata (pinkish) and Syzygium cumini (white) **are the species**

produce colourful flowers to improve the visual quality

***Annona squamosa, Ficus benghalensis, Ficus recemosa, Ficus religiosa, Mangifera indica, Manilkara zapota* are fruit bearing trees suggested in the areas of people live in**

Diverse and local species list suggested to increase the survival, growth rate and also provide habitat for local faunal species specifically avifauna, herpetofauna.

4.3. WILDLIFE CONSERVATION AND MANAGEMENT PLAN

The Welspun Energy UP Private Limited (WEUPPL), to cater growing energy needs of Uttar Pradesh, proposes to setup a Greenfield Coal based Thermal Power Plant (TPP) of 1320 MW (2x660 MW) capacity at DadriKhurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh, which is surrounded by Reserved Forest on all sides. This forest however is under different levels of degradation, which is mainly due to anthropogenic activities mainly due to the villages located within and outside the 10 km buffer zone of the proposed (TPP), who use this forest to cater part their livelihood needs. The survey conducted by Green Future Foundation during April and May 2012 revealed that the forest edges were comparatively more degraded and was sparse to open and mainly dominated by bushes of shrubs and stunted trees. Further, the remaining forest was dense to semi dense dominated by mixed deciduous forest with *Acacia cutachu* trees, bamboo (with already dead after flowering), *Acacia* and *Zizyphus oenphilia* climber (in the form of bushes) in most of the gentle to flat areas, while Butea monosperma was more in the moist rich areas with pure dry deciduous found only on the hill tops where *Boswellia serrata* and *Lannea coromendalica* were predominant.

The biodiversity in these forests are more towards the lower side with Nilgai being the most dominant species, indicating the degradedness of the forest. However, Common Leopard, Sloth Bear and Four-horned antelope, all three RET species, were found in these forests their numbers were found to be very low. Added, three wetlands Viz; Upper Khajuri Dam, Lower Khajuri Dam Location (LKD), and Kathua Bandh Location (KBD) falling within the buffer zone are presently the only perennial source of water, which are also habitat for wetland birds and other water depended flora and fauna.

With this being the scenario, the conservation plan is prepared taking all these into

consideration and mainly includes general plans for the betterment of the forest and wildlife. Habitat improvement of their habitat, specific plans for the RET species, mitigating man-bear conflict, which is presently very rare or very occasional. Added, enhancement of the forest resources along the fringes of the forest adjoining the most dependent villages and within their village boundary is very important mainly to reduce the pressure on the forest. This is very crucial as any conservation done in the forest would go waste unless the mainly reason for the degradation and loss is not addressed appropriately.

Conservation plan is much more than the preservation of certain plants and animal species. It is of high necessity for any landscape when it comes to preserving the wildlife or the biodiversity of that area, which governs the ecological functions. To this end based on the present biodiversity study especially the floral and faunal assessment of the core and buffer zones of the proposed Greenfield Coal based Thermal Power Plant (TPP) of Welspun Energy UP Private Limited (WEUPPL) to be setup at DadriKhurd village, Mirzapur Sadar tehsil, Mirzapur district, Uttar Pradesh, the conservation plan is prepared for the betterment of the wildlife in the area, which includes both general and specific plans targeting the threatened species that were sighted or found to be present in the study landscape.

4.3.1. Leopard

The leopard (*Panthera pardus*), another vulnerable species (IUCN 2010), is the most adaptable and widely distributed among the big cats (Nowell and Jackson 1996). This species is known for the use of habitat edges and its ability to live close to human habitation (Seidensticker *et al*.1990). Leopard feed on a broad spectrum of prey, ranging from smallest rodent to a young buffalo (Qureshi and Advait 2006, Ahmed and Khan 2008 and Ramesh *et al*. 2009). Studies on feeding of leopard have shown that chital, sambar and common langur forms their major diet (Karanth and Sunquist 1995, Sankar and Johnsingh 2002, Ramesh *et al*. 2009 and Mondal *et al*. 2011).

Leopard, scats, in the study landscape was recorded from three locations mainly in stream/riverine habitats. Two scats were recorded along the Jogidari Nala cutting across the forest blocks 1 & 3 of Marihan Range (East to project site) and one scat along Khankardali nala of Bela block of Lalganj Range (south west of project site). However, leopards are adaptable to any type of habitat in and around wilderness areas, it is important

that sufficient prey or food is available in the forest. Though the study area supports good population of Nilgai and Wild pig which can be prey for leopard, as part of conservation plan for this predator, habitat protection and improvement, especially the food availability for both the leopard and the prey species, along with availability of water and salt licks are of priority.

However, many of the tree species used as food by the langurs and the ungulates were available, most of the regeneration and recruitment was low or stunted due to grazing and occasional fire (in some forest areas), that has led to low availability of fodder species in the area. So the nearby forest areas must be protected from fire in addition to improving the fodder availability in and around the high forest dependent villages so as to reduce the grazing pressure and its impact in the forest. Gap plantation and intensive plantation of food plants for major faunal species and also improve their habitat must be taken up in the RFs within the study area especially in the highly degraded parts with the consultation of local forest department. Gap plantation can be done in 10 to 15 locations in the degraded reserve forest areas covering one ha area in each plantation site.

4.3.1.1. Development of Grasslands/patches for prey species of leopard:

Even though the forest department list reported, Chital, Sambar, Indian Muntjac, Indian Gazelle and Four Horned Antelope no sightings and evidences of these species were recorded during this study, except for Sambar and Four Horned Antelope. Of these except for Sambar and Indian Muntjac, rest of the ungulates prefer open habitats with grass. Sambar diet includes large amount of browse in dry season to grass and herbaceous plants in the wet season.

In order to improve the prey species, the habitat improvement should involve developing grass patches in the areas that are open. List of some grass species reported in the study area are suggested for grassland development (**Table 4.3**). This should be done in a minimum of 25ha plots, and at least six such plots, mainly in the degraded patches away from the villages in different directions should be developed.

Table 4.3: List of Grass species suggested for developing grassland/patches

S.no.	Grass Species
1	*Apluda mutica* L.
2	*Cenchrus ciliaris* L.
3	*Cynodon dactylon* (L.) Pers.

4	*Desmostachya bipinnata* (L.) Stapf
5	*Dichanthium annulatum* (Forak.) Stapf
6	*Eragrostis ciliaris* L.
7	*Eragrostis Sp.*
8	*Heteropogon contortus* (L.) P.Beauv. ex.R. & S.
9	*Sporobolus coromandelianus* (Retz.) Kunth
10	*Sporobolus sp*

4.3.1.2 Bamboo Plantation /forest

The forest habitat within 10 km radius of the study area is dominated by bamboo plantation with thickets of *Zizyphus species.* In most of the cases, bamboo thickets attained maturity and flowered and they are in drying stage. In order to improve the habitat quality it is suggested to remove the dead thickets and do re-plantation of bamboo which provide habitat for some of mammalian fauna wild pig, muntjac, sambar which are prey species of leopard and to enhance the associated biodiversity of this bamboo forest which dominated the study area .

4.3.1.3. Population status assessment

Even though the forest department list showed occurrence of many ungulate species like; chital, sambar, Indian Muntjac, Indian Gazelle, no direct sightings and indirect evidences of these species were reported in during the study in the forest areas.

Therefore, along with habitat protection and improvement, it is highly essential to re-assess the status of leopard population and other major prey species especially ungulates within 10 km radius of the project site.

Regular monitoring of the leopard and its prey population using comparable ecological methods is essential and is one of the other most important actions for leopard conservation.

This survey need to be carried out with the wildlife experts and the state forest department to identify the areas or forest needed all the conservation and management interventions which are highly crucial.

4.3.2. Four-horned Antelope

This is one of the smallest Asian bovids and is endemic peninsular India and small parts of low lands in Nepal. Sexually dimorphic Boselophid of small stature with only males having two anterior and two posterior smooth small horns unique among wild horned mammals. This Tetracerus is monotypic (Leslie and Sharma 2009). They have also mentioned that this

antelope prefers dry deciduous forested habitat and hilly terrain and are secretive.

Rice (1990) reported that Four-horned Antelope occurs in low densities and small population sizes. Further, this small bovid prefers dry deciduous forest especially the short grass habitat associated with stunted and sparse tree growth know as 'tree savanna' than the dry thorn forest (Baskaran *et al.* 2011). They have also mentioned that this antelope is a mixed feeder and the major diet of is grass, followed by browse biomass of herbs and shrubs, and leaves and fruits of few trees.

This being a vulnerable species (IUCN Red List 2011.12) and listed in Schedule I of the Wildlife Protection Act (1972), was recorded in six locations, of that two locations in the open scrub / wasteland along the boundary of the core zone, and four locations in the forests along the rivers during this study. This clearly shows that the animal tends to stay in vegetated areas in the study area. Since forests in most parts of the study area is degraded or disturbed, specific conservation plans to improve the habitat and food availability some shrub species are suggested for their long term existence.

It is important that the habitat needs to have short to medium size grasses, with herbs, shrubs and trees of stunted nature. Care must be taken that only species that are locally available and was said to be present earlier in the landscape should be planted as part of habitat improvement and increasing the food availability.

In addition to 10 grass species suggested (**Table 4.1**), a total of 11 woody shrub species are also suggested to grow in the degraded forest areas to enhance the food availability for ungulates. This list include the species secured more than 10% of RVI values of Core zone and top 10 species of buffer zone of the study area (**Table 4.4**).

These species can also provide food resources for some of the other ungulate species reported by the forest department in addition to four-horned antelope reported during this survey in the study area.

Table 4.4: List of woody shrub species suggested under habitat improvement program.

S.no.	Common Woody Shrub species	Core Zone				Buffer Zone				SPS
		RF	RDN	RVI	RO	RF	RDN	RVI	RO	
1	*Capparis sepiaria*					4.58	2.52	7.10	8	*
2	*Capparis zeylanica*					4.58	1.57	6.15	10	*
3	*Carissa congesta*	5.77	7.08	12.84	6	12.98	15.59	28.57	2	*
4	*Cocculus hirsutus*	15.38	16.51	31.89	3	10.69	9.29	19.98	3	*
5	*Cocculus pendulus*					3.82	1.57	5.39	11	*
6	*Helicteres isora*					3.82	6.30	10.12	6	*

7	*Securine gavirosa*					7.63	4.09	11.73	5	*
	Waltheria indica	7.69	6.60	14.30	5	2.29	1.26	3.55	12	*
9	*Zizyphus nummularia*	19.23	9.43	28.66	4	7.63	8.82	16.45	4	*
10	*Zizyphus oenoplia*	21.15	23.11	44.27	2	3.05	3.31	6.36	9	*
11	*Zizyphus xylopyrus*	19.23	30.66	49.89	1	25.95	36.54	62.49	1	*
Total species		**6**				**11**				**11**

4.3.3. Sloth Bear

Sloth bear (*Melursus ursinus*), an omnivore and vulnerable species (IUCN 2010), play a very vital ecological role in the form of seed dispersal (Willson 1993, Sreekumar and Balakrishnan 2002), and aid in improving the diversity of floral species in the forest. Their principal diet is fruits (Bhaskaran *et al.* 1997)**,** followed by termites and ants, in addition to honey. They climb on the tree and feed on fruit and honey, picking fruits fallen on the ground and digging for the termites and ants.

