# Ecological Assessment of Sites Designated for Collection of Sand and Boulders from River Beds of Uttarakhand


**STUDY REPORT**
**October 2011**

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

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# CONTENTS

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## *Executive Summary*

Economic development invariably requires resources. Extraction of resources from the environment involves changes in the state of the environment. Hence, our ability to integrate development and ecological integrity can help in making informed decisions without affecting the ecological values of the ecosystem. The Riverbed Materials (RBM) are renewable resource which are abundantly used as construction materials. RBMs are by-product of the massive sediment load and deposition that the rivers carry along the course of its flow. In Uttarakhand, most rivers that run through *bhabar* tract are targeted for their rich deposition RBM ( sand and boulders).

Uttarakhand Forest Development Corporation (UAFDC) has proposed extraction of RBM form different rivers in Uttarakhand. Under the direction of Ministry of Environment and Forest (MoEF), vide letter No.11-329/2010-FC, dated 16 November 2010 the Wildlife Institute of India has carried out a study to assess the impact of RBM collection in six rivers (Kosi, Dabka, Nihal, Gola, Sharda and Kiroda Nullah). Subsequently, vide its let No. 8-80/93-FC (pt.), dated 26 November 2010 the Ministry of Environment and Forests, Government of India directed to add two more sites; viz. Tons and Yamuna Rivers at Kalsi and Rampur Mandi respectively in Chakrata Forest Division. The Terms of Reference (TOR) of the study are as under:

1. Assessment and identification of the adverse impacts, if any, of the collection of sand, boulder and other minor minerals on wildlife and its habitat;
2. Identification of the appropriate ameliorative measures to eliminate if possible, or minimize to the extent possible, the identified adverse impacts of the collection of minor minerals on wildlife and their habitat;
3. Identification/ delineation of the migratory corridors in and around the area proposed for collection of minor mineral;
4. Assessment and identification of the adverse impacts, if any, of the non-collection of sand, boulder and other minor minerals from the area identified as corridor on river geometry and soil erosion pattern along the adjoining river banks; and
5. Development of an appropriate plan for management of the identified migratory corridors. Such plan *inter-alia* may include restriction on collection of minor minerals for major part of the year, with a provision of periodic accelerated collection

(preferably during the period having least frequency of wildlife movement) to maintain river geometry.

Within the ambit of the TOR, following questions were explored (i) whether the area of interest has any wildlife value in terms of species of conservation significance (e.g. large mammals and their habitat integrity) (ii) whether the collection of RBM has any adverse impacts on wildlife population and their habitats and (iii) whether non-collection of RBM will have any negative impact on river geometry and river banks. To answer the above mentioned questions, transects of 2 km length were walked in the forest adjacent to river, perpendicular to river course 300 m away from the bank. On these transects data was collected on the presence and absence of carnivores and their prey.

To quantify the wildlife habitat condition within each landscape, quadrats were laid on the 2 km transects at an interval of 400 m distance to examine the vegetation composition. At each point, a circular plot of 10 m radius (314 $m^2$ area) was laid for trees, 5 m radius (78.5 $m^2$ area) circular plot for shrubs and 1 m radius plot for herbaceous vegetation were laid and data on number of species, their population and GBH and status of ground cover was collected.

Anthropogenic disturbance reflected by cut and lopped trees, cattle dung, livestock and human presence were also recorded in each of the 10 m radius plots. At Dabka, Kosi, Nihal, Gola, Yamuna and Tons Rivers data was collected twice, once during the mining season (summer) and once during the non-mining season (monsoon). Because of constraint of time at the sites of Sharda River and Kiroda nullah data was collected only during the non-mining season (monsoon).

The study also collected qualitative data on the possible negative effects of non-mining in all the eight sites by examining the river width, channel width, extent of deposition of sediments and evidences of erosion during flooding. We have also relied upon secondary information on the status of corridors and their use by wildlife provided to us by other institutions working in the area such as WWF-India which is annexed with this report. The results of the site wise assessment are summarized below.

At the proposed mining site at Kosi River, the habitat comprised mainly of teak and eucalyptus plantations. It showed very high level of anthropogenic disturbance which was due to the combined effect of presence of labourers and villagers of the nearby settlements. Among wild animals, the area had considerable population of nilgai, chital and sambar and also had sporadic signs of leopard. The evidences of presence of large mammals like elephant and tiger were absent, possibly due to high anthropogenic pressures. Thus, the proposed extraction of RBM from South of the Kosi Barrage will have little impact on the wildlife value of the area, provided that the mining activities adhere to appropriate regulations with regard to depth of mining in this zone and guidelines issued by MoEF Vide letter No. 8-61/1999-FC dated 9th February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011 as applicable for this site. However, mining activity closer to Kosi Barrage may destabilize the river banks.

At the Gola River mining site, the forest on the eastern bank of the river has considerable presence of ungulates like nilgai and sambar. Presence of elephant was found in Tanda forests which are away from the main river course. It was evident that the 2.5 km non-mining corridor stretch in the river (left free of mining) was being used by the wild animals. Mining can be continued at the Gola River subject to the adherence to the guidelines issued by MoEF Vide letter No. 8-61/1999-FC dated 9th February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011.

The *status-quo* of non-extraction of RBM in the designated 2.5 km corridor needs to be maintained. The mining in the rest of the river needs to be regulated within the prescribed limit. Considering the fact that collection of RBM from the river bed coupled with river training has deepened the river bed to more than 5 m, it is suggested to review the quantity of RBM to be extracted each year. All the exit gates should be monitored properly and labourers should not be allowed to stay in the vicinity of the forest. As the Reserve Forests of the Gola Range on the eastern bank is in continuity with the Dauli, Kishanpur and Nandhaur Reserve Forests the entire forest tract should be declared as a Conservation Reserve. The permission to carry out the mining should be reviewed every three years by an appropriate committee.

At the Sharda River site downstream of Tanakpur Barrage the wildlife value of the area was low with the habitat comprising chiefly of recent plantation of *Dalbergia sissoo* and *Accacia catechu.* Only chital presence was observed with low encounter rate. Thus, the proposed

extraction of RBM from South of Tanakpur Barrage will have little impact on the wildlife value of the area, provided that the mining activities adhere to appropriate regulations with regard to depth of mining in this zone and guidelines issued by MoEF Vide letter No. 8-61/1999-FC dated 9th February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011 as applicable for this site. The permission to carry out the mining should be reviewed every three years by an appropriate committee. Mining to the North of the Tanakpur Barrage should not be carried our as it has significant wildlife values and nearness to the Kilpura wildlife corridor.

Along the Dabka River, two sites were surveyed, one where mining is presently going on (south of the Dabka Bridge) and the other where mining is proposed (north of the Dabka Bridge). The presence of large mammals like tiger and elephant in the proposed mining area (north of Dabka Bridge) showed that the habitat condition in this area is suitable for large mammals and it is an active wildlife corridor which facilitates movement of large mammals such as elephants and tiger from the Corbett Tiger Reserve to the Ramnagar Forest Division. Mining to the north of Dabka Bridge will be detrimental to wildlife values of the area. Hence, mining in this area should be avoided.

The absence of evidences of large mammals from the site where mining is presently being carried out indicates that this site might have lost its conservation value for large mammals due to mining and other anthropogenic pressures. Hence, mining at the south of Dabka Bridge will have little impact on the wildlife value of the area provided that the mining activities adhere to the guidelines issued by MoEF vide letter No. 8-61/1999-FC dated 9th February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011 as applicable for this site. The permission to carry out the mining should be reviewed every three years by an appropriate committee.

The forest area along the Nihal River site showed riverine vegetation with significant wildlife value. The area had the presence of large mammals like tiger and elephant. This area is an important corridor for the dispersal of tigers from the Corbett Tiger Reserve and is a part of the Nihal-Bhakra corridor. Mining activities are likely to hamper the wildlife value of the

area since it will threaten the functionality of this corridor. Hence, mining in this area needs to be avoided.

The habitat around the Kiroda nullah site had riverine vegetation with good forage resources for large mammals like elephant. The presence of well forested islands in the middle of the river helped in the movement of the wild animals from one side of the stream to other. This area is a part of the Kilpura corridor which connects the forests of Tanakpur to those of Nepal and facilitates the movement of elephant and tiger. A branch of this corridor also connects with the Pilibhit Tiger Reserve. Since this area forms a critical corridor in the Terai-Arc landscape and as the proposed mining site falls in the heart of the corridor mining will severely affect the wildlife value of the area. Thus mining in this area needs to be avoided.

The proposed mining site in the Yamuna River within Asan Conservation Reserve has significant wildlife value in terms of habitat for migratory as well as resident waterbirds. During the field survey 62 species of birds were recorded in late winters while 30 species were recorded during summer from the proposed mining site in the Yamuna River bed which is a part of the Asan Conservation Reserve. The study suggests that during mining in the Yamuna River site more than 20% area of the Asan Conservation Reserve will be affected which is substantial. Hence, it is suggested that the mining site in the Yamuna River be shifted downstream of the present proposed mining site away from the boundary of the Asan Conservation Reserve to avoid deleterious effects of mining on the Reserve.

At the proposed mining site in the Tons River bed near Kalsi, 42 species of birds were recorded. The north-west portion of the proposed mining area in the Tons River bed had sporadic signs of leopard, jackal, hyena and barking deer while the river water had fish-fauna like golden mahseer, snow trout and *barilius* spp. For this site mining may be allowed subject to appropriate regulations with regard to depth of mining in this zone and guidelines issued by MoEF, vide letter No. 8-61/1999-FC dated 9$^{th}$ February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1$^{st}$ June 2010 and letter No. 8-61/1999-FC dated 8$^{th}$ April 2011 as applicable for this site. Mining at this site between early and late monsoon should be prohibited. The exact mining location needs to be demarcated on the ground. It is further suggested not to allow camping of labourers on the riverbed especially during the winter months as the nearby water channel attracts migratory waterbirds. There should not be any kind of mining activity

near to the flowing water channel of the river. In this regard it is proposed to have a 200 m buffer area which should be maintained from the east bank high tide level of Tons River to the north-west part of proposed mining site. Mining should not be allowed during early or late monsoon season. The permission to carry out the mining should be reviewed every three years by an appropriate committee.

During the study, we collected qualitative data on the possible negative effects of non-mining in all the eight sites. Only in the sites of Sharda, Dabka (south of Dabka Bridge) Rivers problems due to floods seem likely. However, it may be noted that the deposition of sand and boulders is a natural phenomenon in all rivers and streams of the *Bhabar* tract, when they enter the plains. Biodiversity in this region has evolved with this phenomenon and they have adapted to this. Therefore, in most of the sites we could not visualise any kind of adverse impact on biodiversity and geomorphology of the river if the area is not mined. The Uttarakhand Forest Department will need to monitor the extent of mining and its possible impacts on the river bed morphology periodically by constituting a committee of appropriate stature.

It is proposed that appropriate mechanism may be developed for restoration and strengthening of adjoining forested land by sharing a portion of revenue generated from the mining for the improvement of habitat. Laborers should not be allowed to stay near the river bank or in nearby forests to prevent extraction of forest products and minimize disturbances. All the entry and exit points should be checked and monitored to prevent any illegal mining.

Mitigation measures to minimize the impacts of sand mining on wildlife value of the area have been suggested for each site. Based on which a detailed management plan for the entire landscape could be developed by the Forest Department with emphasis on identification of suitable areas for conservation as desired by the Government of India vide its letter No. 8-61/1999-FC dated 8$^{th}$ April 2011 section xii and xiii.

# CHAPTER 1
# INTRODUCTION

## 1.1 Background

Our Common Future, *a.k.a* the Brundtland report developed by the World Commission on Environment and Development developed the concept of sustainable development in 1987. This document revolves around sustainability and insists to ensure "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The population, economic and developmental growth will obviously involve changes in the physical environment. Hence, our ability to integrate development and ecological integrity can help in making informed decisions. In general, the non renewable resources like the fossil fuel and minerals should be minimally depleted and the criticality of the resource availability should be considered. As far as the renewable resources are concerned, they can be exploited provided the rate of use is within the limits without affecting the ecological values of the ecosystem. The Riverbed materials (RBM) are one such renewable resource, which is abundantly used as construction materials. Utilization of this resource in a sustainable manner will help in improving the living standards, economic needs and development aspirations of the region. This RBM are a by-product of the massive sediment load and deposition that the rivers carry along the course of the river. Due to this phenomenon, river bed mounting and widening of flood plain result in accelerated water related hazards to the forest and local people settlements. In this background, an environment friendly collection, extraction, transportation and processing of RBM like stone, boulder and gravels etc. that can mitigate the water induced threats viz. floods, erosion, river cutting in the up and downstream is imperative.

In Uttarakhand, most rivers that run through *bhabar* tract are targeted for their rich deposition of sand and boulders. The *Bhabar* tract falls under the non-montane physiographic zone which is a level surface zone at the foothills of the Himalaya where the Himalayan torrents rush down from the steep slopes and disappear under the River Bed Materials due to the high porosity of the soil type. Under the direction of Ministry of Environment and Forest (MoEF) vide letter No.11-329/2010-FC, dated 16 November 2010 the Wildlife Institute of India (WII) has carried out a study to assess the impact of RBM collection in six rivers (Kosi, Dabka,

Nihal, Gola, Sharda and Kiroda Nullah). Subsequently, vide its let No. 8-80/93-FC (pt.), dated 26 November 2010 the Ministry of Environment and Forests, Government of India directed to add two more sites; viz. Tons and Yamuna Rivers at Kalsi and Rampur Mandi respectively in Chakrata Forest Division. Terms of Reference (TOR) of the study are as under:

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5. Development of an appropriate plan for management of the identified migratory corridors. Such plan *inter-alia* may include restriction on collection of minor minerals for major part of the year, with a provision of periodic accelerated collection (preferably during the period having least frequency of wildlife movement) to maintain river geometry.

Within the ambit of the TOR following questions were explored (i) whether the area of interest has any wildlife value in terms of species of conservation significance (e.g. large mammals and their habitat integrity) (ii) whether the collection of RBM has any adverse impacts on wildlife population and their habitats and (iii) whether non-collection of RBM will have any negative impact on river geometry and river banks. To answer the above mentioned questions, transects of 2 km length were walked in the forest adjacent to river, perpendicular to river course 200 m away from the bank. Data was collected on the presence of carnivores and their prey on the transects.