The signs of sloth bear during this study were recorded at two different locations. Of these, one track was in the forest, while the second, a dropping was found in the riverine forest (Pahiti Nadi) adjacent to the thorn mixed forest both in the Sirso forest block 3 of Marihan Range located in the buffer zone. The dropping revealed that it had eaten termites as it had termite and mud. The forest were the sloth bear signs were seen and other forest areas `nearby revealed that the fruit availability, which the major diet, was low in the forest. However, now there is very less or occasional conflict, it could become a problem, so action plans needs to be developed to address this issue. However, the only one dropping was recorded, the remains of termites (fed mostly during monsoon), it also shows that the availability of the fruits was low.

The specific conservation action needed is improving the habitat through restoration and planting of fruiting trees that are eaten by sloth bear in the forest that would enhance the food availability for this species and also reduce the conflict with humans. Some of the fruit tree species have been suggested to grow in the degraded forest areas to increase the food resources for sloth bear (**Table 4.5**)

Though this list includes 24 tree species, of that 14 species would improve the availability food resources for sloth bear and also support some of the ungulate species reported/said to occur in the forest areas.

In addition some of the shrub species suggested: *Zizyphus nummularia, Zizyphus oenoplia, Zizyphus xylopyrus, Capparis sepiaria, Carissa* congesta are also form food species of sloth bear (especially *Zizyphus* spp.) and other ungulate of the project area.

Table 4.5: List of tree species suggested under habitat improvement program for sloth bear

S.no.	Scientific name	Faunal Species				
		SB	CL	NL	FH	CH
1	*Acacia cathechu*		*	*		
2	*Acacia nilotica*			*		
3	*Aegle marmelos*	*				
4	*Albizia lebbeck*		*			*
5	*Butea monosperma*			*		
6	*Cassia fistula*	*				
7	*Dalbergia sissoo*		*			
8	*Diospyros melanoxylon*	*			*	
9	*Emblica officinalis*	*	*		*	
10	*Ficus benghalensis SB*	*	*			*
11	*Ficus mollis*	*				
12	*Ficus racemosa* SB	*	*			
13	*Ficus religiosa* SB	*	*			
14	*Flacourtia indica*	*				
15	*Holoptelea integrifolia*		*			
16	*Lannea coromandelica* CL		*			
17	*Madhuca indica* SB	*	*	*	*	*
18	*Mangifera indica*	*	*			
19	*Syzygium cumini SB*	*	*			*
20	*Syzygium heyneanum SB*	*	*			
21	*Tectona grandis*		*			
22	*Terminalia arjuna CL*		*			
23	*Terminalia bellirica CL*		*			
24	*Zizyphus mauritiana*	*	*	*	*	
	Total	14	17	5	4	4

SB-Sloth bear, CL-Common Langur, NL – Nilgai, FH- Four-horned antelope, CH – Chital

4.3.4. Long-billed Vulture

However, Long-billed vulture, White-rumped Vulture, Red-headed Vulture (all critically endangered) and Egyptian Vulture (endangered) were listed by the Mirzapur forest division, during this study only Egyptian Vulture was sighted once in the buffer zone. Once all these species were found common in India have presently reach to the stage of extinction mainly due to the use of the Diclofenac, a pain killer used to treat livestock which affected these vulture populations since they feed on dead livestock. Habitat loss in the form of removal of forest with tall and large trees and mining the rocks in the areas with rocky cliffs where they nest is another threat for the population decline.

As said above strict protection must be given to the rocky area especially cliffs and ledges, rocky ledges along the rivers and keep them out from mining in addition to restricting human interference in these sites, as these are probably good nesting and roosting habitats.

Secondly, it is very important to create awareness amongst local veterinary doctors and

the livestock keeper mainly to avoid use of Diclofenac which kills the vultures when they feed on livestock carcass. This is because even after banning of this drug in India, it is found that human Diclofenac is being used on livestock and therefore systematic awareness to be provided to the chemists in the area.

Thirdly, monitoring of the nesting sites and the vulture population numbers are very important during October to May, as these species nest during this period.

- Finally as part of habitat improvement, large sized tree species such as *Ficus benghalensis, F. religiosa, F. recemosa, Terminalia arjuna, T. tomentosa, T. bellirica* and other large sized species can be plant in patches as well as gap plantation keeping in mind the habitat conditions and requirement for other wildlife in the area, that is all open or semi dense forest should not be planted with trees.

4.3.5. Indian Peafowl

The Indian Peafowl (*Pava cristatus*) is an omnivore and listed in Schedule I of IWPA (1972). The Indian Peafowl *(Pavo cristatus)* has been an integral part of the people of the India and their culture for centuries. From religion and mythology to civilization and socio-culture, the Indian Peafowl occupies an important place in the lives of the people. In addition to this, the Indian Peafowl is well recognized for its ecological and aesthetical values, and hence aptly declared as the 'National Bird' of India in the year 1963 . The Indian Peafowl has been widely distributed throughout India except for the Himalayan ranges, north-east India and the Islands (Ali & Ripley 1987). Although the Indian peafowl is widely distributed and locally abundant or fairly common in some areas, the present population status of this species is only speculative and many of its former contiguous range has become fragmented and discontinuous (Choudhury and Sathyakumar 2009).

It is a bird of scrub jungles and forest edges, showing affinity to moist and dry deciduous and semiarid biomes. It is also found in the agriculture fields, along streams with good vegetation and close to human habitations in a semi-feral condition (Johnsgard 1986). It generally prefers a habitat mosaic of scrub and open areas, with adequate sites for dust bathing. Dust bathing is important as this bird has to condition its feathers and remove feather-degrading bacteria and other external parasites (Choudhury and Sathyakumar 2007). It roosts on trees and also uses tall buildings where trees are scarce (Birdlife International 2000).

- During this study only 18 Peafowls was sighted within the study area. However being a schedule - I species of IWPA 1972, it is very crucial to maintain and protect the open scrub habitats mainly through keeping it out from mining, encroachment or expansion

for agriculture and further degradation of the habitat as part of its conservation.

- As part of habitat improvement in the form of increasing the availability of roosting trees, it is important to plant tree species that are tall and with dense branching with good cover like *Ficus benghalensis, F. religiosa* and other locally found tall growing species in additions to opening up spaces by way of uprooting the *Lantana camara* in patches and also creating scrub forest by planting local shrub species.
- Educate and create awareness among local people on the significance of this species and its role as a pest controller, why the roosting trees in the area should not be lopped and need for the proper protection of this species especially during breeding as they are ground nesting birds and its habitat.
- Monitoring of the Peafowl population and its habitat is also very crucial.

4.4. HABITAT QUALITY IMPROVEMENT

4.4.1. Developing Check dams

There are three dams (Upper Khajuri Dam, Lower Khajuri Dam and Kathua Bandh) located in and around the study area, and though many rivers and streams are cutting across the study area from north to south, they are highly seasonal and water availability in most of the forest habitats/blocks are totally nil during summer season. Hence, it is suggested that a total of 12 check dams need to constructed across the streams/rivers passing through four reserve forest areas located in the study area (Table 4.6). As suggested the sites should be identified along the major streams/nullahs and construct check dams which would facilitate water availability for all the major faunal species of the study area.

Table 4.6: Reserve Forests identified for the construction of the Check Dams

No	Area	Number of check dams
1	Danti Reserve forest	3
2	Dadhiram Bamboo forest	3
3	Sarson Reserve forest	3
4	Bela Bamboo forest	3

4.4.2. Developing Water holes:

In addition, developing/creating water holes at strategic location in different forest blocks in the study area is suggested. It is very essential to develop small water holes especially in Lalganj and Marihan Ranges where sightings and evidences of more mammalian fauna reported.

Development of additional water resources likely to improve some of the other faunal groups like: amphibians, other Schedule I reptilian fauna; and Indian Flapshell Turtle reported in the study area.

As part of this six water holes are suggested, three each in the Lalgamj and Marihan Ranges and these should be filled with water through tankers frequently during summer and other periods of unavailability of water.

4.4.3. Salt Licks

Requirement of salt is very important for most wildlife, which they often meet from natural salt licks available in the forests, but during the survey there were no such salt licks present in the forest area. So artificial salt licks should be preferably made in the forest near the water holes, where watch and ward is possible to prevent poaching, as these are most vulnerable sites to poaching. This will help these animals and other wildlife to confine in the forest away from the villages.

4.4.4. Protection

It is very important to protect the forest from biotic interference (cutting, lopping, encroachments, expansion of agriculture lands, and other negative influence) caused mainly by the local population. However the forest department is well equipped and with full-fledged protection strategy in place, the project can complement the forest protection activities including a list of duties in the code of conduct of the project employees and more specifically the security guards in stopping and reporting the illegal activities. Provision of communicating equipment for this purpose would also be very important. Capacity building program on protection would be of high significance.

4.4.5. Forest Fire Protection Plan

This being a tropical forest with dry deciduous and thorn forest type, it is prone to fire each year between mid February to June (until onset of rains). Fire lines are to be cleared around the project area and also along the forest boundaries, in addition to clearing along the roads, footpaths and nullahs to prevent fire.

The forest department identified some areas in Marihan Rage which are prone to frequent

fire and prepared forest fire map and therefore the above said management plans need to be implemented in those areas. In addition, it is suggested to develop watch towers to monitor fire incidences.

4.4.6. Anti-Poaching Plan

Poaching being one of the causes for depletion of wildlife in general, it is necessary to improve enforcement and create awareness among the people for eliminating poaching /hunting, which is present almost nil or very low, and help in improving the status of the wildlife and its habitat. Towards this end the protection staff has to be strengthened through employing more people (3-4 persons). They along with the forest staff should be provided with appropriate equipment including the anti-poaching kit at the project cost. They should help to prevent poaching and illicit felling after being trained appropriately.

4.4.7. Development of Wetland habitat

Among the three dam sites, the larger one Upper Khajuri dam seems to be a potential wetland habitat of the study area. Since the study was carried out during summer, it had only 25% water and supported 30 species of wetland birds. The reservoir covers large extent of area it can support diverse wetland species with good population (**Plate**). Therefore it has been suggested to develop this dam site as potential wetland habitat of the area. The forest department should have stake to implement the following suggestion with the joint venture of the Irrigation department:

The peripheral area of the dam site need to be planted with larger tree species *Ficus benghalensis*, *Ficus religiosa, Syzygium cumini, Mangifera indica, Holoptelea integrifolia*, *Albizia lebbeck*, *Derris indica*, *Azadirachta indica* that can provide habitat for perching and nesting site for some of the aquatic birds species.

The reservoir area need to be developed few (four to five) stone mounds and dead tree shape concrete structures in the middle which can act as perching/resting as well as basking sites for some ducks and cormorants. This would also facilitate for clear sighting of birds by the local visitors and easy counting of birds by professional bird watches visit this wetland.

Two to three watch towers are suggested to construct along the south, east and west sides of the boundary of the reservoir area which can facilitate the tourists and bird watchers to observe birds and to take photograph and bird count.

The forest depart can develop interpretation centre close to dam site with the information

and visuals (photos) of the common birds found in the wetland, breeding birds, migratory birds and species of conservation significance.

4.5. Mitigation of Human – Animal Conflict

4.5.1 *Eco-Education and awareness Generation*

The project should take up widespread awareness program to sensitize the locals through multimedia (slide shows, films, street plays) on relevant subjects like Diclophenac and its dreadful effect on vulture species and complete stopping of its use, general conservation of biodiversity and their benefits to mankind, significance of different species of animals and plants more specifically the species of conservation significance and also on how to live in harmony with the wildlife in the area.

Conduct Panchayat workshops, school programs and events at the weekly markets using eco-educational packages, which would show the locals the interdependence of nature for survival and development along with instilling them a feeling of love and respect for the flora and fauna. Villagers should be made aware that the wildlife should not be disturbed in the forest during any time of the day.

4.5.2. Light

Since the animals generally enter the fields in the night and cause damage to the property, as they are not visible in the darkness and chance of conflict increases, lights are necessary along the boundary of the villages to reduce the conflicts. It is suggested to provide eco-friendly solar lights in the villages where the problems are very high and frequent.

The project proponent must provide funds and take up all the above mentioned initiatives with the help of the forest department and a subject specialist. All these planning needs to be done after an appropriate survey of the area based on which sites and implementation plans can be developed. All these would be basically planned, implemented and monitored by a specific committee.

4.5.3. Project labour force and increasing pressure on the forest resources

The proposed project activities needed larger labour force for non-technical activities. These, labours may depend on the forest area for their stay (land) and fuel wood requirement and construction materials (small poles) for temporary sheds. The sudden influx

of larger labour forces expected to cut of small poles from the forest area for the construction of temporary sheds and fuel wood demand and they may also involve in illegal hunting of animals

Due to the above said likely impact it is suggested that, the project proponent should provide all the basic requirement like: accommodation, fuel resources for their day to day requirements, portable water.

The project proponent should give very strict instruction to the outside labours working in the project related activities should not involved in any illegal cutting of trees from the nearby forest areas and hunting of animals.

4.6 Management for forest resource dependency

4.6.1. Development of energy resources

One of the major problems identified in the forest areas adjacent to the project site is degradation of forest due to severe wood cutting problems for fuel wood and fodder resources and therefore these issues need to be addressed under conservation and management plan. With the concept being that conservation of RET species and enhancement of the forest resource around the highly dependent villages would preserve a larger ecological system and landscape, thus providing safety to all other biodiversity or flora and fauna surviving within it.

- In order to minimize the fuel wood cutting pressure which degrade forest cover and impact the associated faunal biodiversity, it is suggested to develop energy resources to replace the fuel wood requirement.

- The villagers fall under BPL and fully depend on forest resources for fuel wood should be identified and provided energy efficiency smokeless chullas and solar cooker.

- Those who are having livestock should be trained and bring under the practice of development of biogas and use to reduce the fuel wood cutting from the nearby forest areas.

4.6.2. Development of Fodder Resources

- Local villagers cut trees from the forest areas and also graze their livestock which would reduce the food availability for the wildlife and impact overall biodiversity of the local forest areas. Therefore it is suggested to grow fodder trees in the close vicinity of the villages which depend on the forest resources to meet their fodder requirement.

- It is suggested to develop immediately fodder grass plots within the village Gaucher land (land allotted for grazing) to reduce the grazing pressure in the forests.

- These grass plots should be developed with the grass species which are highly nutritive and locally available with the consultation of local villagers especially livestock keepers.

- Simultaneously, it is suggested to develop fodder plantation within the village waste land or along the agriculture hedges to minimize the lopping pressure in the forest area.

- Since it is essential to allow the plantation to develop, in the initial five years the villagers should depend on the grass fodder and agriculture residues to feed their livestock.

- Both the fodder resources suggested to develop need to be used sustainably under the management of Village Fodder Committee - VFC.

- The following are the tree species suggested to develop under fodder plantation which are having high growth rate and high fodder values and grow locally (**Table 4.6.**)

- Added the fodder plantation likely to increase the vegetation cover locally and expected to support local faunal biodiversity

- These species are wild and common species, selected primarily based on the fodder value above five according to Hocking 1993. Among the species except *Boswellia serrata* and *Tamarindus indica* rests of the species having growth rate value of more

than five.

- Though, except five species having lesser than five value of fuel efficiency, rest of the species are good for fuel wood. However, these species can be extracted sustainably for fuel wood provided if they were grown under this program within their agriculture hedges. This can be an additional management option to reduce wood cutting pressure in the forest area for fuel wood.

Table 4.6: List of tree species suggested to grow under fodder plantation

S.no.	Scientific Name	Local Name	Fodder value *	Growth rate*	Fuel value*
1	*Acacia cathechu*	Khair	5	5	6
2	*Acacia nilotica*	Babul	7	6	10
3	*Azadirachta indica* A. Juss.	Neem	6	6	6
4	*Balanites aegyptiaca*	Hingu. Hingot	6	6	4
5	*Boswellia serrata*		5	4	6
6	*Derris indica*		6	6	7
7	*Ficus benghalensis*	Bargad	6	7	4
8	*Ficus religiosa*	Pipal	7	8	4
9	*Pithecellobium dulce*	Vilayati iimli	8	8	5
10	*Syzygium cumini*	Jamun	7	6	7
11	*Tamarindus indica*	Imli	8	2	8
12	*Wrightia tinctoria*	Mitha indrajau	5	5	4
13	*Zizyphus mauritiana*	Baer	6	6	8
14	Zizyphus nummularia	Jhadiabar	8	7	3

*** Plant list sources; Hocking 1993**

4.7 Social Surveys:

Before starting the project or sanctioning the budget for the conservation activities there is a need to carry out social survey to assess the status of forest resources dependency by the local villagers. So that actual data can be collected and collated on species of use for the locals (e.g. fuel-wood species, fodder species and other facilities required- small wood or poles for construction of fencing, gate and cattle sheds etc) Therefore a questioner / social survey need to be carried out in the villagers located within the boundary of the forest areas to exactly identify the areas where the above said management plans need to be implemented.

4.8. MONITORING OF CONSERVATION AND MANAGEMENT ACTION PLANS

The above suggested all the conservation and management plans would be developed and implemented by a different stakeholder's committee that would be headed by the DFO Mirzapur Forest Division. The other members of the committee include DFO (wildlife),

Mirzapur / representative; CEO of Mirzapur block, Project representative, one subject specialist, one NGO working with local people, one NGO working on Wildlife in the area and two representatives from local villages (it would be rotational with two villages getting to represent every year. This committee will be in charge of all issues related to conservation and their implementation, including 25% to 30% or entire fund management along with regular monitoring from the planning, implementing and long term monitoring. The finacial budget/ forecast for the Wildlife Conservation and Eco- Management Plan is detailed in the table (**Table 4.7**).

Conservation Plan

Endorsed By

Signature:

Divisional Forest Officer, Mirzapur, UP.

Approved by

Signature:

PCCF Wildlife, UP State Forest Department,

Lucknow, UP.

Table 4.7: Financial Forecast (in lakhs) for the Wildlife Conservation and Eco-Management Plan

No	Activity	Year wise fund Requirement (in lakhs)										Modified Final
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
1	**Protection**											
1a	**Anti-poaching & Protection**											
A	Four Temporary Guards @ Rs.4500/- + Rs.500 travel per persons x 4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	24.00
b	Anti-poaching Kit ,Wireless etc	2.0	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	03.30
	Sub Total (1a)	***4.4***	***2.5***	***2.5***	***2.5***	***2.5***	***2.9***	***2.5***	***2.5***	***2.5***	***2.5***	***27.30***
1b	**Fire Protection**											
a	Clearance	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.0
b	Wages of Fire Watchers @ Rs.4000 x 5 months x 2 nos. x 10 yrs	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.0
c	Cost of Fire Fighting Equipment	0.5	-	-	0.5	-	-	0.5	-	-	0.5	2.00
d	Training & Drill	0.3	-	-	0.3	-	-	0.3	-	-	0.3	1.20
e	Cost of one Watch Tower & maintenance	3.0	-	-	0.2	-	-	0.2	-	-	0.2	3.60
	Sub Total (1b)	***4.7***	***0.9***	***0.9***	***1.9***	***0.9***	***0.9***	***1.9***	***0.9***	***0.9***	***1.9***	***15.8***
	Total (1a+1b)	***9.1***	***3.4***	***3.4***	***4.4***	***3.4***	***3.8***	***4.4***	***3.4***	***3.4***	***4.4***	***43.10***
2	**Habitat Improvement**											
2a	**Nursery**											
	Development & Maintenance of Nursery	4.5	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	11.25
	Sub Total	***4.5***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***0.75***	***11.25***
2b	**Water Conservation**											
a	Game tank / water holes 3 Nos. @ Rs.80,000 each & Maintenance	2.4	-	-	0.3	-	-	0.3	-	-	0.3	3.30
b	Check- Dams 8 Nos. @ Rs.1.25 lakh each & Maintenance	10.0	-	-	0.75	-	-	0.75	-	-	0.75	12.25
	Sub Total	***12.4***	***-***	***-***	***1.05***	***-***	***-***	***1.05***	***-***	***-***	***1.05***	***15.55***
2c	**Food Availability**											
a	Improvement of vegetation - habitat & Food by RDF method with gap plantation in RF 50 ha @ Rs.40,000/- per ha	20.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	25.00
b	Creation & Maintenance of Meadows (Grassland) 5 plots each 25 ha @ Rs.1 lakh per plot	5.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	9.50
	Sub Total	***25.0***	***1.5***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***34.50***
2d	**Salt Licks**											

No	Activity	Year wise fund Requirement (in lakhs)										Modified Final
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
a	Creation of artificial Salt Lick near meadows & water holes	1.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.80
	Sub Total	***1.0***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***2.80***
	Total (2a+2b+2c+2d)	***42.9***	***2.45***	***1.95***	***3.0***	***1.95***	***1.95***	***3.0***	***1.95***	***1.95***	***3.0***	***64.10***
3	**Man -animal Conflict**											
a	Solar lamps 20 Nos. & its Maintenance (5 lamps per village for 4 village with high conflict) @ Rs.6000/- per lamp	1.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	3.0
b	Corpus Fund	8.0	-	-	-	-	-	-	-	-	-	8.0
	Sub Total & Total (3a +3b)	***9.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***0.2***	***11.00***
4	**Livelihood Development, Monitoring and Capacity Building**											
a	Eco-development Support FD,BDO & VAS (Livelihood development -fuel & fodder plots) -Four most Forest dependent villages	8.0	1.0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	15
b	Incidental Charges of the Monitoring Committee	0.75	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	3.45
c	Capacity Building / Skill Development training	2.0			1.0			1.0			1.0	5.00
	Sub Total & Total (4)	***10.75***	***1.30***	***1.05***	***2.05***	***1.05***	***1.05***	***2.05***	***1.05***	***1.05***	***2.05***	***23.45***
5	**Awareness & Education -Biodiversity Significance & Sustainable Use of Resource**											
a	School Level	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.0
b	Village Level	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.5
c	Gram Panchayat Level & Vetenary doctors, Chemists, Livestock keepers & Project Staff, Security guards	8.0	-	-	-	-	-	-	-	-	-	8.0
	Sub Total & Total (5)	***9.5***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***1.0***	***18.50***
6	**Wetland (habitat) Development**											
a	Mounds (4/3 Nos) & Artificial Dead Tree (4/3 Nos) (RCC)	4.5	-	-	-	-	-	-	-	-	-	4.5
b	Two Watch Towers Construction & Maintenance	5.0	-	-	-	0.5	-	-	-	0.5	-	6.0
c	Interpretation Centre Development & Maintenance	4.0	-	-	-	-	0.5	-	-	-	-	4.5
	Sub Total & Total (6)	***13.5***	***-***	***-***	***-***	***0.5***	***0.5***	***-***	***-***	***0.5***	***-***	***15.00***
7	**Research & Monitoring - Wildlife (Terrestrial and Wetland)**											
a	Population Status Assessment once in a year (FD) & Overall (FD& Wildlife Experts)	3.0	-	-	2.0	-	-	2.0	-	-	2.0	9.0