## 1.2 Study approach and methodology

With reference to the Terms of Reference (TOR) and the scope of work given to WII, the study involved answering the following question: whether the area of interest has any wildlife value in terms of species of conservation significance (e.g. large mammals and their habitat

integrity). The question was investigated in the contexts of (a) past status of species of conservation significance, (b) prevailing scenario given the expansion and intensification of the mining activity in the recent years, and (c) potential condition that can emanate from the continuous mining.

The primary focuses of the study were:

- To examine whether the mining site has any wildlife value in terms of conservation significance
- To assess the adverse impacts of RBM collection on wildlife population and their habitats
- To identify wildlife corridors (if present) along the proposed mining areas
- To propose appropriate ameliorative measures to minimize/eliminate any adverse impact
- To assess the adverse impacts of non-collection of RBM in the river stretch on river geometry and erosion, if any.

To answer the above mentioned question, transects of 2 km length were walked in the forest adjacent to river, perpendicular to river course 200 m away from the bank with five plots placed at an interval of 400 m. Data was collected on presence/abundance of carnivores (pugmark, scats, scraps, rake, kills, vocalization and direct sighting) and herbivores (pellets, dungs, droppings and direct sightings) on the transects.

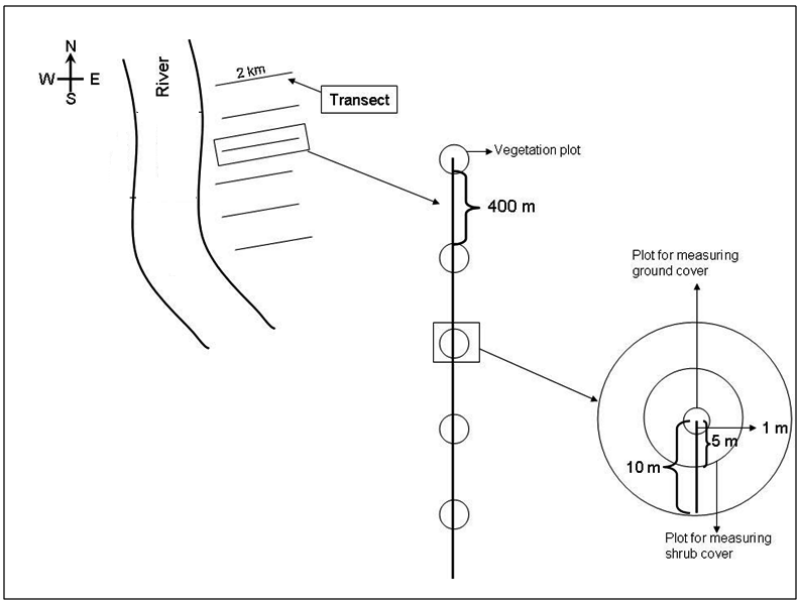


Fig. 1.1 Sampling scheme for wildlife population and habitat condition

To quantify the wildlife habitat condition within each landscape quadrats were laid for vegetation at an interval of 400 m distance (5 points). At each point, a circular plot of 10 m radius (314 $m^2$ area) was laid for trees, 5 m radius (78.5 $m^2$ area) circular plot for shrubs and 1 m radius plot for herbaceous vegetation were laid. Anthropogenic disturbance details reflected by cut and lopped trees, cattle dung, livestock and human presence were also recorded in each of the 10 m radius plots.

The study also collected qualitative data on the possible negative effects of non-mining in all the eight sites by examining the river width, channel width, extent of deposition of sediments and evidences of erosion during flooding. Study reports on the status of corridors and their use by wildlife such as Jhala et al. (2011) and WWF-India (2011) were consulted to arrive at an understanding on present status of corridors.

# CHAPTER 2

# KOSI RIVER

## 2.1 Background

The Kosi River originates from Totaseeling, Kausani hills of Bageshwar District of Uttarakhand. The river flows through the foothills in the Tarai West Forest Division, Ramanagar of Western Circle of Uttarakhand Forest. The river flow is bleak most of the year except during the monsoon season. Vegetation, reserved forests and human habitats cover the riverbanks, on both sides; many reserved and protected forests surround the project area. They are Dechauri Reserved Forest, Dabka Reserved Forest, Kota Reserved Forest, Papri Reserved Forest, Ampani Protected Forest, Jalaban Protected Forest, Jurka Protected Forest, Jogipura Protected Forest and Lower Kosi Protected Forest. Extraction of Minor Minerals is proposed from the bed of the Kosi River. The mining area in the Kosi River in the Nainital district is a stretch of 11 km. The area allotted for the purpose is 254 ha of which 127 ha would be the effective working area. The collection of minor-minerals will be carried out from 50% of the total area (127 ha) leaving 25% area on each side of the river banks for better channelization of the water during the rainy season and to protect the nearby forest land and habitants from floods. The proposed extraction of riverbed material would be 20.3 lakh $m^3$ or 36.5 lakh tonnes per annum. The mining is confined to extraction of sand and boulders from the riverbed.

## 2.2 Approach

Intensive field data collection was done twice, once in summer and again in monsoon season. In summer, four transects of 2 km length were sampled systematically to assess the wildlife population status on the western and eastern bank of river Kosi. Transects were placed in the Ramnagar Forest Range (Terai west Forest Division) perpendicular to river course on the left bank at an interval of 1 km, 200 m away from the riverbank. During monsoon, similar exercise was repeated.

## 2.3 Observations

### *2.3.1 Status of mining and river morphology*

The mining area in the Kosi River in the Nainital district is a stretch of 11 km. The area allotted for the purpose is 254 ha of which 127 ha (50%) would be the effective working area for the collection of minor-minerals. Three mining gates are currently operational at Kalusidh, Kathiyapul and Banjari. Mining depth was observed to range between 2 m to 6 m and was carried out in middle of the river, however considerable digging and mining was seen beyond permissible boundaries near to the river bank.

The Kosi River is known for its unpredictable and damaging torrents during monsoon. It was seen that in the mined area the flow of the river was mostly confined to the middle of the river, which is due to the extraction of RBM from the river bed in the past.


Fig. 2.1 Kosi River mining site

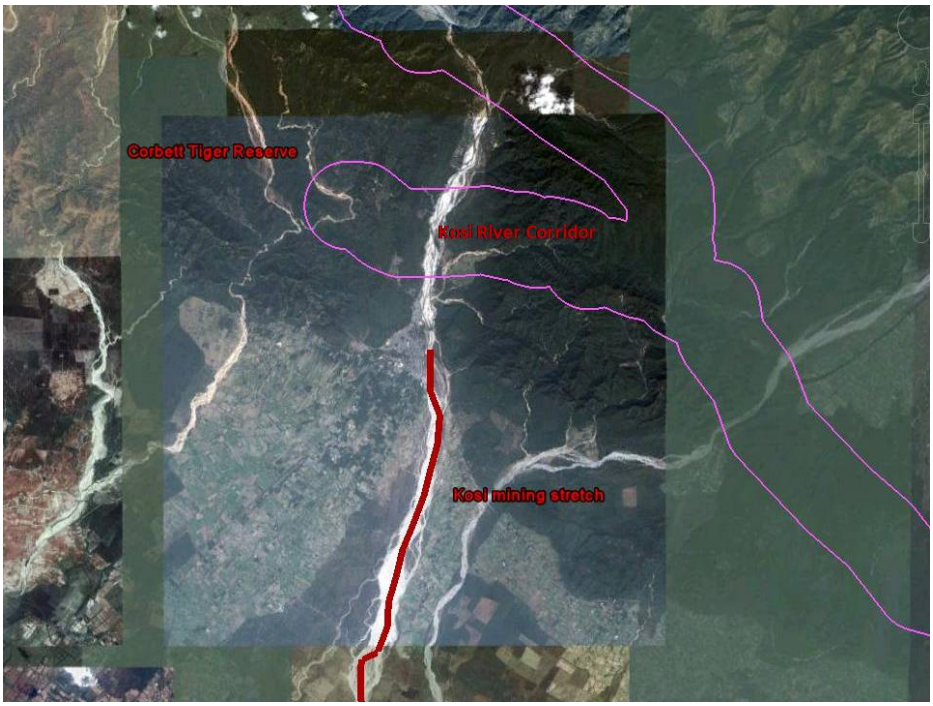


Fig. 2.2 The area inside the pink lines shows the Kosi corridor patch which is important for the movement of tigers and elephant (Source: Jhala *et al*. 2011)

Plate 2.1 Mining from Kosi River bed

### *2.3.2 Forest structure*

A total of 10 tree species were recorded from the study area. The overall tree density was 205 trees $ha^{-1}$ with high density of *Tectona grandis* (123 trees $ha^{-1}$) followed by *A. catechu* (30 trees $ha^{-1}$) and *D. sissoo* (21 trees $ha^{-1}$). The total basal area (TBA) of the forest was 11.48 $m^2$ $ha^{-1}$ with highest TBA shown by *L. coromandelica* (4.57 $m^2$ $ha^{-1}$). The high density and low TBA of *T. grandis* suggest that most of the trees are in lower girth class as the area is *T. grandis* plantation.

Table 2.1 Species composition (density, total basal area and IVI) of study area forest

| **Species** | **Density (trees $ha^{-1}$)** | **TBA ($m^2$ $ha^{-1}$)** | **IVI** |
|---|---|---|---|
| *Accacia catechu* | 29.69 | 1.87 | 49.47 |
| *Bombex ceiba* | 10.60 | 0.72 | 23.95 |
| *Cordia myxa* | 2.12 | 0.03 | 7.57 |
| *Dalbergia sissoo* | 21.21 | 1.16 | 29.80 |
| *Eucalyptus globulus.* | 2.12 | 0.03 | 4.44 |
| *Holoptelia integrifolia* | 6.36 | 0.37 | 12.54 |
| *Lannea coromandelica* | 2.12 | 4.57 | 43.92 |
| *Mallotus philippensis* | 4.24 | 0.07 | 8.89 |
| *Tectona grandis* | 123.00 | 2.62 | 110.78 |
| *Ziziphus mauritiana* | 4.24 | 0.04 | 8.63 |
| **Total** | **205.70** | **11.48** | **300.00** |

Across the gradient of distance, based on the Importance Value Index (IVI) the forest communities in the study area were as follows:

| | |
|---|---|
| 0-400 m | *D. sissoo - A. catechu- B. cieba* |
| 400-800 m | *T. grandis- A. catechu* |
| 800-1200 m | *T. grandis* |
| 1200-1600 m | *T. grandis* |
| 1600-2000 m | *T. grandis - B. cieba* |

Thus, it is recorded that near the riverbank there is some natural, riverine vegetation but far from the riverbank the area comprises of only Teak plantation. The maximum tree density was recorded between 800 m to 1200 m from riverbed (Fig. 2.3 (a). Similar trends were also

observed for TBA at different distance gradients with maximum TBA recorded between 800 m to 1200 m (40 $m^2$ $ha^{-1}$).

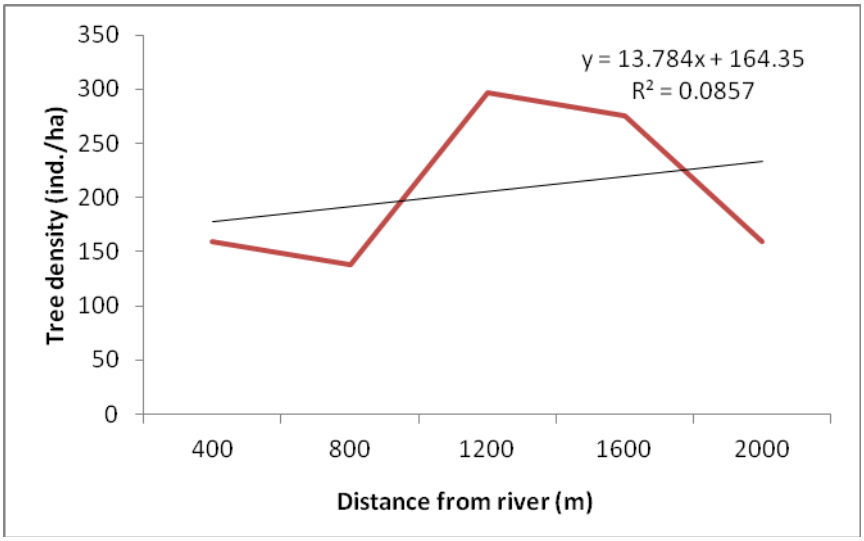


Fig. 2.3(a) Trends in tree density across the distance gradient

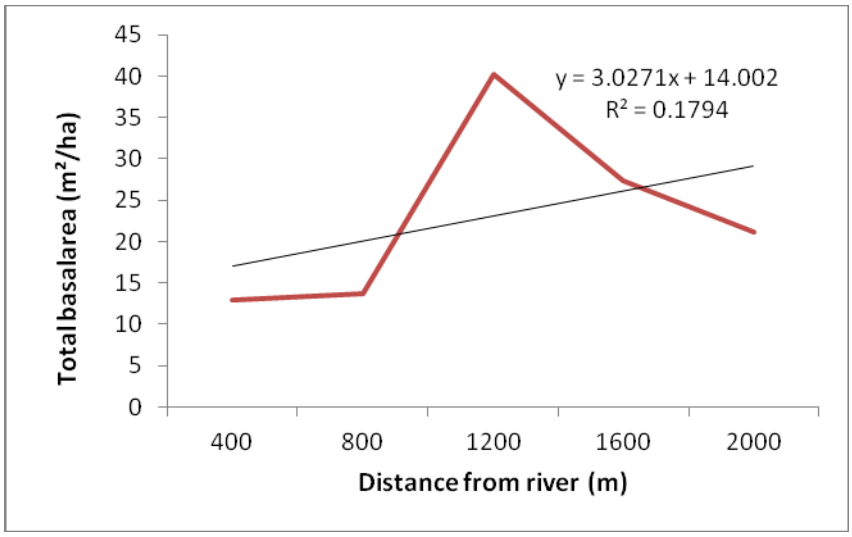


Fig. 2.3(b) Trends in total basal area across the distance gradient

### *2.3.3 Shrub abundance, tree regeneration and weed invasion*

Among shrubs, *Cassia tora* was most abundant and it showed a high abundance throughout the distance gradient from the river bank. *Murraya koeingii* showed high abundance in the plots near the river bank, while a declining trend away from the river bank. *Lantana camara* was the other shrub, which had a low but consistent presence throughout the study area. As this area did not have much natural vegetation, saplings of only *Ziziphus mauritiana* were recorded.