No	Activity	Year wise fund Requirement (in lakhs)										Modified Final
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
	Sub Total & Total (7)	*3.0*			*2.0*			*2.0*			*2.0*	*9.00*
	Grand Total (1+2+3+4+5+6+7)	97.95	08.35	07.60	12.65	08.10	08.50	12.65	07.60	08.10	12.65	184.15

Finacial Budget Endorsed by

Signature:

Divisional Forest Officer
Mirzapur Forest Division
UP Forest Department
Mirzapur

Finacial Budget Approved by

Signature:

PCCF Wildlife
UP State Forest Department
Lucknow

Chapter 5 – REFERENCE

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6. Annexures

Annexure 1. Overall status of Floral species - Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttrapradesh

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
1	**Acanthaceae**											
1	*Andrographis paniculata* Nees	Kalmegh	Herb	—		+		+				**
2	*Asteracantha longifolia* Nees	Talmakhana	Herb	—						+		**
3	*Blepharis repens* (Vahl) Roth		Herb	—	3			1	25	5	34	**
4	*Dipteracanthus patulus* (Jacq.) Nees		Herb	—						4	4	**
5	*Justicia spp.*		Herb	—			4			2	6	**
6	*Lepidagathis trinervis* Wall.		Herb	—		6		62	28	2	98	**
7	*Peristrophe bicalyculata* (Retz.) Nees	Atrilal , Chirchiri	Herb	—		3	35	8		16	61	**
2	**Agavaceae**											**
8	*Agave americana* L.	Hathiya chinghar, Rambans	Shrub	—			3				3	**
3	**Alangiaceae**											
9	*Alangium salvifolium* (L. f.) Wang.		Tree	—			2			12	14	**
4	**Alismataceae**											
10	*Sagittaria sagittifolia* L.,		Herb	—						+		**
5	**Amaranthaceae**											
11	*Achyranthes aspera* L.	Lather	Herb	—			29			7	36	**
12	*Amaranthus spinosus* L.	kateeli chaurai	Herb	—	+		+					**
13	*Amaranthus viridis* L.		Herb	—			3				3	**
14	*Celosia argentea* L.		Herb	—	2	9		2			13	**
15	*Digera muricata* (L.) Mart.		Herb	—			2				2	**
16	*Gomphrena globosa* L.		Herb	—						3	3	**
6	**Anacardiaceae**											
17	*Buchanania lanzan* Spreng.	Chiraunji	Tree	FD			+					FD*
18	*Lannea coromandelica* (Houtt.)		Tree	FD		8		5			13	FD*
19	*Mangifera indica* L.	Ama	Tree	FD			21				21	FD*
7	**Annonaceae**											
20	*Annona squamosa* L.	Shareefa	Small Tree	—	+	+				+		**
21	*Polyalthia longifolia* (Sonn.) Thw.	Ashok	Tree	—			1				1	**
8	**Apiaceae**											
22	*Daucus carota* L.	Gajar	Herb	—			+					**
23	*Foeniculum vulgare* Mill.	Saunf	Herb	—			+					**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
9	**Apocynaceae**											
24	*Alstonia scholaris* (L.) R. Br.	Saptaparni	Tree	—			+	+				**
25	*Carissa spinarum* L.		Shrub	FD	15		3	52	20	24	114	FD*
26	*Holarrhena antidysenterica* (Heyne ex Roth) Wall.	Kutaj	Tree	FD				62	2	20	84	FD*
27	*Ichnocarpus frutescens* (L.) R.Br.		Climber	FD		2		3			5	FD*
28	*Thevetia peruviana* (Pers.) Merr.	Pila Kaner	Shrub	—			+					**
29	*Wrightia tinctoria* R. Br.		Tree	—		1		5			6	**
10	**Araceae**											
30	*Amorphophallus campanulatus* (Roxb.) Bl. Ex Decne.	Sooran	Herb	—						+		**
11	**Arecaceae**											
31	*Borassus flabellifer* L.		Tree	—			+					**
32	*Caryota urens* L.		Tree	—			+					**
33	*Cocos nucifera* L.	Narial	Tree				+					**
34	*Phoenix humilis* L.		Tree	FD						2	2	FD*
12	**Asclepiadaceae**											
35	*Calotropis gigantea* (L.) R. Br.		Shrub	—	+		+					**
36	*Calotropis procera* (Ait.) R. Br.	Madar	Shrub	FD	1		2			2	5	FD*
37	*Telosma pallida* (Roxb.) Craib	Kusiyari	Climber	—		+		8	14	6	28	**
13	**Asteraceae**											
38	*Echinops echinatus* Roxb.		Under Shrub	FD					3	5	8	FD*
39	*Eclipta prostrata* (L.) L. Mant.		Herb	—						4	4	**
40	*Launaea procumbens* (Roxb.) Ram. & Raj.		Herb	—			7		2	4	13	**
41	*Oligochaeta ramosa* (Roxb.) Wagenitz		Herb	—			1				1	**
42	*Parthenium hysterophorus* L.	Gajar Ghas	Herb	—		8	67			19	94	**
43	*Sphacranthus indicus* L.	Mundi	Herb	—						+		**
44	*Tridax procumbensi* L.	Phulni	Herb	—	1		2	26	69	53	151	**
45	*Vernonia cinerea* (L.) Less.	Sahadaiya	Herb	—	15		24	82	122	60	303	**
46	*Xanthium strumarium* L.	Gokhur	Herb	—			4				4	**
14	**Balanitaceae**											
47	*Balanites aegyptiaca (L.) Del.*		Small Tree	—				2	+		2	**
15	**Bignoniaceae**											
48	*Haplophragma adenophyllum* (Wall. ex G. Don) Dop	Kath Sagon	Tree	FD			+	+				FD*

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
49	*Millingtonia hortensis* L. f.		Tree	—					+			**
50	*Stereospermum suaveolens* DC.		Tree	—						1	1	**
16	**Bombacaceae**											
51	*Bombax ceiba* L.		Tree	—			+					**
17	**Boraginaceae**											
52	*Coldenia procumbens* L.		Herb	—			2				2	**
53	*Heliotropium indicum* L.		Herb	—			1				1	**
54	*Heliotropium sp*		Herb	—				3	1		4	**
18	**Brassicaceae**											
55	*Brassica nigra* (Linn.)Kach.	Rai	Herb	—	+		+					**
56	*Raphanus sativus* L.	Murai	Herb	—			+					**
19	**Burseraceaae**											
57	*Boswellia serrata* Roxb.	Salai	Tree	FD				14			14	FD*
20	**Cactaceae**											
58	*Opuntia elatior Mill.*		Herb	—					+			**
21	**Caesalpiniaceae**											
59	*Bauhinia racemosa* Lam.	Kaliar	Tree	FD		1		7		1	9	FD*
60	*Bauhinia variegata* L.	Kanchaner	Tree	—		+		+				**
61	*Cassia fistula*L.	Amaltas	Tree	FD				4			4	FD*
62	*Cassia occidentalis* L.	Kasaundhi	Herb	FD		+				+		FD*
63	*Cassia siamea* Lam.	Sandan	Tree	FD					10		10	FD*
64	*Cassia tora* L.	Chakwar	Herb	—	33	2	2	36	74		147	**
65	*Delonix elata* (L.) Gamble	Gul Mahor	Tree	—				7			7	**
66	*Parkinsonia aculeata* L.		Small Tree	FD			+					FD**
67	*Peltophorum pterocarpum* (DC.) Backer ex Heyne		Tree	—			+		+			**
68	*Tamarindus indica* L.	Imli	Tree	FD	+		+					FD*
22	**Cannabinaceae**											
69	*Cannabis sativa* Linn.	Bhang	Herb	—			+					**
23	**Cannaceae**											
70	*Canna indica* L.		Under Shrub	—			+					
24	**Capparaceae**											
71	*Capparis sepiaria* L.		Straggling Shrub	FD				1	13	2	16	FD*
72	*Capparis Sp*		Under Shrub	—					2		2	**
73	*Capparis zeylanica* Linn.		Straggling Shrub	FD		3		5	5		13	FD*
74	*Cleome gynandra* L. var. *gynandra*		Herb	—		+						**
75	*Cleome viscosa* L.	Hurhur	Herb	—		+		+		+		**
76	*Maerua oblongifolia*		Woody	—		2					2	*8