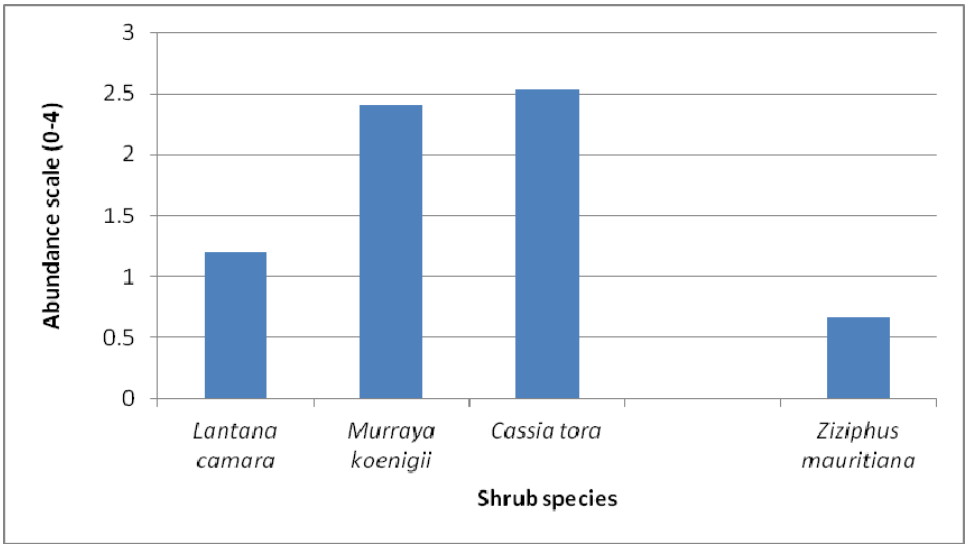


Fig. 2.4 Shrub abundance on scale of 0-4 (<25% of cover ≤1, 26-50%≤2, 51-75%≤3, >76% of cover ≤4)

Since *C. tora* and *L. camara* are weeds, their high percent cover shows that the habitat is considerably degraded. Weed cover shows an uneven trend but it was decreased from riverbed. This could be due to the fact that the area had *T. grandis* plantation, a species that does not support much ground cover.

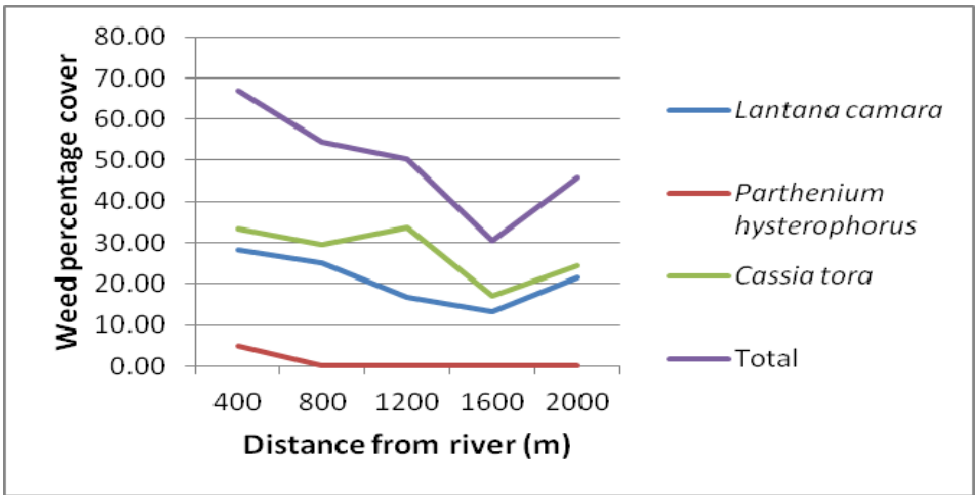


Fig. 2.5 Trends in weed percent cover along the distance gradients

### *2.3.4 Status of ground layer*

The ground layer was dominated by weeds throughout the distance gradient from the river bank. Green grass also had a substantial presence while the other factors like dry grass and

herbs showed little presence. In addition, a high percentage was shown by bare ground; this can be attributed to the Teak plantation, as it does not allow much vegetation. The high percent cover of weeds is an indicator of habitat degradation.

### *2.3.5 Assessment of anthropogenic pressure*

Fig. 2.6 clearly shows that during the mining period the forest was under heavy anthropogenic pressure, this is due to the large amount of mining laborers who depend on the forest for fuelwood. During the non-mining season (monsoon), the disturbance levels decrease considerably, since mining goes on for around eight months, due to which this forest area is highly disturbed.

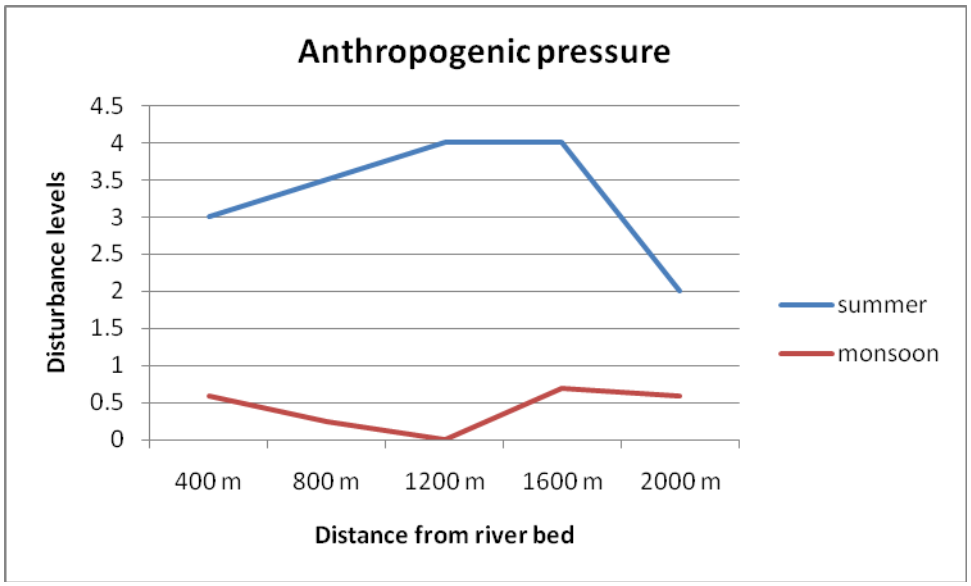


Fig. 2.6 Anthropogenic pressures on a scale of 0-4 across the distance gradient

### *2.3.6 Wild animal signs*

Five species of ungulates were recorded during the survey. The encounter rate of pellets was very low during the monsoons (2.7). The encounter rate for nilgai was highest since it thrives well in disturbed forest areas. Fig. 2.8 shows that the distribution of ungulates increased along the distance gradient as we went away from the river bank during the mining period whereas in the non-mining period the distribution was more uniform throughout suggesting that the disturbance near the river bed had a negative relationship to the distribution of the wild animals.

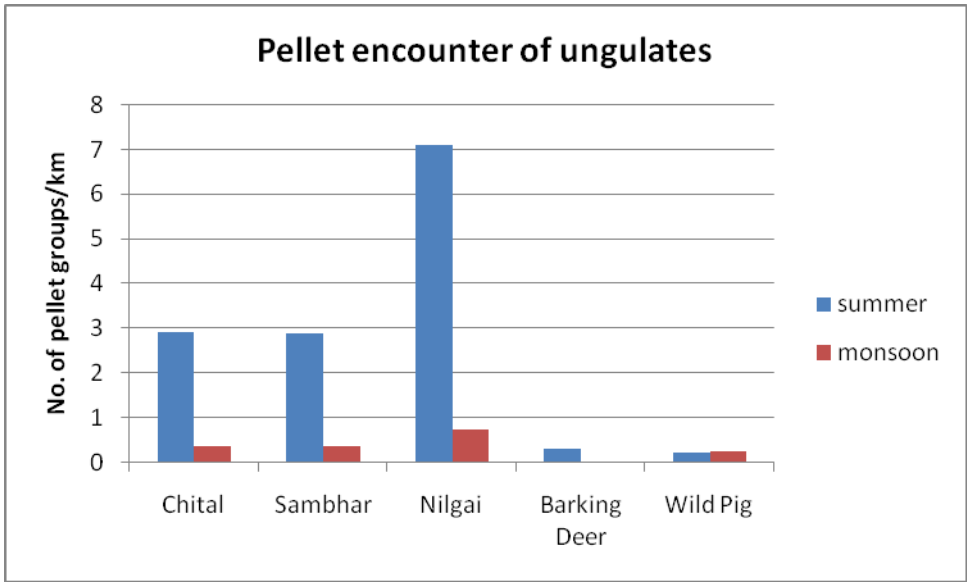


Fig. 2.7 Pellet encounter rate for ungulates

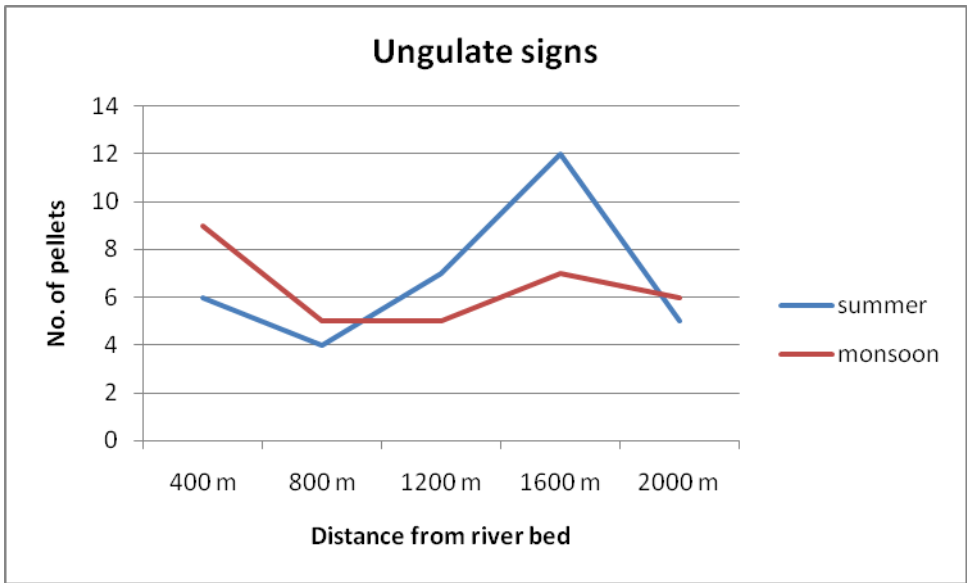


Fig. 2.8 Number of pellets of ungulates across the distance gradient

Among carnivores, the signs of leopard and jackal were recorded. These carnivores can continue to exist in highly disturbed areas but the absence of large mammals like tiger and elephant suggests that this habitat might not be suitable for large mammals anymore.

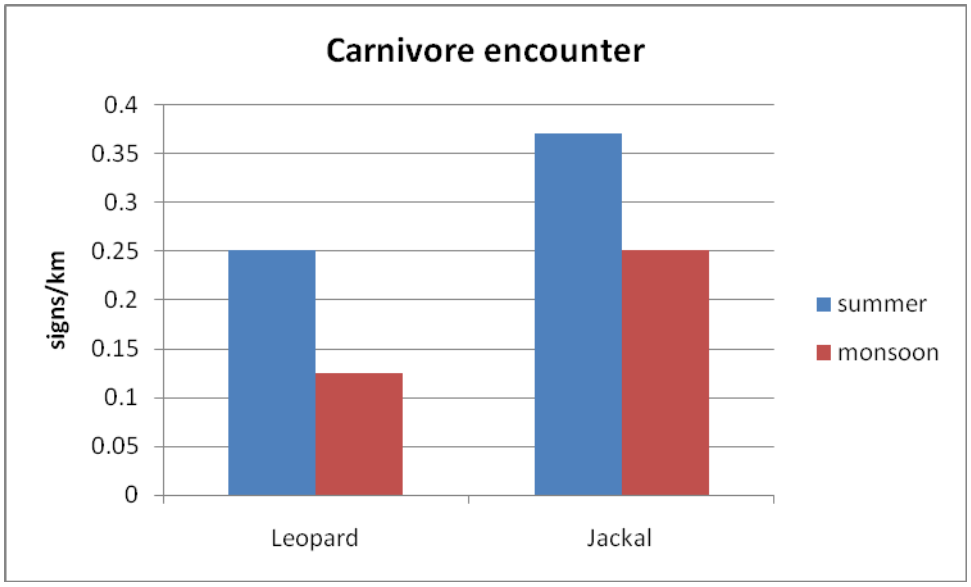


Fig. 2.9 Carnivore sign encounter rate during summer and monsoon

### *2.3.7 Possible impacts of non-mining*

River had a riverbed width from 300 m to 800 m with a channel width of 20-60 m. Kosi is a braided system with 2- 3 channels. Both the banks were at height of 2-5 feet from riverbed. Signs of spreading of water were noticed near the bank. However, there were no signs of water spreading beyond banks. Plausible impacts of non-mining causing flood or destruction are hard to justify due to time and data constrain.

## 2.4 Conclusions

Along the proposed mining site at Kosi River, the habitat comprises mainly of Teak and Eucalyptus plantations and shows very high level of anthropogenic disturbance during the mining period, which is due to the combined activities of the mining labourers and villagers of the nearby settlements. Among wild animals, the area has considerable population of nilgai, chital and sambar and also has the presence of leopard, but mammals like elephant and tiger were absent due to habitat degradation and high anthropogenic pressures.

As per The WWF-India report (2011), the river stretch south of Kosi Barrage falling in the Ramnagar range of the Terai West Forest Division does not have a major implication on wildlife movement as the wildlife corridor falls in the upper catchment (north of Kosi Barrgae) of the Kosi River in the Ramnagar Forest Division.

Thus, the proposed extraction of RBM from South of the Kosi Barrage will have little impact on the wildlife value of the area provided that the mining activities adhere to appropriate regulations with regard to depth of mining in this zone and guidelines issued by MoEF Vide letter No. 8-61/1999-FC dated 9th February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011. However, mining activity closer to Kosi Barrage may destabilize the river banks.

Laborers should not be allowed to stay near the river bank or nearby forests to prevent extraction of forest products and minimize disturbances, as laborers were seen carrying wood from nearby forests. The entry and exit points would have to be the only way through which load is transferred. Presence of too many unmapped and unmanned entry and exit points would lead to undue disturbance along the protected forests.

Permission to mine should be reviewed every three years by an appropriate committee so as to monitor if there is any adverse impact on the environment. Mining should not be allowed in the river stretch north of the Kosi Barrage as this area is a functional corridor for both tiger and elephant beyond the Sundarkhal settlement till Kumeria, as kills and crop raids have been reported from the villages around the Kosi River (WWF-India, 2011).

# CHAPTER 3

# GOLA RIVER

## 3.1 Background

The Gola River originates from Padampuri in Nainital district of Uttarakhand and flows through foothills in Haldwani Forest Division and Terai East forest Division (TEFD). The total length of the river is around 60-70 km, of which 29 km stretch of the river from Kathgodam to Lalkuan is being used for sand/boulder extraction, covering 1497 hectare. The mining was regularized in 1952, and the mining leases were auctioned by Forest Department until 1974. The permission for extraction of RBM was granted by MoEF, Govt. of India on 29 September 1989 (vide letter 8-361/89-F.C.), and approval for next ten years was again granted on 18 November 1999. Initially in the year 1990-91, the extraction of RBM in Gola River was done by the Forest Department. Subsequently, private contractors and agencies such as Garhwal Mandal Vikas Nigam (GMVN), Kumaon Mandal Vikas Nigam (KMVN), UP Van Nigam and Uttarakhand Forest Development Corporation (UKFDC) were involved in the following years. However, UKFDC is undertaking the extraction for the last 11 years (from 2000-2010). The year-wise details of extraction by different agencies are given in Annexure I.

The extraction sites were selected on the basis of maximum debris deposition. The entire mining activity is carried out from 11 gates (under Haldwani and Terai East Forest Divisions) located parallel to Nainital-Bareilly road on the west bank of the Gola River, during October-July every year. Approximately 7,000 trucks and other carriers supported by ca.6,500 laborers are involved in the process annually. The permissible limit for sand/boulder extraction as per MoEF was fixed to 65,00,000 $m^3$ in central part of the river leaving one fourth of the total width of the river from each bank being mined to prevent bank erosion. As per the environmental clearance report prepared by Uttarakhand Forest Development Corporation (UAFDC), the average annual extraction for 16 years from 1990-2005 was ca. 17,43,238 $m^3$. This extraction quantity was hugely increased in the last five years, with a maximum of 62,03,998 $m^3$ in 2008-2009 (Annexure I).

## 3.2 Approach

Intensive field data collection was done twice, once in winters and again in monsoon. In winters, six transects of 2 km length were sampled systematically to assess the wildlife population status on the eastern bank of river Gola. Transects were placed in the Gola Forest Range (Terai East Forest Division) perpendicular to river course on the left bank at an interval of 1 km, 200 m away from the river bank. Sign surveys for herbivore and carnivore presence/abundance was also done in the nearby intact forest in Tanda Forest Range (Terai Central Forest Division). During monsoon, similar exercise was repeated.

## 3.3 Observations

### *3.3.1 Status of mining and river morphology*

In the 29 km river stretch, sand/boulder mining is being carried out with 11 entry & exit gates (Figure 1), with a total revenue turnover of Rs. 20.90 crores for the Government of Uttarakhand as indicated from last year revenue. The revenue comes in the form of royalty (Rs. 17.28 crores), stamp duty (Rs. 1.38 crore), sales tax (Rs. 1.29 crore) and income tax (Rs. 0.95 crore). The total cost involved in the sand/boulder mining may account for over Rs. 65 crores annually, at least in the recent past. It was observed during the survey that the extraction is carried out in series of pits/plots, which eventually meets to form an extended excavated area. The depth profile of mining in the 11 gates ranges from 2 ft to 20 ft, with an average of 13 ft (± 4.4 SD) (Table 3.1). Currently, the river course could be seen in the terrace form of more than one steps, and the river flow is channeled to middle of the river. Apart from the designated corridor stretch, mining has been prohibited in about a kilometer stretch on either side of Haldwani-Chorgalia bypass Bridge for the last three years. We also observed the protective fences on the river where mining is prohibited. It was apparent that this particular stretch has rapidly recovered. The banks are also with natural vegetation, dominated by *Dalbergia sisoo* and *Acacia catechu*. This suggests that there is clear opportunity for sustainable mining, if the miners adhere to prescribed limit, and regulate mining sites within the stretch. Otherwise, it may lead to enhanced erosion of the riverbanks, as was observed all along the river course, more prominently in the mining sites. Recent river flow (2010) was reportedly substantial, and has caused severe erosion, to the extent that river trainings (spurs) could not withstand the flow. There are places in the stretch, where the river

width has expanded beyond the spurs. These are indications pointing to adequate management efforts to deal with mining and erosion excesses.

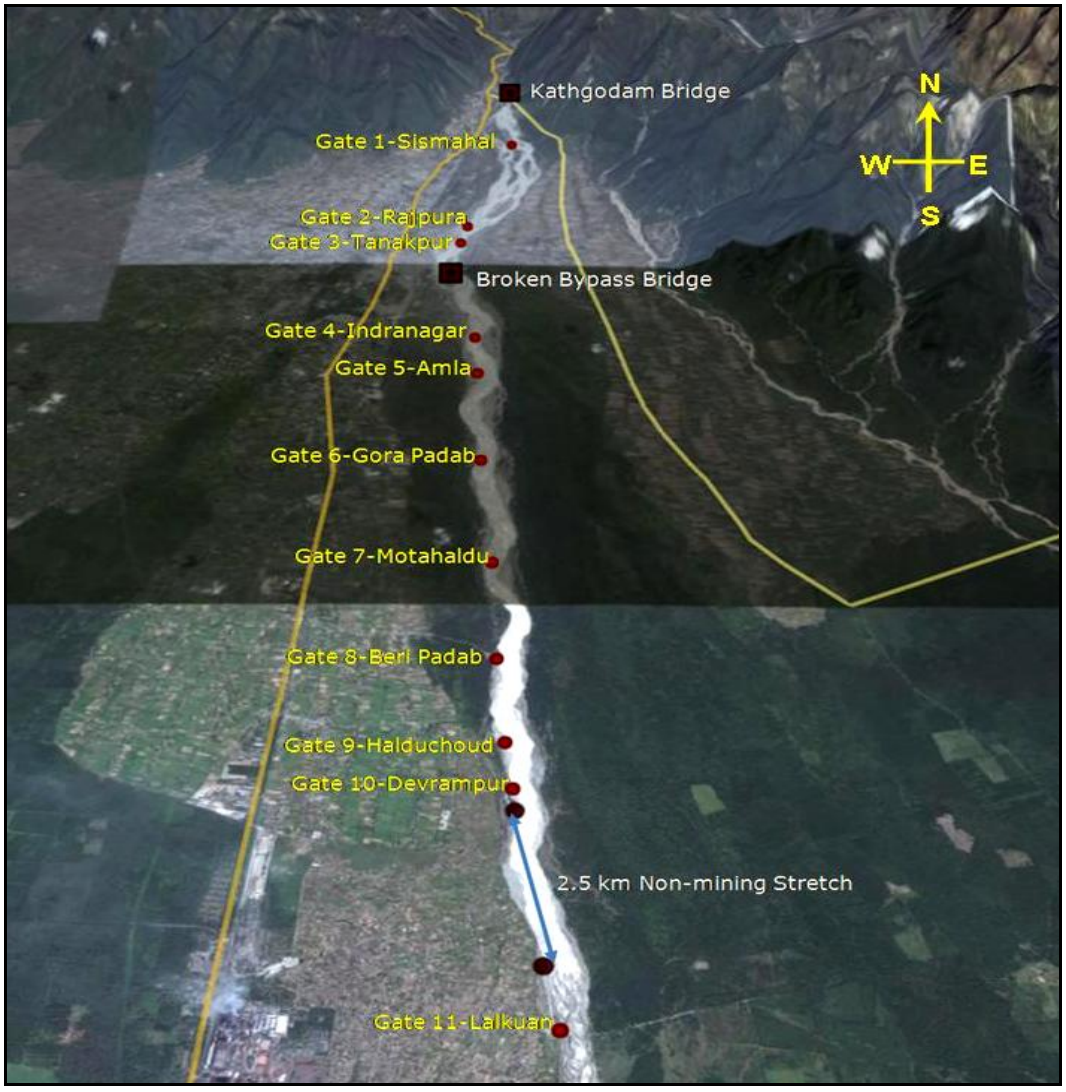


Fig. 3.1 Location of mining gates along Gola River

Table 3.1: Depth profile of mining sites along Gola River

| S.No. | Gate | Name | Latitude | Longitude | Depth Profile (Range in Ft) |
|---|---|---|---|---|---|
| 1 | *Up Stream* | *Kathgodam Bridge* | 29.26818 | 79.54874 | No Mining |
| 2 | Gate 1 | Sismahal | 29.25103 | 79.54905 | 10 to 12 |
| 3 | Gate 2 | Rajpura | 29.22405 | 79.54124 | 10 to 12 |
| 4 | Gate 3 | Tanakpur | 29.21871 | 79.54016 | 5 to 6 |
| 5 | *No Mining* | *Bypass Bridge* | 29.20980 | 79.53888 | No Mining |
| 6 | Gate 4 | Indranagar | 29.19108 | 79.54326 | 15 to 20 |
| 7 | Gate 5 | Amla | 29.18148 | 79.54391 | 15 to 20 |
| 8 | Gate 6 | Gora Padab | 29.16019 | 79.54483 | 15 to 20 |
| 9 | Gate 7 | Motahaldu | 29.13820 | 79.54682 | 15 to 20 |
| 10 | Gate 8 | Beri Parab | 29.11958 | 79.54768 | 12 to 15 |
| 11 | Gate 9 | Halduchoud | 29.10510 | 79.54892 | 15 to 20 |
| 12 | Gate 10 | Devrampur | 29.09772 | 79.54993 | 15 to 20 |
| 13 | *Corridor* | *Non-Mining Start* | 29.09433 | 79.55020 | No Mining |
| 14 | *Corridor* | *Non-Mining End* | 29.07228 | 79.55353 | No Mining |
| 15 | Gate 11 | Lalkuan | 29.06419 | 79.55532 | 2 to 4 |

Plate 3.1 Vehicles at the Indranagar gate, Gola River mining site

### *3.3.2 Forest structure*

During the study, it was recorded that the habitat is riverine and mainly dominated by *Acacia catechu*, *Dalbergia sissoo* and *Holoptelia integrifolia* species. For the assessment of forest community in the study area, 30 plots were laid, in which 22 tree species were encountered. The total tree density of the study area was 555 trees $ha^{-1}$ with having maximum density of *Mallotus philippensis* (138 trees $ha^{-1}$) followed by *Holoptelea integrifolia* (113 tree $ha^{-1}$) and *Dalbergia sissoo* (71 trees $ha^{-1}$). Similarly, the total basal area was recorded 25.25 $m^2$ $ha^{-1}$ in the area with maximum represented by *Holoptelea integrifolia* (10.77 $m^2$ $ha^{-1}$) followed by *Dalbergia sissoo* (4.45 trees $ha^{-1}$) and *Acacia catechu* (3.38 $m^2$ $ha^{-1}$; Table 3.2).

Across the distance gradient, based on the Importance Value Index (IVI) the forest communities in the study area are as follows:

| | |
|---|---|
| 0-400 m | *A. catechu- H. integrifolia- M. philippensis* |
| 400-800 m | *D. sissoo-M. philippensis-H. integrifolia* |
| 800-1200 m | *H. integrifolia* |
| 1200-1600 m | *D. sissoo- H. integrifolia-M. philippensis* |
| 1600-2000 m | *H. integrifolia* |

The tree density and the total basal area across the distance gradient are showing an increasing trend (Fig. 3.2 a & b). This is because of the high number of lower girth class trees contributing to the total basal nearer to the riverbank while as we go away from the river bed high girth class trees contributed more to total basal area.

Table 3.2. Species composition (density, total basal area and IVI) of study area forest

| **Species** | **Density (trees ha$^{-1}$)** | **TBA (m$^2$ ha$^{-1}$)** | **IVI** |
|---|---|---|---|
| *Acacia catechu* | 84.84 | 3.38 | 45.38 |
| *Adina cordifolia* | 4.24 | 0.48 | 3.14 |
| *Aegle marmelos* | 24.39 | 0.96 | 18.75 |
| *Bombax ceiba* | 6.36 | 0.26 | 1.62 |
| *Cassia fistula* | 8.48 | 0.05 | 6.21 |
| *Cordia myxa* | 1.06 | 0.14 | 2.62 |
| *Dalbergia sissoo* | 71.04 | 4.45 | 45.6 |
| *Anogeissus latifolia* | 1.06 | 0.32 | 4 |
| *Mitragyna parvifolia* | 1.06 | 0.37 | 2.17 |
| *Haplophragma adenophyllum* | 4.24 | 0.06 | 3.15 |
| *Holoptelea integrifolia* | 113.49 | 10.7 | 77.17 |
| *Lannea coromandelica* | 1.06 | 0.03 | 1.06 |
| *Celtis australis* | 6.36 | 0.01 | 1.97 |
| *Garuga pinnata* | 2.12 | 0.35 | 1.86 |
| *Ehretia Levis* | 5.30 | 0.04 | 5.43 |
| *Mallotus philippensis* | 138.93 | 1.25 | 48.15 |
| *Ficus sp.* | 8.48 | 0.32 | 4.51 |
| *Trewia Nudiflora* | 5.30 | 0.09 | 2.78 |
| *Wrightia tinctoria* | 14.84 | 0.16 | 5.97 |
| *Ziziphus mauritiana* | 13.78 | 0.54 | 10.98 |
| Unkown A | 7.02 | 0.15 | 3.74 |
| Unknown B | 31.81 | 1.14 | 3.74 |
| Total | 555.28 | 25.25 | 300 |