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
	(Foeak.) A. Rich.		Twiner									
25	**Caricaceae**											
77	*Carica papaya* L.	Papaya	Tree	–			**5**				**5**	**
26	**Chenopodiaceae**											
78	*Atriplex hortensis* L.	Palakh	Herb	–			+					**
79	*Chenopodium album* L.	Bathua	Herb	–			**2**			**4**	**6**	**
27	**Combretaceae**											
80	*Terminalia arjuna* (Roxb.) W. & A.	Arjun Sadad	Tree	**FD**			**5**			**19**	**24**	**FD***
81	*Terminalia bellirica* (Gaerth) Roxb.	Baharai	Tree	**FD**			**1**				**1**	**FD***
28	**Commelinaceae**											
82	*Commelina benghalensis* L.		Herb	–			**19**				**19**	**
83	*Commelina diffusa* Burm. f.		Herb	–	**+**		**+**			**+**		**
29	**Convolvulaceae**											
84	*Convolvulus microphyllus* (Roth) Sieb. ex Spr.		Herb	–					**2**	**10**	**12**	**
85	*Evolvulus alsinoides* L.	Neel Shankh,Puspi	Herb	–	**17**	**15**		**52**	**29**	**6**	**119**	**
86	*Ipomoea carnea* Jacq. Subsp. *fistulosa* Mart. Ex Choisy		Stragglin g Shrub	–			**3**			**3**	**6**	**
87	*Ipomoea pes-tigridis* L.		Twining Herb	–				**2**			**2**	**
88	*Merremia dissecta* (Jacq.) Hall. f.		Twining Herb	–						**2**	**2**	**
89	*Merremia* Sp		Twining Herb	–			**31**	**7**	**4**		**42**	**
90	*Merremia tridentata* L.		Twining Herb	–					**3**		**3**	**
91	*Rivea hypocrateriformis* Choisy	Rivea	Climber	–		**5**			**1**	**1**	**7**	**
30	**Cucurbitaceae**											
92	*Citrullus colocynthis* (L.) Soland.	Indrayana	Climber	–	**+**					**+**		**
93	*Coccinia grandis* (L.) Voigt	Kundru	Climber	–				**+**				**
94	*Cucumis melo* L. *var. melo*	Kharbooja	Herb	–			**+**					**
95	*Cucumis prophetarum* L.		Climber	–		**+**			**+**			**
96	*Cucumis sativus* L.	Kheera	Climber	–			**+**					**
97	*Cucurbita maxima* Duch.	Kadhu	Climber	–			**+**					**
98	*Lagenaria siceraria* Stardl.	Lauki	Climber	–			**+**					**
99	*Luffa acutangula* L.	Jagli Torai	Climber	–						**4**	**4**	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
100	*Luffa cylindrica* (L.) M. J. Roem.	Torai	Climber	—			+					**
101	*Momordica charantia* L.	Karela	Climber	—			+					**
102	*Momordica dioica* Roxb.	Kheksa	Climber	—			+					**
103	*Trichosanthes dioica* Roxb.	Parval	Climber	—			+					**
31	**Cuscutaceae**											
104	*Cuscuta reflexa* Roxb.	Amerbel	Parasite	**FD**		+		+	+			**FD***
32	**Cyperaceae**											
105	*Cyperus compressus* L.		Sedge	—						+		**
106	*Cyperus rotundus* L.	Motha	Sedge	—			**2**				**2**	**
107	*Eleocharis sp*		Sedge	—						**28**	**28**	**
108	*Scirpus littoralis* auct.		Sedge	—						+		**
109	*Scirpus sp.*		Sedge	—						+		**
33	**Ebenaceae**											
110	*Diospyros melanoxylon* Roxb.	Tendu	Tree	—				**6**		**4**	**10**	**
34	**Ehretiaceae**											
111	*Cordia dichotoma* Forst.	Lisora	Tree	**FD**			+					**FD***
35	**Euphorbiaceae**											
112	*Chrozophora prostrata* Dalz.		Herb	—			**4**				**4**	**
113	*Chrozophora rottleri* (Geis.) Juss.		Herb	—			**8**				**8**	**
114	*Croton bonplandianum* Baill.		Herb	—	+					+		**
115	*Emblica officinalis* Gaertn.	Aawla	Tree	**FD**			**2**	**1**			**3**	**FD***
116	*Euphorbia hirta* L.	Doodhi	Herb	—	**5**	**7**	**2**			**7**	**16**	**
117	*Euphorbia microphylla* Roth		Herb	—	**3**			**8**			**11**	**
118	*Euphorbia milli* Ch.		Herb	—				+				**
119	*Euphorbia nivulia* Buch.-Ham.	Sehur	Shrub	**FD**			+					**FD***
120	*Euphorbia thymifolia* L.		Herb	—			**6**				**6**	**
121	*Jatropha curcas* L.		Shrub	—	**6**						**6**	**
122	*Kirganelia reticulata* (Poir.) Baill.		Shrub	—						**6**	**6**	**
123	*Phyllanthus fraternus* Webst.	Bhui Awala	Herb	—			**22**				**22**	**
124	*Putranjiva roxburghii* Wall	Putra jeevi	Tree	—				+				**
125	*Ricinus communis* L.	Rendi ,Arandi	Shrub	—			+					**
126	*Securinega virosa* (Roxb. ex Willd.) Pax & Hoffm		Shrub	**FD**	**2**		**5**	**6**	**3**	**12**	**28**	**FD***
36	**Fabaceae**											
127	*Abrus precatorius* L.	Gumachi,ratti	Climber	**FD**		**2**		+			**2**	**FD***
128	*Alysicarpus monilifer*		Herb	—	**11**	**6**		**67**	**24**	**16**	**124**	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
	(L.) DC. var. *monilifer*											
129	*Butea monosperma* (Lam.) Taub.		Tree	FD	32	16	8	22	70	12	160	**
130	*Cajanus cajan* (L.) Millsp.	Tuvar	Under Shrub	–			+					**
131	*Clitora ternatea* L.	Aprazita	Twiner	–				+				**
132	*Dalbergia paniculata* L.		Tree	–		+						**
133	*Dalbergia sissoo* Roxb.	Shishu	Tree	FD			19	+			19	FD*
134	*Derris indica* (Lam.) Bennet	kiramal,karanj	Tree	FD			+			+		FD**
135	*Indigofera linifolia* Retz.		Herb	–					6	4	10	**
136	*Mucana prurita* Hk. f.	kewanch	Climber	FD				+				FD*
137	*Rhynchosia minima* (L.) DC. *var. minima*		Climber	–	9	9		6	2	3	29	**
138	*Rhynchosia minima* L.		Twiner	–	14	6		10		7	37	**
139	*Rhynchosia Sp.*		Climber	–				+	+			**
140	*Tephrosia purpurea* (L.) Pers.	Sharpunkh	Herb	FD		2		2	3		7	FD*
37	**Flacourtiaceae**											
141	*Flacourtia indica* (Burm. F.) Merr.		Small Tree	FD	14	9	4	2	7		36	FD*
38	**Gentianaceae**											
142	*Conscora diffusa* L.		Herb	–						2	2	**
39	**Lamiaceae**											
143	*Hyptis suaveolens* (Linn.) Poir.		Herb	–	3	334	2	1068	32		1439	**
144	*Leucas cephalotes* Spreng.	Dronepushpi	Herb	–		+		+				**
145	*Mentha arvensis* Linn.	Pudeena	Herb	–			+					**
146	*Ocimum sanctum* Linn.	Tulsa	Herb	–			+					**
40	**Liliaceae**											
147	*Allium cepa* L.	Pyas	Herb	–			+					**
148	*Asparagus racemosus Willd.*	Satavari	Sarmentose Shrub	FD		2					2	**
149	*Drimia indica* L.	Jungli pyaz	Herb	–				4			4	**
41	**Loranthaceae**											
150	*Loranthus longiflorus* Desr	Vando	Parasite	–			+			+		**
42	**Lythraceae**											
151	*Ammannia baccifera* L.		Herb	–						+		**
152	*Lagerstroemia parviflora,* Roxb.		Tree	FD		7		36	5		48	FD*
153	*Lawsonia inermis* L.		Shrub	–		+						**
154	*Woodfordia fruticosa* Kurz		Shrub	FD				5			5	FD*
43	**Malvaceae**											
155	*Abelmoschus esculentus* (L.) Moench	Bhinda, Bhindo	Under Shrub	–			+					**
156	*Ceiba pentandra* (L.) Gaertn.		Tree	–			+					**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
157	*Hibiscus ovalifolius* (Forsk.) Vahl		Shrub	–				1			1	**
158	*Hibiscus rosa-sinensis* L.	Gurhal	Shrub	–			+					**
159	*Hibiscus sp*		Shrub	–			3				3	**
160	*Sida acuta* Burm. f.		Herb	–	1		2				3	**
161	*Sida cordifolia* L.	Bariyari	Herb	–	6		21	13	+	7	47	**
162	*Sida ovata* Forsk.		Herb	–			10		1		11	**
44	**Meliaceae**											
163	*Azadirachta indica* A. Juss.	Neem	Tree	FD	8	24	7	6	8	49	102	FD*
45	**Menispermaceae**											
164	*Cocculus hirsutus* (L.) Diels		Straggling Shrub	FD	18	17	4	17	25	13	94	FD*
165	*Cocculus pendulus*(Forst.) Diels		Straggling Shrub	–				2	7	1	10	**
166	*Tinospora cordifolia* Roxb.		Climber	–			1			5	6	**
46	**Mimosaceae**											
167	*Acacia auriculiformis* A. Cunn. ex Benth.	Sonjari	Tree	FD				+				FD*
168	*Acacia catechu* (L.F.) Willd.	Khair,Kattatha	Tree	FD	2	36	2	59	6		95	FD*
169	*Acacia concinna DC.*	Shikakai	Climber	–		3	6	26		15	50	**
170	*Acacia leucophloea* (Roxb.) Willd.		Tree	FD	1	3	4	2	9	17	36	FD*
171	*Acacia nilotica* (L.) Del. subsp. *indica*(Bth.) Brenan	Babul	Tree	FD	+		5	+		9	14	FD*
172	*Albizia lebbeck* (L.) Bth.	Shireesh,Chichola	Tree	FD			+					FD*
173	*Leucaena latisiliqua* (L.) Wt. & Arn.		Tree	–			17				17	**
174	*Pithecellobium dulce* (Roxb.) Bth.		Tree	FD				4		1	5	
175	*Prosopis juliflora* (Sw) DC.	Cathela	Shrub	–				+				**
47	**Molluginaceae**											
176	*Mollugo pentaphylla* L.		Herb	–						13	13	**
48	**Moraceae**											
177	*Artocarpus heterophyllus* Lamk.	Katahal	Tree	–			+					**
178	*Ficus benghalensis* L.	Bargad	Tree	FD			1	2			3	FD*
179	*Ficus mollis Vahl*		Tree	–		3		1		2	6	**
180	*Ficus racemosa* L.	Gular	Tree	FD			2			7	9	FD*
181	*Ficus religiosa* L.	Pipal	Tree	FD						1	1	FD*
182	*Morus alba* L.	Sahatoot	Tree	–			+					**
183	*Streblus asper* Lour.		Small Tree	FD				24	+			FD*
49	**Moringaceae**											

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
184	*Moringa concanensis* Nimmo		Tree	—				1			1	**
185	*Moringa oleifera* Lam.		Tree	FD				+				FD*
50	**Musaceae**											
186	*Musa paradisiaca* L.	Kela	Herb	—			5				5	**
51	**Myrtaceae**											
187	*Callistemon lanceolatus* Sweet.Eng.	Bottle Brush	Small Tree	FD				+				FD*
188	*Eucalyptus globulus* Labill.		Tree	—			9				9	**
189	*Psidium guajava* L.	Amrut	Tree	—			5				5	**
190	*Syzygium cumini* (L.) Skells	Jamun	Tree	FD			5				5	FD*
191	*Syzygium heyneanum* Wall. ex W. & A.	Kathjamun	Tree	FD						1	1	FD*
52	**Nyctaginaceae**											
192	*Boerhavia diffusa* L.	gadah-punna	Herb	—		6				4	10	**
193	*Bougainvillea spectabilis* Willd.		Stragglin g Shrub	—	+							**
53	**Oleaceae**											
194	*Jasminum multiflorum* (Burm. F.) Andr.	Chameli	Twining Shrub	—			+					**
195	*Jasminum sambac* Ait.	Mogro	Twining Shrub	—			+					**
54	**Oxalidaceae**											
196	*Oxalis corniculata* L.		Herb	—						+		**
55	**Papaveraceae**											
197	*Argemone mexicana* L.	Bharbhanda	Herb	—						4	4	**
56	**Pedaliaceae**											
198	*Sesamum indicum* L.	Til	Herb	—			+					**
57	**Periplocaceae**											
199	*Cryptolepis buchanani* Roem & Sch.		Woody Climber	FD			1	3			4	FD*
200	*Hemidesmus indicus* (L.) Schult.	Anantmulla	Twiner	—	2	18	4	39	18	21	102	**
58	**Poaceae**											
201	*Apluda mutica* L.		Grass	FD	45	42		64			151	FD*
202	*Aristida hystrix* L.		Grass	FD		18		16	69		113	FD*
203	*Bambusa arundinacea* (Retz.) Willd.	khokhla baus	Grass	FD		1	14	44	2	13	74	FD*
204	*Bothriochloa pertusa* (L.) A. Camus		Grass	FD		+		+				FD*
205	*Cenchrus ciliaris* L.		Grass	FD		4		5	4		13	FD*
206	*Cynodon dactylon* (L.) Pers.		Grass	FD	12		51			83	146	FD*
207	*Desmostachya bipinnata* (L.) Stapf		Grass	FD	42	6	109	187	8	32	384	FD*
208	*Dichanthium annulatum* (Forak.) Stapf		Grass	FD	45	11	85	24	8	40	213	FD*
209	*Eragrostis ciliaris* L.		Grass	—		48			30		78	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
210	*Eragrostis Sp.*		Grass	—			35			2	37	**
211	*Heteropogon contortus* (L.) P.Beauv. ex.R. & S.		Grass	FD	21						21	FD*
212	*Imperata cylindrica* (L.) Beauv		Grass	—						+		**
213	*Oplimenus* spp.		Grass	—						+		**
214	*Oryza sativa* L.		Grass	—			+					**
215	*Saccharum officinarum* L.	Ganna	Grass	—			+					**
216	*Saccharum spontaneum*L.		Grass	FD	+					+		FD*
217	*Sporobolus coromandelianus* (Retz.) Kunth		Grass	—					25	3	28	**
218	*Sporobolus sp*		Grass	—						1	1	**
219	*Triticum aestivum* L.	Gehu	Grass	—			+					**
220	*Vetiveria zizanioides* (L.) Nash		Grass	FD					2		2	**
221	*Zea mays* L.		Grass	—			+					**
59	**Polygonaceae**											
222	*Polygonum glabrum* Willd.		Herb	—						64	64	**
223	*Polygonum plebeium* R. Br.		Herb	—		4	2	4		17	27	**
60	**Portulacaceae**											
224	*Portulaca oleracea* L.	khatti chaulai	Herb	—			+			+		
225	*Portulaca quadrifida* L.		Herb	—			4				4	**
61	**Punicaceae**											
226	*Punica granatum* L.	Anar	Small Tree	—			1				1	**
62	**Rhamnaceae**											
227	*Zizyphus mauritiana* Lam.	Jherberi,Ber	Small Tree	FD		1	4	2			7	FD*
228	*Zizyphus nummularia* (Burm. F.) W. & A.	Jharberi,Jharbaila	Under Shrub	FD	8	12		20	25	11	76	FD*
229	*Zizyphus oenoplia* Mall.		Shrub	FD	16	33	2	+	18	1	70	FD*
230	*Zizyphus xylopyrus* Willd.	Ber	Shrub	FD	+	5	8	135	65	24	237	FD*
63	**Rubiaceae**											
231	*Adina cordifolia* (Willd. ex Roxb.) Benth. & Hook. f. ex Brandis	Haldu	Tree	FD				+				FD*
232	*Borreria articularis* (L.f.) F.N. Will.		Herb	—		23		29	20	4	76	**
233	*Ixora arborea* Roxb. Ex. Sm.		Tree	FD				2		7	9	FD*
234	*Mitragyna parvifolia* (Roxb.) Korth.		Tree	FD				1			1	FD*
235	*Morinda tomentosa* B.Heyne ex Roth		Tree	—						+		**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
236	*Oldenlandia corymbosa* L.		Herb	—						4	4	**
237	*Xeromphis spinosa* L.		Small Tree	—		7	1	4		3	15	**
238	*Xeromphis uliginosa* (Retz.) Maheshwari		Small Tree	—			4	3			7	**
64	**Rutaceae**											
239	*Aegle marmelos* (L.) Corr.	Bel	Tree	FD				5	1	1	7	FD*
240	*Citrus limon* (L.) Burm. f.	Leembu	Shrub	—			1				1	**
65	**Sapotaceae**											
241	*Madhuca indica* J. F. Gmel.	Mahua	Tree	FD			9			2	11	FD*
242	*Manilkara hexandra* (Roxb.) Dub		Tree	FD				+				FD*
66	**Scrophulariaceae**											
243	*Bacopa monnieri* (L.) Pennell	Jalneem	Herb	—						+		**
244	*Lindernia ciliata* (Colsm.) Penn.		Herb	—						5	5	**
245	*Lindernia oppositifolia* (Retz.) Mukerjee		Herb	—						3	3	**
67	**Simaroubaceae**											
246	*Ailanthus excelsa* Roxb.		Tree	FD			+					FD*
68	**Solanaceae**											
247	*Capsicum annuum var. acuminata* Fingerh.	Marcha	Herb	—			+					
248	*Datura innoxia* Mill.		Under Shrub	—			2				2	**
249	*Datura metel* L.	Dhaturo	Under Shrub	—					+			**
250	*Lycopersicon lycopersicum* (L.) Karst.	Tamater	Herb	—			+			+		**
251	*Physalis minima* L.	Tankari	Herb	—			2				2	**
252	*Solanum melongena* L. var. *insana* Prain	Ringna	Herb	—			+					**
253	*Solanum melongena* L. var. *melongena*	Bhanta	Herb	—			+					**
254	*Solanum nigrum* L.	Macoi	Herb	—	+					+		**
255	*Solanum surattense* Burm. f.	Bhatkataiya	Herb	—	4		4		2		10	**
256	*Withania somnifera* (L.) Kurz	Ashwagandha	Under Shrub	—			+		+			**
69	**Sterculiaceae**											
257	*Helicteres isora* L.		Shrub	FD				37		3	40	FD*
258	*Sterculia urens* Roxb.		Tree	FD		4		1			5	FD*
259	*Waltheria indica* L.		Under Shrub	—	7	7		3	5		22	**
70	**Tiliaceae**											
260	*Corchorus aestuans* L.		Herb	—			4				4	**
261	*Corchorus olitorius* L.		Herb	—			4			2	6	**

S.no.	Scientific Name	Local Name	Habit	FD	Core Zone		Buffer Zone				SAT	OS
					AG/ FL	OS/ WL	AG/ FL	FR	OS/ WL	R/ WL		
262	*Grewia flavescens* Juss.		Shrub	**FD**					**1**		**1**	**FD***
263	*Triumfetta rhomboidea* Jacq.		Herb	—	**5**		**10**	**7**	**2**	**7**	**31**	**
264	*Triumfetta rotundifolia* Lam.		Herb	—	**+**	**+**				**+**		**
71	**Ulmaceae**											
265	*Holoptelea integrifolia* (Roxb.) Planch.	Chilbil	Tree	**FD**		**2**	**1**	**2**	**5**	**12**	**22**	**FD***
72	**Verbenaceae**											
266	*Gmelina arborea* Linn.	Gmhar	Tree	**FD**		**+**						**FD***
267	*Lantana camara* auct. Non L.		Under Shrub	**FD**				**23**	**2**	**1**	**26**	**FD***
268	*Phyla nodiflora* (L.) Greene		Herb	—						**2**	**2**	
269	*Tectona grandis* L.f.	Sagon	Tree	**FD**								**FD***
73	**Violaceae**											
270	*Viola cinerea* Boiss.		Herb	—						**+**		**
74	Vitaceae											
271	*Cayratia carnosa* (Lam.) Gagnep.		Climber	—			**2**				**2**	**
Total				**82**	**429**	**803**	**838**	**2517**	**949**	**921**	**6457**	

D/DR- Dense Forest / Degraded Forest, WB/R -Water Body /Rivers, OS/WL- Open Scrub / Wasteland, AG/FL- Agriculture/ Fallow Land SAT Study Area Total , FD + = Species listed by Forest department and Present Study, ** Species Reported only by the present Study, OSR – Overall Species

Annexure 2. Overall List and Conservation Status of Herpetofauna of the Proposed Thermal Power Plant -WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family and Species name	Common Name	SA	FD	Conservation Status	
	AMPHIBIANS				**CAMP 1998**	**WPA 1972**
1	**Randidae**					
1	*Occidozyga cyanophlyctis*	Skittering Frog	30	**	LR-nt	IV
2	*Limnonectes limnocharis*	Indian Pond Frog	3	**	-	
3	*Hoplobatrachus tigerinus*	Indian Bull Frog	5	**	LC	IV
	REPTILES					
2	**Crocodylidae**					
4	*Crocodylus palustris*	Mugger / Marsh Crocodile	-	FD@	VU	Sch-I
3	**Gavialidae**					
5	*Gavialis gangeticus*	Gharial	-	FD@		Sch-I
4	**Trionychida**					
6	*Lissemys punctata*	Indian Flapshell Turtle	-	FD@	LR-nt	Sch-I
5	**Gekkonidae**					
7	*Hemidactylus flaviviridis*	Yellow Bellied House Gecko	-	FD@	LR-lc	
8	*Hemidactylus frenatus*	Asian House gecko	1	**	LR-lc	
6	**Lacertidae**					
9	*Ophisops leschenaultii*	Leschenault's Lacerta	17	**	LR-lc	
7	**Agamidae**					
10	*Calotes versicolor*	Indian Garden Lizard	35	FD+	LR-nt	
11	*Sitana ponticeriana*	Fan-Throated Lizard	4	**	LR-lc	
8	**Scincidae**					
12	*Mabuya carinata*	Common Keeled Grass Skink	2	**	LR-nt	
13	*Mabuya macularia*	Bronze Grass Skink	20	**	LR-lc	-
9	**Varanidae**					
14	*Varanus bengalensis*	Common Indian Monitor	1	FD+	VU	Sch-II
10	**Pythonidae**					
15	*Python molurus*	Indian Rock Python	-	FD@	LR-nt	Sch-IV
11	**Colubridae**					
16	*Ptyas mucosa*	Indian Rat Snake	1	FD+	LR-nt	Sch-II
17	*Xenochrophis piscator*	Checkered Keelback Water Snake	2	FD+	LR-lc	Sch-II
12	**Elapidae**					
18	*Bungarus caeruleus*	Common Indian Krait	-	FD@	LR-lc	Sch-IV
19	*Naja naja*	Spectacled Cobra	1	FD+	LR-nt	Sch-II
13	**Viperidae**					
20	*Daboia russelii*	Russell's Viper	-	FD@	LR-nt	Sch-II
	Total Species		**13**	**20**		

SAT Study Area Total , FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study