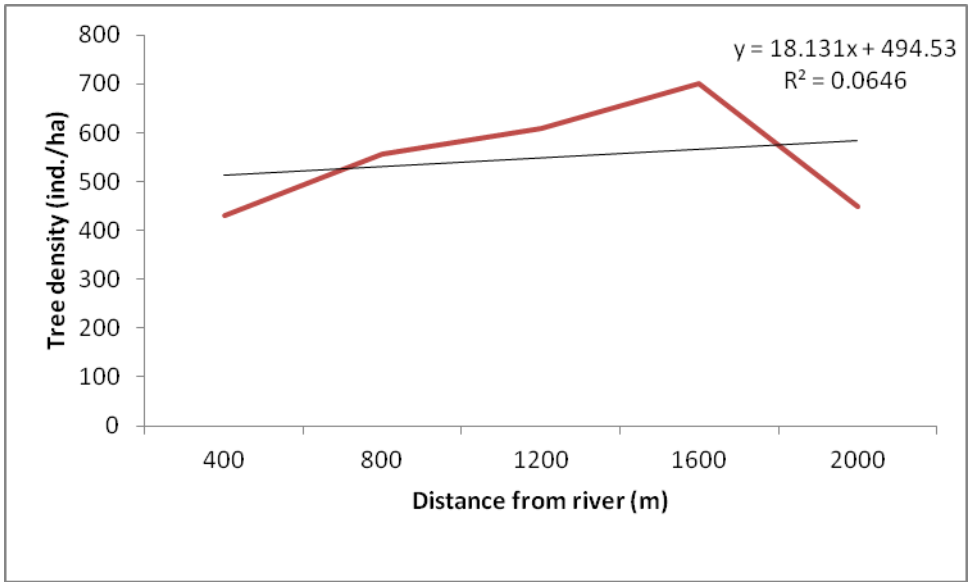


Fig 3.2 (a) Trends in tree density across the gradient of distance

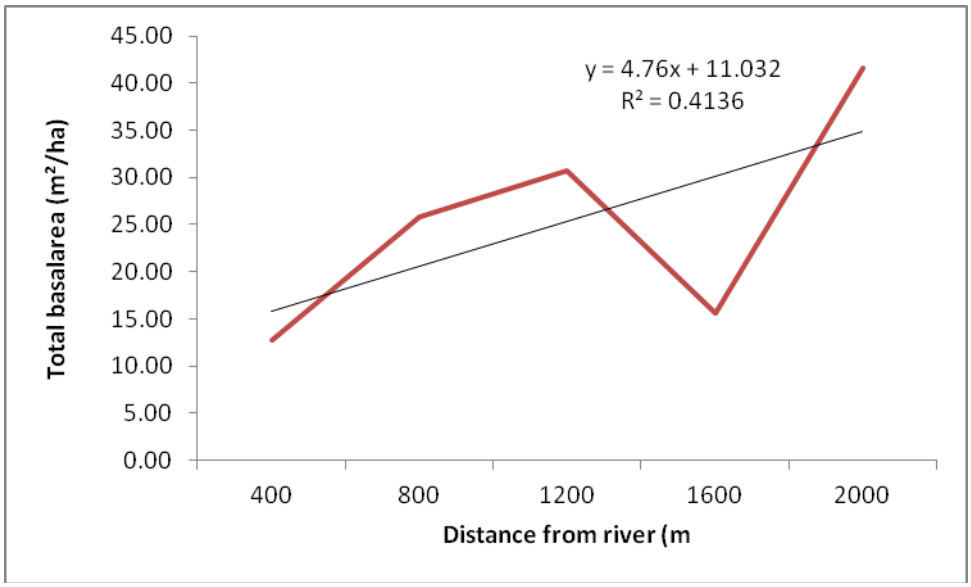


Fig 3.2 (b) Trends in total basal area across the gradient of distance

### *3.3.3 Shrub abundance, tree regeneration and weed invasion*

In general, Fig. 2.3 shows that the shrub species like *M. koenigii, L. camara, P. benghalensis, P. frutescens* and *A. aspera* were thoroughly distributed, while *A. vasica, C. tora* and *G. pentaphylla* were least distributed in the entire study area. Among tree species *M. philippensis* followed by *H. integrifolia* had the maximum distribution, while others (*A. marmelos, W. tinctoria* and *Z. mauritiana*) were least distributed in the study area.

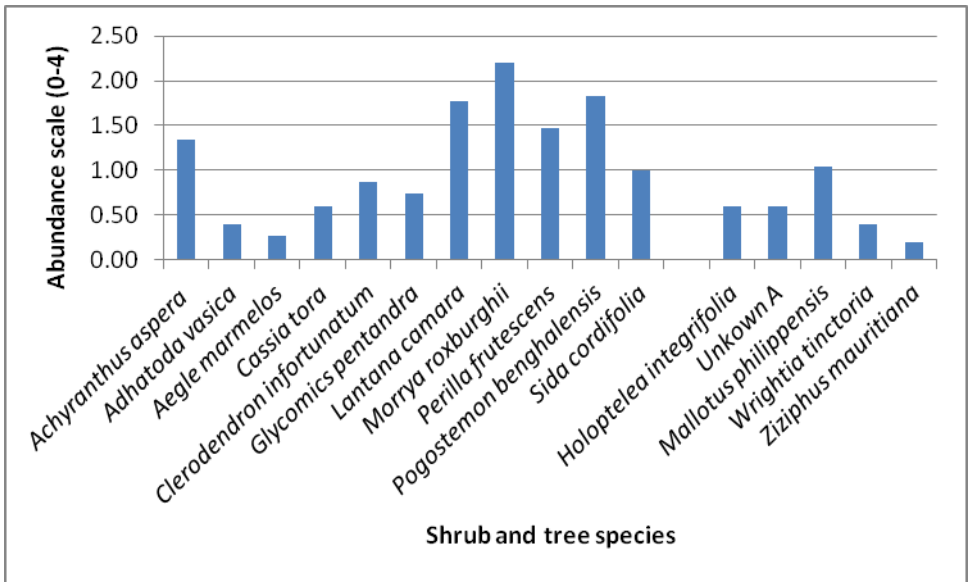


Fig 3.3 Shrub and tree sapling abundance on a scale of 0-44 (<25% of cover =1, 26-50%=2, 51-75%=3, >76% of cover =4)

Weed species in the study area included *Lantana camara, Clerodendron infortunatum, Parthenium hysterophorus.* Highest percentage was shown by *Lantana camara* covering 27% of a 10 m radius plot on an average. Fig. 3.4 shows decreasing trend in weed percentage as we move away from the riverbed, which is being reflected in the graph.

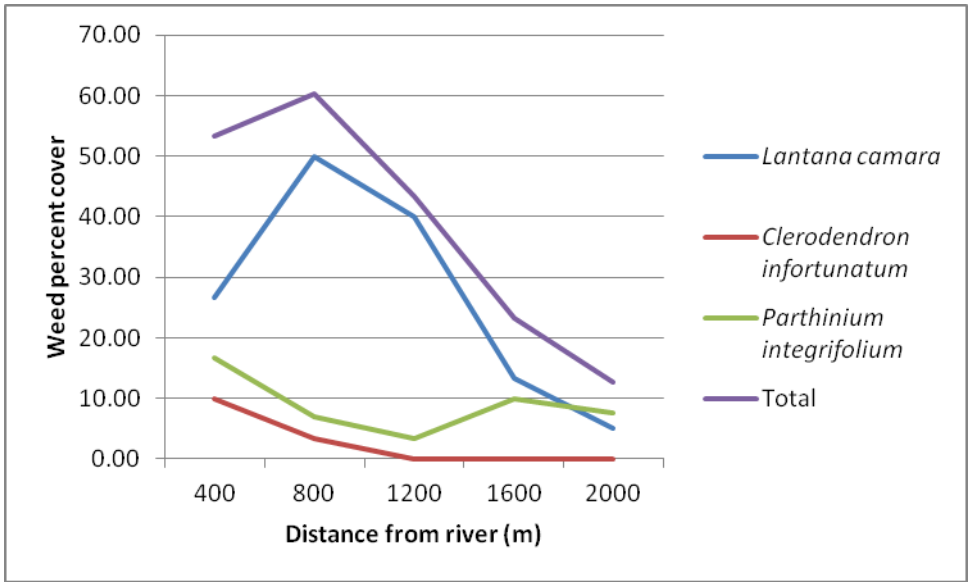


Fig. 3.4 Trends in weed percent cover along the distance gradient

### *3.3.4 Status of ground layer*

At ground level various parameters *viz.*, dry and green grass cover, herb cover, weeds, bare ground and dry leaf litter were recorded at various points from the river bed in the study area. The ground cover is mainly dominated by herbs where it increases with distance from river bed. Maximum herb cover (26%) was recorded almost at the end of the transect (2000m). Similarly, leaf litter is increasing with increase in distance and was maximum between 1600-2000 m distance. However, high weed cover was recorded between 400-1200 m distance from the river bed, because of high disturbance and low canopy cover.

### *3.3.5 Assessment of anthropogenic pressure*

The overall anthropogenic pressure decreases with increase in distance from the river bed (or mining activities) in the study area (Fig. 3.5). The anthropogenic disturbance is significantly increased during mining season as the area is being frequently used by mine workers for their daily routine as well as by the villagers of opposite site. However, anthropogenic pressure slightly increases after 1200 m, which is mainly due to the presence of *khatta* people residing in the forest.

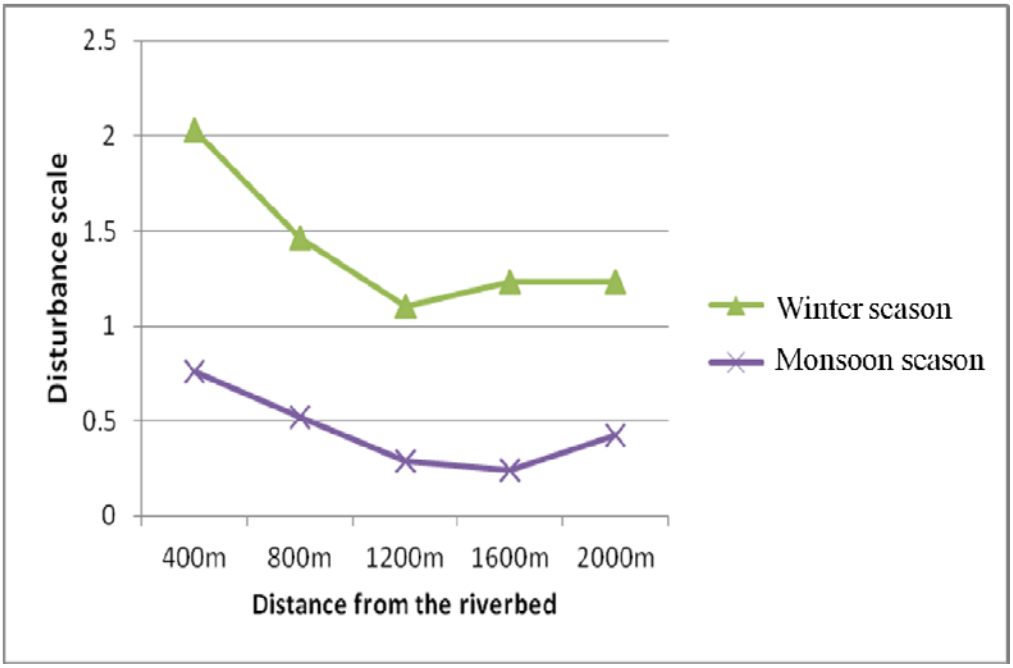


Fig. 3.5 Anthropogenic pressures on a scale of 0-4 across the gradient of distance

Almost every family in the area had animals for both sustenance and commercial purposes, thus resulting in collection of fodder and grazing inside the forest.

### *3.3.6 Animal signs*

A total of six species of ungulates were recorded from the study area during both the seasons. Highest pellet encounter was shown by nilgai during mining period (in winters) followed by sambar and chital. Nilgai shows a positive relationship with disturbance as seen by a decline in the pellet encounter during non-mining period (in monsoon) and an increase of signs of other animals. Sambar had the highest encounter rate during non mining period followed closely by nilgai. The encounter rate of pellets of ungulates was low during monsoon season probably because of availability of water and food inside the forest resulting in more spaced out distribution of the animals, fast degradation of pellets and heavy undergrowth. Elephant dung was also encountered in the area in the non-mining period.

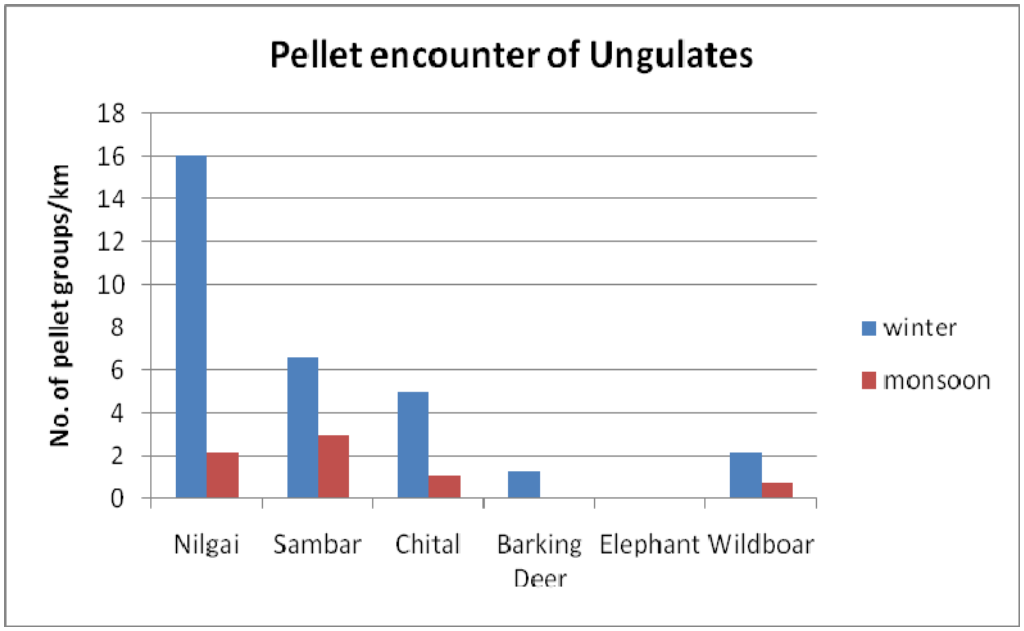


Fig. 3.6 Pellet encounter rate for ungulates

Carnivore signs mainly of leopard and Jackal were encountered in this forest patch during the study period. Scrape marks and fresh scat of leopard (*Panthera pardus*) and a chital kill probably made by leopard were observed in the area. These species can exist in areas with considerable amount of disturbance levels. Leopard signs increased during non-mining period compared to mining period and no Jackal signs were encountered during non-mining season.

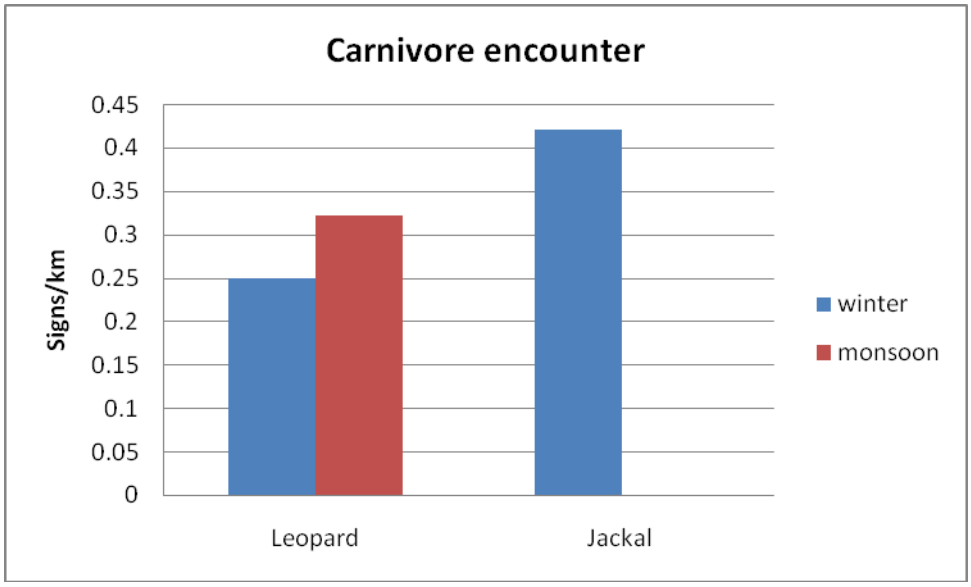


Fig. 3.7 Carnivore sign encounter rate

### *3.3.7 Status of wildlife corridor*

Topographic map of 1955 (US Army Map Service Figure 2) provides a clear perspective on the past status of the entire forest stretch, and more prominently, illustrates the forest connectivity between Terai Central and Terai East Forest Divisions across the Gola River, near Lalkuan. Known as Gola River Corridor (GRC), Wildlife Institute of India (Johnsingh et al. 2004) and Widlife Trust of India (Menon et al. 2005) identified this stretch in 2003/2004 as the critical area for movement of tiger and elephants between these two Forest Divisions. In the absence of this connectivity, it was feared that the wildlife populations particularly the wide ranging species like tiger and elephants would be further divided into smaller populations, thereby, facilitating local extinction and increasing human-wildlife conflicts. Currently, the corridor is in abysmal state, with habitat loss to infrastructure development and human habitation, with an imposing challenge if we are to revive the habitat connectivity for the animals. In order to create further opportunities, the Forest Department has restricted mining in 2.5 km stretch in Gola River between Devrampur and Lalkuan, aligning the GRC (Fig. 3.8).

The Gola River Corridor (GRC) has been facing anthropogenic pressures apart from boulder mining and heavy traffic along the Haldwani-Bareilly Road due to certain built up areas in the form of a railway sleeper factory (foundation stone of which was laid in January 2007), storage depot of the IOC and establishments of ITBP.

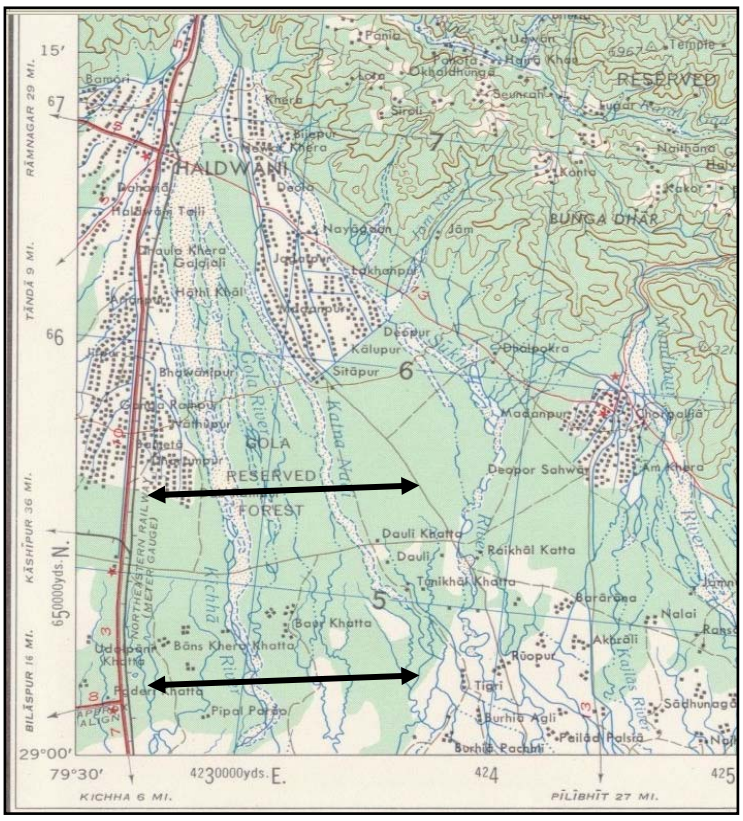


Fig. 3.8 Topographic Map (1:250000), showing past forest condition (1955) along Gola River (http://www.lib.utexas.edu/maps/ams/india/nh-44-10.jpg)

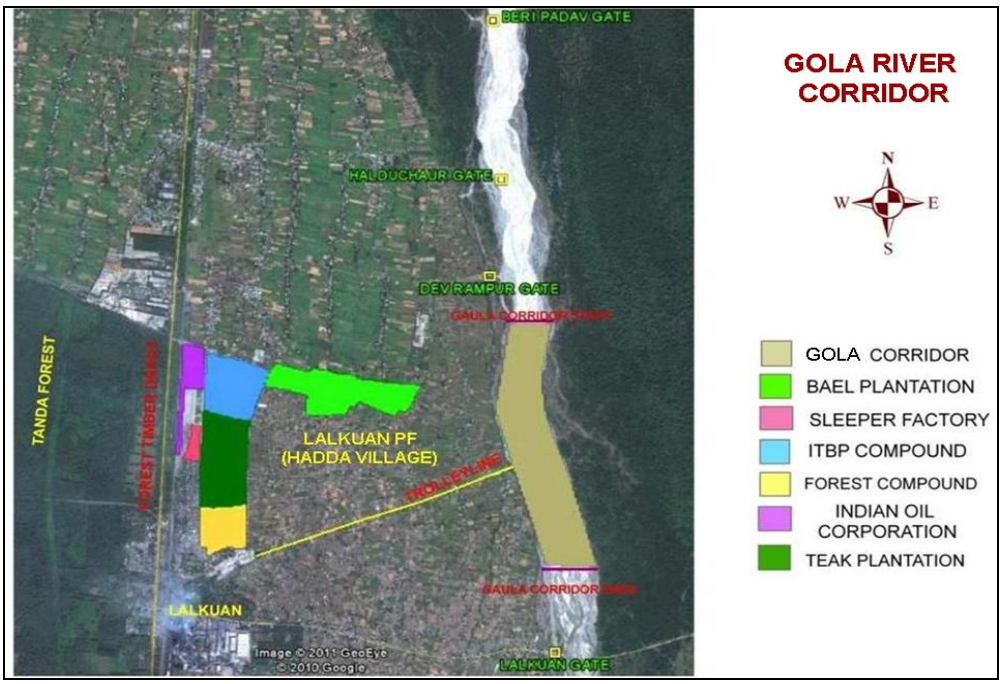


Fig. 3.9 Closer view of Gola River corridor

In 2008, the Uttarakhand Forest Department gave 13.76 ha of reserve forest in the corridor to the ITBP (Figure 3.8). The IOC depot has a 15 ft high wall that encircles the oil storage complex for almost a kilometer and acts as a barrier for animal movement. The tankers of IOC also add up to the heavy trafficked Haldwani-Bareilly road.

During the survey in the corridor stretch on the river, we recorded pugmark of leopard, scats of leopard and tracks of Sambar in few locations. Tracks of Jackal and pellets of Nilgai were recorded all through the stretch. Wild pig signs were also found in a few places. There were evidences of erosion damaging the riverbank, but no report of flood getting into cropland and habitations of the people. We also observed that river-training measures (spurs) were being implemented to arrest further erosion in this particular stretch. As given in the preceding section on Impact on Wildlife Value, the wildlife values were found on either side of the corridor, including the evidences of Elephants, Leopard, Sambar, etc.

### *3.3.8 Possible impacts of non-mining*

Riverbed of Gola River had a width from 200 to 400 m. River channel was somewhat braided with a channel width from 10 to 25 m. There was no sign of expansion of river channel beyond 50m, not even in monsoon season. River did not have much water during survey period and water depth was 1-2 feet except places where mining had caused deep channel. Both the banks were some 8-10 feet high from the riverbed, at very few points it was less than 4 feet. Water was flowing in the channels made due to mining activity except in the corridor area where it was flowing in 2-3 channels not far from bank (eastern bank).

There was no sign of erosion of banks caused due to water in the corridor area, thus it indicates non-mining does not have any ill effect. However, as the river was not monitored for a longer period during rainy days, it could not be ascertained whether it will cause any flood in the nearby areas.

## 3.4 Wildlife value of Tanda Forest

Surveys conducted in the Tanda forest range (Terai Central Forest) showed good signs of wildlife indicating movement of elephant and large carnivore in the area. Hoof mark and fresh dung of elephant was encountered at many places. Other ungulate signs encountered

include that of Chital, Sambar, Nilgai, Langur and Wild pig. Scats of Leopard and Jackal were also found.

### 3.5 Conclusions

The study looked into the specifics of the terms of reference, and based on the study and other relevant details from secondary sources, it was possible to conclude as below:

The adjoining forests along Gola River (Beat no. 3 and no. 4) have significant wildlife values, and it also has a wildlife corridor (Gola River Corridor). Large mammals such as large herbivores, carnivores and their prey species continue to occupy the habitats and were observed to venture closer to the river stretch.

The 2.5 km stretch of river designated as Gola River Corridor is used by wild animals including leopard, and the major prey species. Similar observation has also been made by WWF-India. Opportunity still exists for movement of elephants and tigers if other disturbance factors are removed.

Current level of mining activity along the 29 km stretch is extensive. The river course is deeply excavated (above the prescribed limit), potentially causing erosion, and from wildlife point of view, the loss of habitat along the river stretch.

There was no evidence to suggest that non-mining would affect the corridor area. On the contrary, extensive erosions were observed in the area where mining is substantial. However, this assessment did not delve into impact on the river geometry and erosion issues in detail, since it was beyond the scope of expertise available in WII.

Tanda forest has significant wildlife value as evident from the signs of elephant in the area. If sleeper factory, IOC and ITBP establishment and human settlement are removed, this corridor is likely to be functional again allowing the movement of elephant between Terai East and Terai Central Forest Divisions.

In view of the above observations the status-quo of the 2.5 km non mined area designated as Gola River corridor needs to be maintained. The stretch needs to be monitored for future positive (increased wildlife use) and negative events (flood and erosion).

The mining in the rest of the stretch needs to be regulated so as not to compromise with the prescribed limit. Considering the fact that collection of RBM from the river bed coupled with river training has deepened the river bed to more than 5 m, it is suggested to review the quantity of RBM to be extracted each year. Narrowing down the river channel may increase the rate of erosion in the upper catchment and all along the river bank and might cause extreme flood downstream of the mining areas. The loss of RBM from the river bed is likely to further reduce the ground water infiltration rate.

Knowing that around 6,416 registered and an equal number of unregistered labourers settle in the area during the mining season and the quantity of fuelwood provided to them by the Forest Department for their daily needs is inadequate, illegal extraction of biomass from the adjoining forests is quite obvious. Therefore, it is suggested that the Department should ensure provision of adequate fuelwood on regular basis until an arrangement is made to supply alternatives to fuelwood. It is proposed that each gate should have labour sheds with adequate compartments to house the labours and basic amenities like drinking water, bathroom and toilet facilities. Communal boarding system needs to be introduced. It should be ensured that no hutments or camps are constructed on the left bank of the river so that access to forests is restricted.

As the Reserve Forests of the Gola Range on the left bank is in continuity with the Dauli, Kishanpur and Nandhaur Reserve Forests the entire forest tract should be declared as Conservation Reserve.

# CHAPTER 4
# SHARDA RIVER

## 4.1 Background

The Sharda River originates in the Champawat District of Uttarakhand. It flows through the foothills in the Haldwani Forest Division of Western Circle of Uttarakhand Forest. The mining area is in Champawat District and the area allotted for the purpose is 384.69 ha which falls under Tehsil Purnagiri (Tanakpur), District Champawat, Uttarakhand. The collection of minor-minerals is carried out from 50% of the total area (192.345 ha) leaving 25% area on each side of the river banks for better channelization of the water during the rainy season and to protect the nearby forest land and habitant from floods.

The proposed area is situated in Tarai and *Bhabar* area of East Tarai Forest Division and Haldwani Forest Division in Nainital District of Uttarakhand. Geographically, the site lies between 29° 5'56.03" N and 29° 4'45.49" and 80° 8'12.47" E and 80° 7'10.85"E which comes under the toposheet 62C/4. The Barrage which is situated across the river Sharda is 109 m long, the river bed is 250 m above sea level .

The extraction site was selected on the basis of maximum debris deposition. It has been proposed to collect approximately 12.0 lac cu. m. or 21.6 lac tons of riverbed material annually.

## 4.2 Approach

We assessed the wildlife value of the area 500 m downstream to the Tanakpur Barrage. We have not evaluated any mining activities above the Barrage. As per WWF-India (2011) mining used to be done in the area above the Barrage. Mining parallel to the Tanakpur town adjacent to the Boom-Bhramdev corridor in past has affected the existence of small islands above the Tanakpur Barrage which were once habitat for tiger and elephants, particularly between Boom to Bhramdev (WWF-India, 2011).

At the site lower to the Barrage, three transects of 2 km length were sampled systematically, perpendicular to the river course, at an interval of 1 km, 300 m away from the eastern river bank along the mining area to assess the wildlife population status. NHPC canal and public

transport road is along the western bank of the river, therefore, no transects could be sampled on this side.

## 4.3 Observations

### *4.3.1 Status of mining and river morphology*

In the 12 km river stretch, sand/boulder mining is being carried out downstream the NHPC on both eastern and western bank. Two gates, one in the eastern and another on western banks are used for mining activity. No mining activity is undertaken during the monsoon season, to allow the riverbed material to be replenished during the monsoon season every year. There are places in the mining area, where the river width has expanded beyond the spurs and this is leading to enhanced erosion of the riverbanks, as well as loss of structures like military camps and human settlements. To manage the flow, at many places, small banks are being constructed and precautions are taken during monsoons.