Annexure 3. Overall List and Conservation Status of Terrestrial Bird Species in the Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
1	**ACCIPITRIDAE**													
1	*Elanus caeruleus*-Black-shouldered Kite				-	1	-	2	3	3	**FD+**	**C**	R	LC
2	*Accipiter badius* - Shikra	1	1	2	2	1	-	1	4	6	**FD+**	**C**	R	**LC**
3	*Circaetus gallicus* Short-toed Snake Eagle	2	1	3							**	C	R	LC
4	*Butastur teesa* White-eyed Buzzard				-	-	-	1	1	1	**FD+**	**C**	R	**LC**
5	*Milvus migrans* Black Kite										FD@	**C**	R	**LC**
6	*Haliastur indus* Brahminy Kite										FD@	**C**	R	**LC**
7	*Gyps indicus* Long-billed Vulture										FD@	**C**	R	**CR**
8	*Sarcogyps calvus* Red-headed Vulture										FD@	**C**	R	**CR**
9	*Gyps bengalensis* White-rumped Vulture										**FD@**	**C**	R	**CR**
10	*Neophron percnopterus* Egyptian Vulture				-	-	-	1	1	1	**FD+**	**C**	R	**EN**
2	**ALAUDIDAE**													
11	*Eremopterix grisea Ashy*-crowned Sparrow Lark	6	11	17	-	3	7	1	11	28	**	I	R	**LC**
12	*Mirafra cantillans* Singing bush Lark	16	4	20	-	4	5	8	17	37	**	I	R	**LC**
13	*Ammomanes phoenicurus* Rufous-tailed Lark				-	1	-	2	3	3	**	I	R	**LC**
3	**APODIDAE**													
14	*Apus affinis* Little Swift				1	2	-	1	4	4	**	I	R	LC
4	**BUCEROTIDAE**													
15	*Ocyceros birostris* Indian grey Hornbill					1			1	1	FD+	F	R	Sch-I
5	**CAPRIMULGIDAE**													
16	*Caprimulgus asiaticus* Indian Nightjar	3		3	1	2	-	-	3	6	**FD+**	I	R	LC
17	*Caprimulgus indicus* Indian Jungle Nightjar										**FD@**			
18	*Caprimulgus affinis* Savanna Nightjar				1				1	1	**	I	R	LC
6	**CENTROPODIDAE**													
19	*Centropus sinensis* Greater Coucal				3	7	2	3	15	15	**	O	R	LC
7	**CISTICOLIDAE**													
20	*Prinia buchanani* Rufous-fronted Prinia				16	10	8	2	36	36	**	I	R	LC
21	*Prinia socialis* Ashy Prinia	4		4	1	-	1	2	4	8	**FD+**	I	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
22	*Prinia hodgsonii* Grey-breasted Prinia	3		3	2	9	4	-	15	18	**	I	R	LC
23	*Prinia inornata* Plain Prinia	11	2	13	1	-	1	-	2	15	**	I	R	LC
24	*Prinia sylvatica* Jungle Prinia	2	3	5	5	0	6	3	14	19	**	I	R	LC
8	**COLUMBIDAE**													
25	*Columba livia* Rock Pigeon	1		1	0	9	6	9	24	25	**FD+**	G	R	LC
26	*Streptopelia decaocto* Eurasian collared Dove				1	2	2	0	5	5	**FD+**	G	R	LC
27	*Streptopelia senegalensis* Laughing Dove	7	6	13	32	27	21	8	88	101	**	G	R	LC
28	*Streptopelia chinensis* Spotted Dove	33	16	49	14	6	8	5	33	82	**	G	R	LC
29	*Streptopelia tranquebarica* Red Collared Dove	20		20	5	4	0-	0	9	29	**	G	R	LC
30	*Treron phoenicoptera* Yellow-footed Green Pigeon	1	1	2	0	1	0	0	1	3	FD+	F	R	LC
9	**CORACIIDAE**													
31	*Coracias benghalensis* Indian Roller	2		2	1	4	3	4-	12	14	**FD+**	I	R	LC
10	**CORVIDAE**													
32	*Aegithina tiphia* Common Iora	1		1	2	7	0	0	9	10	**	I	R	LC
33	*Aegithina nigrolutea* Marshall's Iora				1	2	2	0	5	5	**	I	R	LC
34	*Pericrocotus cinnamomeus* Small Minivet				1	2	0	0	3	3	**	I	R	LC
35	*Corvus splendens* House Crow	3	1	4	4	0	0	2	6	10	**FD+**	O	R	LC
36	*Corvus macrorhynchos* Large-billed Crow	2		2	2	8	8	8	26	28	FD+	O	R	LC
37	*Dendrocitta vagabunda* Rufous Treepie	1		1	5	5	1	3	14	15	**	O	R	LC
38	*Dicrurus macrocercus* Black Drongo				4	7	4	7	22	22	**FD+**	I	R	LC
39	*Dicrurus caerulescens* White-billed Drongo	12	3	15	1	0	0	0	1	16	**	I	R	LC
40	*Terpsiphone paradisi* Asian Paradise Flycatcher				0	3	0	0	3	3	**	I	R	LC
41	*Oriolus oriolus* Eurasian Golden Oriole				1	3	1	3	8	8	**FD+**	O	R	LC
42	*Rhipidura aureola* White-browed Fantail				1	3	0	0	4	4	**	I	R	LC
43	*Tephrodornis pondicerianus* Common Woodshrike				1	0	0	0	1	1	**	I	R	LC
11	**CUCULIDAE**													
44	*Hierococcyx varius* Common Hawk Cuckoo										**FD@**	I	R	LC
45	*Eudynamys*	1		1	3	0	2	3	8	9	**FD+**	F	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
	scolopacea Asian Koel													
46	*Taccocua leschenaultii* Sirkeer Malkoha	2		2	0	0	1	0	1	3	**	O	R	LC
12	**FALCONIDAE**													
47	*Falco tinnunculus* Common Kestrel				-	1	-	-	1	1	**FD+**	C	R	LC
13	**HIRUNDINIDAE**													
48	*Hirundo concolor* Dusky Crag Martin				-	1	-	-	1	1	**	I	R	LC
49	*Riparia paludicola* Plain Martin				1	-	-	0	1	1	**	I	R	LC
50	*Hirundo smithii* Wire-tailed Swallow				-	0	-	1	1	1	**	I	R	LC
51	*Hirundo daurica* Red-rumped Swallow				0	-	4	0	4	4	**FD+**	I	R	LC
14	**LANIIDAE**													
52	*Lanius schach* Long-tailed Shrike	2		2	2	1	-	-	3	5	**	I	R	LC
53	*Lanius vittatus* Bay-backed Shrike	3	1	4	2	-	2	-	4	8	**	I	R	LC
54	*Lanius meridionalis* Southern Grey Shrike	1		1	1	-	-	-	1	2	**	I	R	LC
15	**MEGALAIMIDAE**													
55	*Megalaima zeylanica* Brown-headed Barbet				-	2	1	2	5	5	**	F	R	LC
56	*Megalaima haemacephala* Coppersmith Barbet				2	2	1	-	5	5	**	F	R	LC
16	**MEROPIDAE**													
57	*Merops orientalis* Green Bee-eater	10	2	12	8	16	6	2	32	44	**	I	R	LC
58	*Merops philippinus* Blue-tailed Bee-eater				2	-	-	-	2	2	**	I	R	LC
17	**MUSCICAPIDAE**													
59	*Phoenicurus ochruros* Black Redstart	1		1		1			1	2	**	I	WV	LC
60	*Cercomela fusca* Brown Rock-chat				-	-	1	-	1	1	**	I	R	LC
61	*Saxicoloides fulicata* Indian Robin	32	6	38	29	9	25	5	68	106	**	I	R	LC
62	*Copsychus saularis* Oriental Magpie Robin				-	4	-	-	4	4	**FD+**	I	R	LC
18	**NECTARINIDAE**													
63	*Dicaeum agile* Thick-billed Flowerpecker				0	4	2	1	7	7	**	N	R	**LC**
64	*Cinnyris asiaticus* Purple Sunbird	2		2	10	2	7	5	24	26	**	N	R	LC
19	**PASSERIDAE**													
65	*Passer domesticus* House Sparrow				-	3	-	-	3	3	**	G	R	LC
66	*Lonchura malabarica* Indian Silverbill				6	2	9	0	17	17	**	G	R	**LC**
67	*Amandava formosa* Green Avadavat				1	0	0	0	1	1	**	G	R	**LC**
68	*Amandava amandava* Red Avadavat										**FD@**	G	R	**LC**
69	*Petronia xanthocollis*				10	5	6	0	21	21	**	G	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
	Chestnut-shouldered Petronia													
70	*Anthus rufulus* Paddyfield Pipit				-	-	-	1	1	1	**	I	R	LC
71	*Ploceus philippinus* Baya Weaver		8	8	-	6	-	1	7	15	**FD+**	G	R	LC
20	**PHASIANIDAE**													
72	*Perdicula asiatica* Jungle Bush Quail	1		1	-	-	-	1	1	2	**FD+**	G	R	LC
73	*Coturnix coturnix* Common Quail										**FD@**	G	R	LC
74	*Gallus gallus* Red Junglefowl										FD@	O	R	LC
75	*Galloperdix spadicea* Red Spurfowl										FD@	G	R	LC
76	*Francolinus pondicerianus* Grey Francolin	9	7	16	4	-	7	4	15	31	FD+	G	R	LC
77	*Pavo cristatus* Indian Peafowl	3		3	1	10	4	-	15	18	FD+	O	R	Sch-I
78	*Francolinus pictus* Painted Francolin										FD@	G	R	LC
79	*Francolinus francolinus* Black Francolin										FD@	G	R	LC
21	**PICIDAE**													
80	*Dinopium benghalense* Black-rumped Flameback				-	1	-	-	1	1	**FD+**	I	R	LC
81	*Dendrocopos nanus* Brown-capped Pygmy Woodpecker				-	-	-	1	1	1	**	I	R	LC
82	*Dendrocopos mahrattensis* Yellow-crowned Woodpecker	1		1	1	-	-	-	1	2	**	I	R	LC
83	*Picus flavinucha* Yellow-napped Woodpecker										**FD@**			
22	**PITTIDAE**													
84	*Pitta brachyura* Indian Pitta				-	1	-	-	1	1	**	I	R	LC
23	**PSITTACIDAE**													
85	*Psittacula cyanocephaea* Blossom-headed Parakeet										**FD@**	F	R	LC
86	*Psittacula krameri* Rose-ringed Parakeet	1		1	2	3	2	7	14	15	**FD+**	F	R	LC
24	**PTEROCLIDIDAE**													
87	*Pterocles indicus* Painted Sandgrouse										FD@	G	R	LC
88	*Pterocles exustus* Chestnut-bellied Sandgrouse	2		2	-	4	-	-	4	6	FD+	G	R	LC
25	**PYCNONOTIDAE**													
89	*Pycnonotus cafer* Red-vented Bulbul	42	6	48	36	16	23	12	87	135	**FD+**	O	R	LC
26	**STRIGIDAE**													
90	*Glaucidium radiatum* Jungle Owlet										**FD@**	O	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS*
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
91	*Athene brama* Spotted Owlet	1		1	-	1	-	1	2	3	**	I	R	LC
92	*Strix leptogrammica* Brown-wood Owl										FD@			
27	**STURNIDAE**													
93	*Acridotheres tristis* Common Myna	5		5	2	11	8	4	25	30	**	O	R	LC
94	*Acridotheres ginginianus* Bank Myna				-	-	-	4	4	4	**			
95	*Acridotheres fuscus* Jungle Myna										FD@			
96	*Sturnus pagodarum* Brahminy Starling	3		3	2	6	-	3	11	14	**	O	R	LC
97	*Sturnus contra* Asian Pied Starling				-	7	-	4	11	11	**	O	R	LC
98	*Sturnus roseus* Rosy Starling	1		1						1	**	O	WV	LC
28	**SYLVIIDAE**													
99	*Orthotomus sutorius* Common Tailorbird	4		4	5	5	5	3	18	22	**	I	R	LC
100	*Turdoides caudatus* Common Babbler	7	2	9	4	7	1	-	12	21	**	O	R	LC
101	*Turdoides striatus* Jungle Babbler	3		3	8	9	9	14	40	43	FD+	O	R	LC
102	*Turdoides malcolmi* Large grey Babbler	20	13	33	8	19	15	24	66	99	**	O	R	LC
103	*Chrysomma sinense* Yellow-eye Babbler				5	3	-	1	9	9	**	I	R	LC
104	*Dumetia hyperythra* Twany bellied Babbler				-	-	-	1	1	2	**	I	R	LC
29	**TURNICIDAE**													
105	*Turnix suscitator* Barred Button Quail				1	-	-	-	1	1	**	G	R	LC
30	**UPUPIDAE**													
106	*Upupa epops* Common Hoopoe	3		3						3	**	I	R	LC
31	**ZOSTEROPIDAE**													
107	*Zosterops palpebrosus* Oriental White-eye				16	6	2	-	24	24	**	I	R	LC
	Total Species	**45**	**19**	**46**	**53**	**58**	**41**	**45**	**85**	**88**				
	Total Birds	291	94	385	281	302	233	181	997	1382				