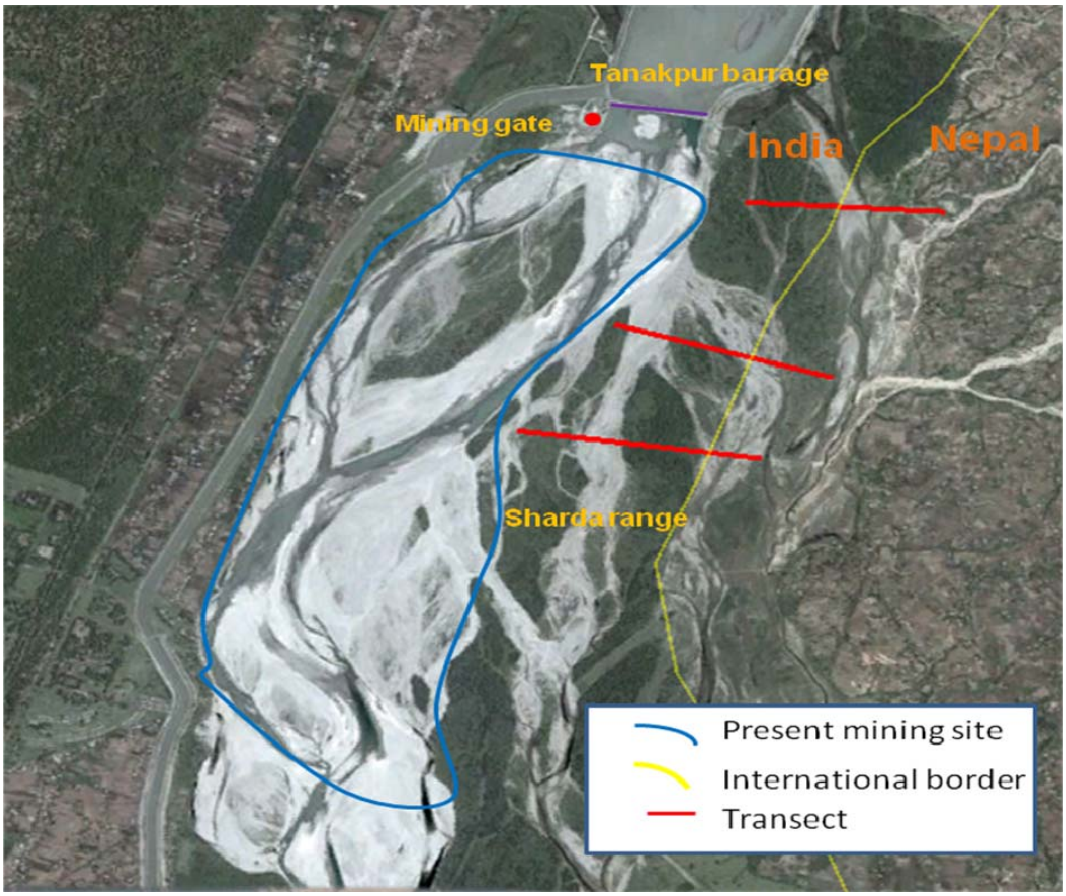


Fig. 4.1 Sharda River mining site

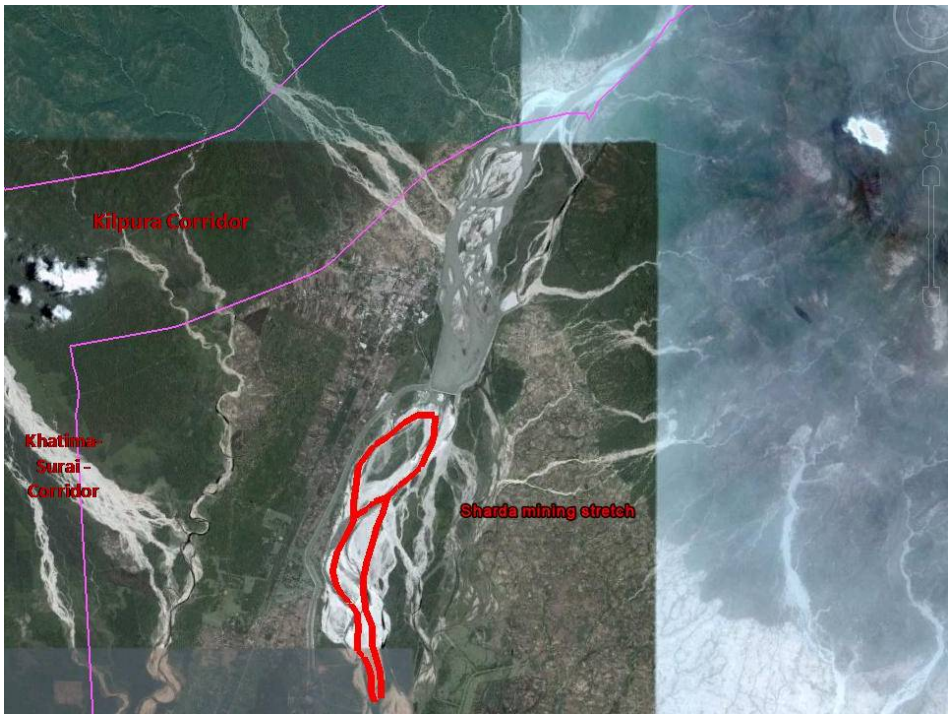


Fig. 4.2 The area inside the pink line shows both the Khatima-Surai corridor (going to the south) and the Kilpura Corridor (going to the east), both these corridors are important corridor areas for elephant and tiger (Source: Jhala *et a.l* 2011).

Plate 4.1 Barrage on Sharda River

### *4.3.2 Forest structure*

The study area was dominated by *Dalbergia sissoo* (IVI 147.7) followed by *Holoptelia integrifolia* (IVI 66.9) and *Acacia catechu* (IVI 52.4). A total of 4 tree species were recorded in the region. The total tree density of the study area across the distance gradient ranged from 53.01-413.5 trees $ha^{-1}$ with an average density of 294.24 trees $ha^{-1}$. The maximum density was contributed by *D. sissoo* (201.5trees $ha^{-1}$) followed by *A. catechu* (61 trees $ha^{-1}$), *T. nudiflora* (21 trees $ha^{-1}$) and *H. integrifolia* (11 trees $ha^{-1}$). Overall, total basal area of the study site was 10 $m^2$ $ha^{-1}$, of which *H. integrifolia* contributed maximum TBA (6.13 $m^2$ $ha^{-1}$) with lowest tree density (10.6 trees $ha^{-1}$), this indicates area has the higher girth class trees of *H. integrifolia.* Both *D. sissoo* and *A. catechu* showed lower girth class trees with high density and low TBA (2.8 $m^2$ $ha^{-1}$ and 0.24 $m^2$ $ha^{-1}$, respectively). The region had plantation of both *D. sissoo* and *A. catechu,* and low girth class trees indicate recent plantation.

Across the gradient of distance based on the Importance Value Index (IVI) the forest communities in the study area are as follows:

| | |
|---|---|
| 0-400 m | *D. Sissoo -A. catechu* |
| 400-800 m | *D. sissoo- H. integrifolia* |
| 800-1200 m | *D. sissoo-A. catechu* |
| 1200-1600 m | *D. sissoo- T. nudiflora* |

Table 4.1 Species composition (density, total basal area and IVI) of study area forest.

| **Species** | **Density (Trees $ha^{-1}$)** | **TBA (m2 ha-1)** | **IVI (IVI)** |
|---|---|---|---|
| *Accacia catechu* | 60.97 | 0.25 | 52.43 |
| *Dalbergia sissoo* | 201.46 | 2.81 | 147.73 |
| *Holoptelea integrifolia* | 10.60 | 6.13 | 66.93 |
| *Trewia nudiflora* | 21.21 | 1.49 | 32.91 |
| **Total** | **294.24** | **10.67** | **300** |

The total tree density and TBA showed a decreasing trend across the distance gradient and was maximum between 400-800 m. The area mainly falls on islands formed along the eastern bank of river during the change of river course and forest department has done plantation in

the area. The reason for high TBA is presence of *H. integrifolia* trees with high girth class in the area.

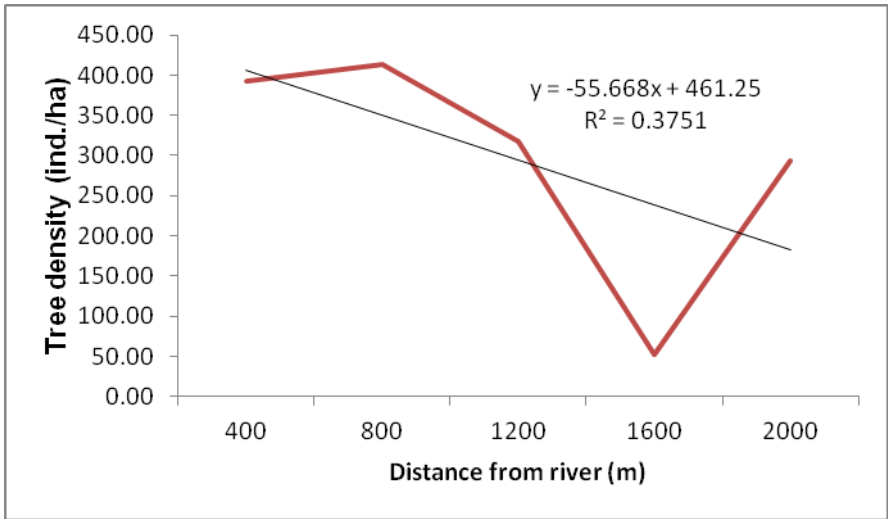


Fig. 4.3 (a). Trends in tree density across the distance gradient

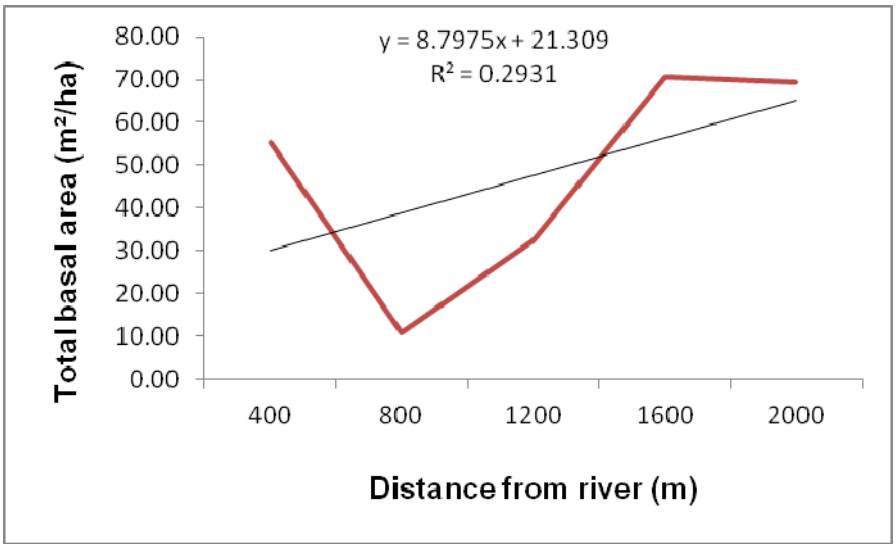


Fig. 4.3 (b). Trends in total basal area across the distance gradient

*4.3.3 Shrub abundance, tree regeneration and weed invasion*

Among shrubs, *Lantana camara* followed by *Murraya koenigii* and *Cassia tora* had maximum abundance after 800 m, while the saplings of *Zyzyphus* and *Dalbergia* showed abundance near the river course up to a distance of 800m, supporting the fact that regeneration has occurred.

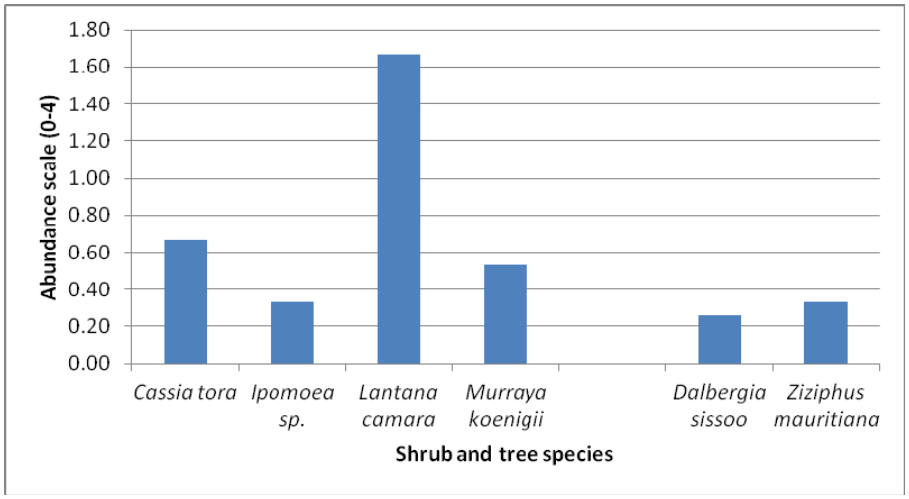


Fig. 4.4 Shrub and tree saplings abundance on a scale of 0-4 (<25% of cover =1, 26-50%=2, 51-75%=3, >76% of cover =4)

*Lantana camara* was most abundant weed followed by *Cassia tora*. Graph does not show any significant trend except for *L. camara.* Percent cover for this species is increased towards the end of the transect.

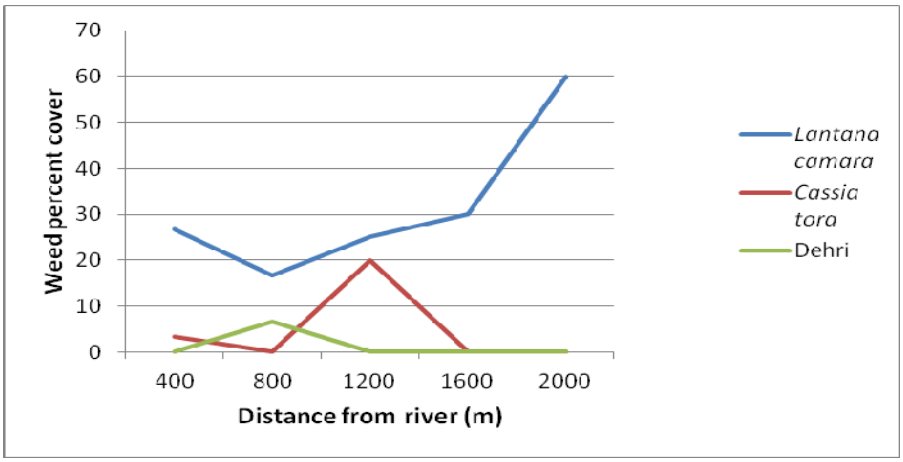


Fig. 4.5 Trends in weed percent cover across the distance gradient

### *4.3.4 Status of ground layer*

All the parameters (dry grass, green grass, herb, weeds, bare ground and dry leaf litter) recorded for the entire study area did not show any particular trend but some parameters were showing higher values in the middle part and lower values near the bank or near the human settlement at the end of transects.