D/DR- Dense Forest / Degraded Forest, WB/R -Water Body /Rivers, OS/WL- Open Scrub / Wasteland, AG/FL- Agriculture/ Fallow Land CT- Core Zone Total, BT – Buffer Zone Total, SAT Study Area Total , FG-Foraging Guild, MS- Migratory Status, CS- Conservation Status. FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study

Annexure 4. Overall List and Conservation Status of Aquatic Bird Species in the Proposed Thermal Power Plant – WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
1	**ANATIDAE**													
1	*Tadorna tadorna* Common Shelduck										**FD@**	**H**	WV	LC
2	*Anser indicus* Bar-headed Goose										**FD@**	**H**	WV	LC
3	*Sarkidiornis melanotos*										**FD@**	**H**	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
	Comb Duck													
4	*Anas poecilorhyncha* Spot-billed Duck										FD@	H	R	LC
5	*Anas crecca* Common Teal										FD@	H	WV	LC
6	*Nettapus coromandelianus* Cotton Pigmy-goose	0	0	0	0	52	0	0	52	**52**	FD+	H	M	LC
2	**ARDEIDAE**													
7	*Bubulcus ibis* Cattle Egret	0	0	0	0	102	4	0	106	**106**	FD+	I	R	LC
8	*Egretta garzetta* Little Egret	0	0	0	0	16	1	0	17	**17**	FD+	P	R	LC
9	*Mesophoyx intermedia* Intermediate Egret	0	0	0	0	5	1	0	6	**6**	**	P	WV	LC
10	*Casmerodius albus* Great Egret	0	0	0	0	16	0	0	16	**16**	**	P	WV	LC
11	*Ardea cinerea* Grey Heron										FD@	P	WV	LC
12	*Ardeola grayii* Indian Pond Heron	0	0	0	0	29	12	1	42	**42**	**	P	R	LC
13	*Nycticorax nycticorax* Black-crowned Night Heron	0	0	0	0	5	1	0	6	**6**	**	P	R	LC
14	*Butorides striatus* Little Heron	0	0	0	0	0	1	0	1	**1**	**	P	R	LC
3	**BURHINIDAE**													
15	*Burhinus indicus* Indian Stone-curlew	0	0	0	0	1	1	0	2	**2**	**	I	R	LC
4	**CERYLIDAE**													
16	*Ceryle rudis* Pied Kingfisher	0	0	0	0	1	1	0	2	**2**	**	P	R	LC
5	**CHARADRIIDAE**													
17	*Charadrius dubius* Little-ringed Plover	0	1	1	0	3	0	0	3	**4**	**	I	WV	LC
18	*Vanellus indicus* Red-wattled Lapwing	1	3	4	0	36	5	1	42	**46**	**	I	R	LC
19	*Vanellus malabaricus* Yellow-wattled Lapwing	0	1	1	0	1	3	0	4	**5**	**	I	R	LC
20	*Himantopus himantopus* Black winged Stilt	0	0	0	0	36	0	0	36	**36**	**	I	R	LC
6	**CICONIIDAE**													
21	*Anastomus oscitans* Asian Openbill	0	0	0	0	27	0	0	27	**27**	**	P	R	LC
22	*Mycteria leucocephala* Painted Stork	0	0	0	0	1	0	0	1	**1**	**	P	WV	LC
23	*Ciconia episcopus* Wooly-necked Stork	0	0	0	0	1	0	0	1	**1**	FD+	P	R	LC
24	*Ciconia ciconia* White Stork	0	0	0	0	2	0	0	2	**2**	**	p	WV	LC
7	**CORVIDAE**													
25	*Motacilla maderaspatensis* White-browed Wagtail	0	0	0	0	3	1	0	4	**4**	**	I	R	LC

S.no.	Family, Scientific & Common Name	Core Zone		CT	Buffer Zone				BT	SAT	FD	FG	MS	CS
		OS/WL	AG/FL		D/DR	WB/R	OS/WL	AG/FL						
8	**DENDROCYGNIDAE**													
26	*Dendrocygna javanica* Lesser Whistling Duck	0	0	0	0	222	15	0	237	**237**	**	H	R	LC
9	**GLAREOLIDAE**													
27	*Cursorius coromandelicus* Indian Courser	0	1	1	0	7	0	0	7	**8**	**	I	WV	LC
10	**GRUIDAE**													
28	*Grus antigone* Sarus Crane										**FD@**	O	R	VU
11	**HALCYONIDAE**													
29	*Halcyon smyrensis* White-throated Kingfisher	0	0	0	0	2	2	1	5	**5**	**FD+**	P	R	LC
12	**JACANIDAE**													
30	*Hydrophasianus chirurgus* Pheasant tailed Jacana	0	3	3	0	16	4	0	20	**23**	**	I	R	LC
31	*Metopidius indicus* Bronze-winged Jacana	0	0	0	0	7	0	0	7	**7**	**	I	R	LC
13	**PASSERIDAE**													
32	*Motacilla cinerea* Grey Wagtail										FD@	I	WV	LC
14	**PHALACROCORACIDAE**													
33	*Phalacrocorax niger* Little Cormorant	0	0	0	0	17	2	0	19	**19**	**	P	R	LC
34	*Phalacrocorax fuscicollis* Indian Cormorant	0	0	0	0	30	0	0	30	**30**	**	P	R	LC
15	**PODICIPEDIDAE**													
35	*Tachybaptus ruficollis* Little Grebe	0	0	0	0	22	6	0	22	**22**	**	C	R	LC
16	**RALLIDAE**													
36	*Amaurornis phoenicurus* White-breasted Waterhen	0	0	0	0	3	0	0	3	**3**	**	0	R	LC
17	**SCOLOPACIDAE**													
37	*Tringa nebularia* Common Greenshank	0	0	0	0	1	0	0	1	**1**	**	I	WV	LC
38	*Limosa melanuroides* Black-tailed Godwit	0	0	0	0	1	0	0	1	**1**	**	I	WV	LC
39	*Gallinago gallinago* Common Snipe										**FD@**	I	WV	LC
18	**THRESKIORNITHIDAE**													
40	*Pseudibis papillosa* Black Ibis	0	0	0	0	2	0	0	2	**2**	**	O	R	LC
	Total Species	1	5	5	0	30	16	3	31	**31**				
	Total Birds	1	9	10	0	667	60	3	730	**740**				

D/DR- Dense Forest / Degraded Forest, WB/R -Water Body /Rivers, OS/WL- Open Scrub / Wasteland, AG/FL- Agriculture/ Fallow Land CT- Core Zone Total, BT – Buffer Zone Total, SAT Study Area Total , FG-Foraging Guild, MS- Migratory Status, CS- Conservation Status. FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study

Annexure 5. Overall List and Conservation Status of Mammals of the Proposed Thermal Power Plant -WEUPPL Study Area - Mirzapur, Uttar Pradesh

S.no.	Family & Scientific Names	Common name	SAT	FD	Conservation Status	
					CAMP 1998	WPA Anon 1972
1	**Cercopithecidae**					
1	*Macaca mulatta*	Rhesus Macaque	-	FD@	LC	Sch.II
2	*Semnopithecus entellus*	Common /Hanuman Langur	4(6)	FD+	LR-nt	Sch.II
2	**Cervidae**					
3	*Cervus unicolor*	Sambar	-	FD@	LC	Sch.III
4	*Muntiacus muntjak*	Indian Muntjac	-	FD@	LR-cd	Sch.III
5	*Axis axis*	Spotted Deer	*	FD+	-	Sch.III
3	**Bovidae**					
6	*Boselaphus tragocamelus*	Nigai	172(16)	FD+	LR-cd	Sch.III
7	*Tetracerus quadricornis*	Four Horned Antelope	6	FD+	LR-cd	Sch.III
8	*Gazella bennettii*	Indian Gazelle	-	FD@	LR-lc	Sch.I
4	**Suidae**					
9	*Sus scrofa*	Wild Pig	32	FD+	LR-	Sch.III
5	**Ursidae**					
10	*Melursus ursinus*	Sloth Bear	2	FD+	VU	Sch.II
6	**Canidae**					
11	*Canis aureus*	Jackal	49(1)	FD+	LR-lc	Sch.II
12	*Canis lupus*	Wolf	-	FD@	LR-nt	Sch.I
13	*Cuon alpinus*	Wild Dog	-	FD@	EN	Sch I
14	*Vulpes bengalensis*	Indian Fox	7	FD+	LR-nt	Sch.II
7	***Hyaenidae***					
15	*Hyaena hyaena*	*Striped Hyena*	8	FD+	LR-nt	Sch.III
8	**Felidae**					
16	*Felis chaus*	Jungle Cat	30	FD+	LR-nt	Sch-II
17	*Panthera pardus*	Common Leopard	3	FD+	VU	Sch.I
18	*Caracal caracal*	Caracal	-	FD@	LR-nt	Sch.I
9	**Mustelidae**					
19	*Melivora capensis*	Honey Badger	-	FD@	LR-lc	Sch-I
20	*Lutrogale perspicillata*	Smooth-coated Otter	-	FD@	VU	Sch.II
10	**Viverridae**					
21	*Paradoxurus hermaphroditus*	Common Palm Civet	1	**	LC	Sch.II
11	**Herpestidae**					
22	*Herpestes edwardsii*	Common or Grey Mongoose	4	FD+	LR-lc	Sch.IV
23	*Herpestes smithii*	Ruddy Mongoose	2(3)	**	LR-lc	Sch.IV
12	**Leporidae**					
24	*Lepus nigricollis*	Indian Hare	92	FD+	LR-lc	Sch.IV
13	**Soricidae**					
25	*Suncus murinus*	House Shrew	-	FD@	LC	
26	*Crocidura attenuata*	Grey Woodland Shrew	-	FD@	LC	
14	**Sciuricidae**					
27	*Funambulus pennantii*	Five-striped Palm Squirrel	(7)	FD+	LR-lc	Sch.IV
15	**Muridae**					
28	*Bandicota indica*	Large Bandicoot-rat	-	FD@	LR-lc	
29	*Tatera indica*	Indian Gerbil	68	**	LR-lc	Sch.V
30	*Rattus rattus*	Black Rat	-	FD@	LR-lc	Sch.IV
31	*Golunda ellioti*	Indian Bush Rat	1	**	-	-
32	*Mus booduga*	Little Indian Field Mouse	19	FD+	LR-lc	

S.no.	Family & Scientific Names	Common name	SAT	FD	Conservation Status	
					CAMP 1998	WPA Anon 1972
16	**Vespertiliondae**					
33	*Scotoecus pallidus*	Yellow Desert Bat	-	FD@	LR-lc	
	Total no. of species		19	33		

SAT Study Area Total , FD + = Species listed by Forest department and Present Study, FD@ Species recorded only by Forest Department, ** Species Reported only by the present Study