### *4.3.5 Assessment of anthropogenic pressure*

The overall anthropogenic pressure decreased with increase in distance from the river bed in the study area (Fig. 4.5). The area didn't have much natural vegetation and supports less natural trees. As mentioned earlier area from 400-800 m had good girth class trees and good forest patch. This could be the reason for more disturbances at a distance of 400-800 m, compared to the later part of transect with plantation.

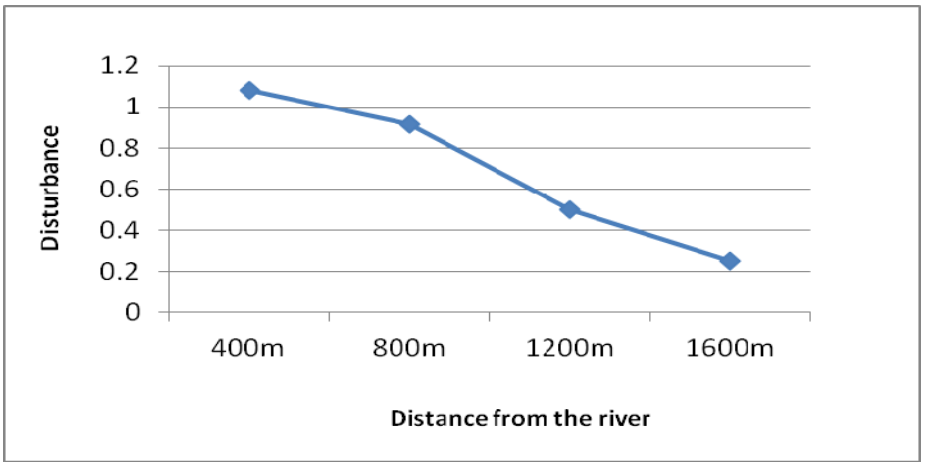


Fig. 4.6 Anthropogenic pressures on a scale of 0-4

### *4.3.6 Wild animal signs*

Presence of only two species of herbivores viz. chital and Indian hare was observed in the Sharda range, adjoining areas of interest. The encounter rate of pellet was 1.12 pellets/km for chital and 0.29 pellets/km for hare. Scats of Jackal were found in the area near human habitation. No other carnivore signs were encountered in this forest patch during the study period. This indicates that this area does not have any conservation significance with regard to wildlife values.

### *4.3.7 Possible impacts of non-mining*

Sharda River is a highly braided system near Tanakpur with many temporary and permanent islands. River had two main channels with a width from 60-120 m. Riverbed was very wide going upto 1.8 km (between two banks with islands in-between). River has caused damage to nearby human settlements and military establishment in the recent past and has gone beyond the spurs (informal talks with locals).

Plate 4.2 Damaged caused to spurs and erosion due to flood in Sharda River

## 4.4 Conclusions

The vegetation of the eastern bank of the Sharda River downstream to the Tanakpur Barrage is mostly *Dalbergia sissoo* and *Accacia catechu* plantation. The study indicates that the wildlife value of this area in terms of conservation significance is low. Thus, th**e** extraction of RBM from Sharda River site can be permitted downstream to the Tanakpur Barrage subject to the guidelines issued by MoEF Vide letter No. 8-61/1999-FC dated 9th February 2010, letter no. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011 as applicable to this site. Mining at the north of Tanakpur Barrage closer to Kiroda Nullah should not be allowed as the extension of mining areas will have negative impacts on this corridor.

While mining, laborers should not be allowed to stay near the river bank or nearby forests to prevent extraction of forest products and minimize disturbance. Permission to mine should be reviewed every three years by an appropriate committee to monitor if there is any adverse impact on the environment.

# CHAPTER 5
# DABKA RIVER

## 5.1 Background

The Dabka River is a tributary of Kosi arising out of Koshimool near Kausani and flows on the western side of the district Nainital. Extraction of minor minerals is proposed from the bed of the Dabka River along a stretch of 11 km. The total available area of this stretch is 223 ha, which falls under the Tarai West Forest Division, District Nainital, Uttarakhand. The aforesaid area has reserved forest regions on the west bank.

The collection of minor-minerals will be carried out from 50% of the total area (111.5 ha) leaving 25% area on each side of the river banks for better channelization of the water during the rainy season and to protect the nearby forest land and habitants from floods. The proposed extraction would be 8.49 lakh $m^3$ or 15.28 lakh tonnes per annum of riverbed material. The mining is confined to extraction of river bed mateials. The operation will be manual in which the riverbed material will be collected in its existing form. Sand and boulders will be collected by sieving of riverbed material. Mining will be carried out only upto a depth of 1.5m, therefore only hand tools like shovel, pan, etc. will be used. Extraction of riverbed material will be completely stopped during the monsoon season.

## 5.2 Approach

Six transects, two km in length were laid perpendicular to the river 300m away from the bank for the data collection regarding wildlife values, vegetation and disturbance levels. Among these, three transects were laid in the forest area adjacent to the Dabka River bed where mining is presently going on in the south of Dabka Bridge. The remaining three transects were laid in the forest area adjacent to the Dabka River bed where mining is proposed in north of Dabka Bridge. The sampling of two different sites was done to get an idea of the impact of RBM collection on the wildlife values of the area. The data collection was done twice, once during May 2011 and then in July 2011 to assess the variations in the above mentioned parameters during summer and monsoon seasons.

## 5.3 Observations

### *5.3.1 Status of mining and river morphology*

The total available area of this stretch is 223 ha out of which collection of minor-minerals will be carried out from 111.5 ha (50%). Presently mining is being carried out along a stretch of 11 km. The mining depth was seen to range between 2 m to 15 m and was carried out in middle, though considerable digging was seen beyond permissible boundaries.

It was seen that in the mining site the main water channel kept mostly to the middle of the river bed because of the extraction of RBM. On the other hand, in the non-mining site the river flow had been divided in to three sub-channels since here the deposition of boulders and pebbles did not allow the river to flow in a single main stream. Thus it is evident that during monsoons the water would spread over a larger area in the non-mined site than in the mined one.

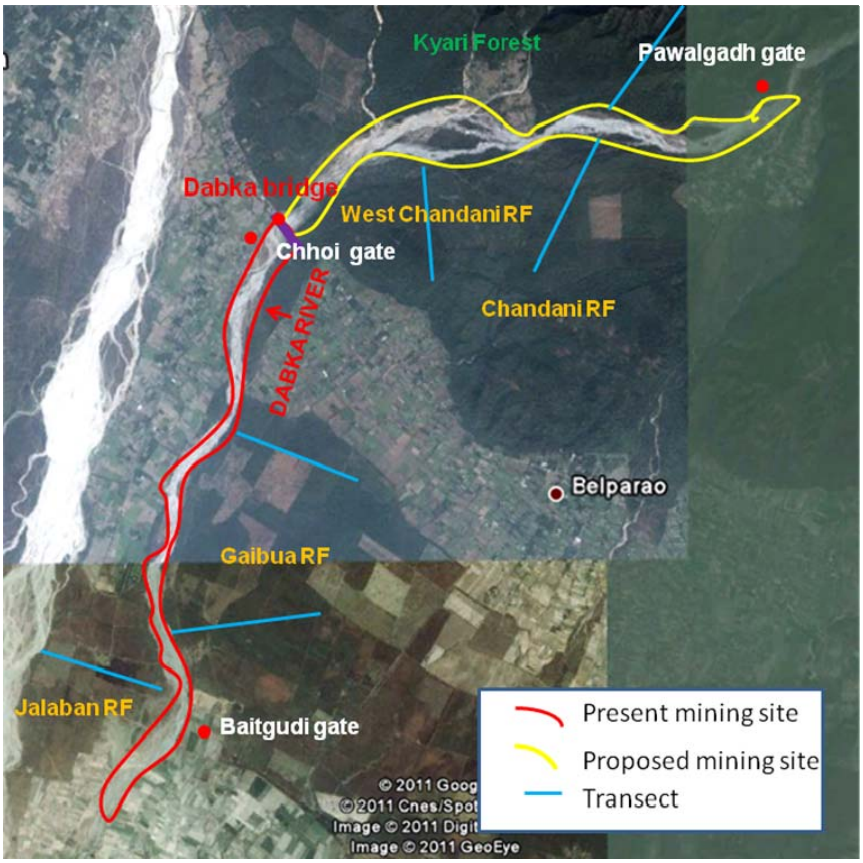


Fig. 5.1 Dabka River mining site

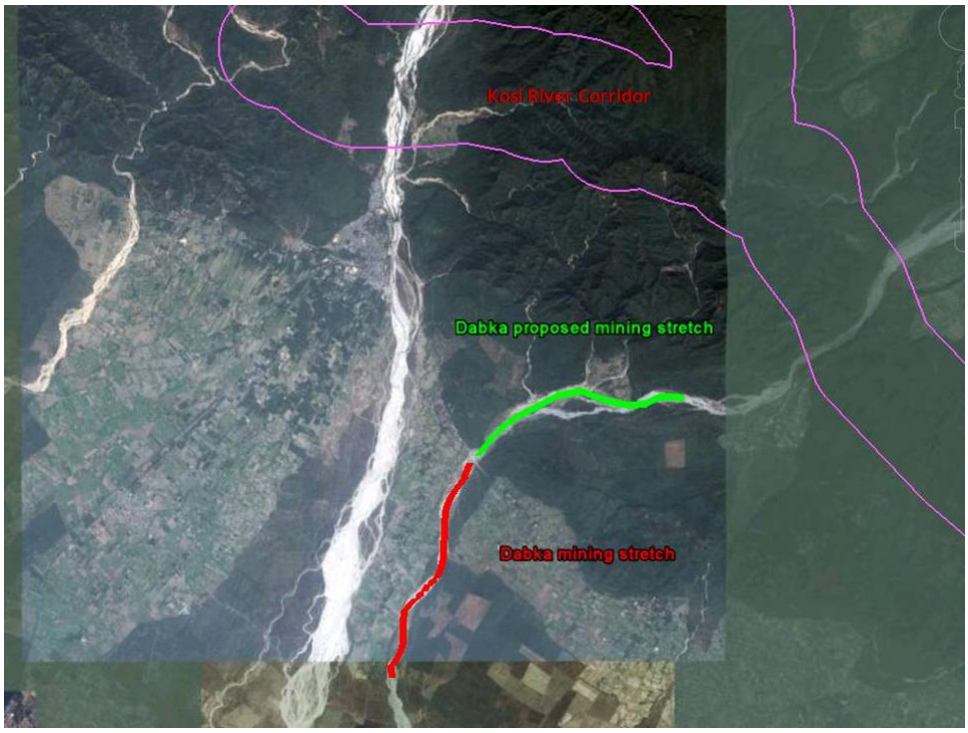


Fig. 5.2 The area inside the pink lines shows the Kosi corridor which passes through dabka and is important for the movement of tiger and elephant.
(Source: Jhala et al., 2011).

Plate 5.1 Forest along the bank of Dabka River (proposed mining site)

*5.3.2 Forest structure*

A total of 28 species of trees were recorded from forests of the both mining and proposed mining sites. Average tree density in the study area was 293 trees $ha^{-1}$ with the highest density shown by *T. grandis* (98.61 trees $ha^{-1}$) followed by *M. philippensis* (43.47 trees $ha^{-1}$), *S. robusta* (26.51 trees $ha^{-1}$) and *H. integrifolia* (21.2 trees $ha^{-1}$). Most dominant species in the area was *T. grandis* (IVI 58.9) followed by *S. robusta* (IVI 41) and *M. philippensis* (IVI 30.3). The total basal area was highest for Sal (5.46 $m^2$ $ha^{-1}$) followed by Teak (2.79 $m^2$ $ha^{-1}$).

Table 5.1 Species composition (density, total basal area and IVI) of study area forest

| **Species** | **Density (Trees $ha^{-1}$)** | **TBA ($m^2$ $ha^{-1}$)** | **IVI** |
|---|---|---|---|
| *Acacia catechu* | 7.42 | 0.51 | 9.29 |
| *Adina cordifolia* | 3.18 | 0.03 | 3.35 |
| *Aegle marmelos* | 4.24 | 0.17 | 6.55 |
| *Ailanthus excelsa* | 1.06 | 0.08 | 1.80 |
| *Anogeisus latifolia* | 8.48 | 0.18 | 5.88 |
| Banda | 6.36 | 0.08 | 5.76 |
| *Bombex ceiba* | 2.12 | 2.34 | 14.30 |
| *Cassia fistula* | 10.60 | 0.32 | 11.54 |
| *Diospyros melanoxylon* | 4.24 | 0.11 | 4.13 |
| *Eucalyptus globulus* | 13.78 | 1.50 | 17.33 |
| *Ficus religiosa* | 1.06 | 0.31 | 2.97 |
| *Ficus sp.* | 1.06 | 0.09 | 1.84 |
| *Holoptelia integrifolia* | 21.21 | 2.45 | 26.68 |
| Kathbaira | 1.06 | 0.06 | 1.70 |
| Khatisa | 1.06 | 0.19 | 2.37 |
| *Ehretia levis* | 7.42 | 0.35 | 7.44 |
| Kodu | 2.12 | 0.02 | 2.96 |
| Kuda | 6.36 | 0.21 | 9.57 |
| *Lannea coromandelica* | 7.42 | 1.36 | 15.55 |

| | | | |
|---|---|---|---|
| *Mallotus philippensis* | 43.47 | 0.99 | 30.27 |
| *Melia azadirach* | 3.18 | 0.07 | 3.56 |
| *Moringa oleifera* | 1.06 | 0.12 | 2.04 |
| *Shorea robusta* | 26.51 | 5.46 | 41.06 |
| *Syzigium cumini* | 1.06 | 0.15 | 2.14 |
| *Tectona grandis* | 98.61 | 2.79 | 58.94 |
| *Terminalia sp.* | 1.06 | 0.03 | 1.58 |
| *Trewia nudiflora* | 7.42 | 0.38 | 7.57 |
| *Ziziphus mauritiana* | 1.06 | 0.08 | 1.83 |

A total of 21 tree species were recorded from the forests along the mining site with a density of 337 trees ha$^{-1}$, of which the highest density shown by *T. grandis* (138 tree ha$^{-1}$) followed by *M. philippensis* (49 trees ha$^{-1}$), *Eucalyptus* sp. (28 trees ha$^{-1}$). Species with highest girth class were *B. ceiba* (14- 56 m² ha$^{-1}$) and *H. integrifolia* (2- 16 m² ha$^{-1}$). Across the gradient of distance, based on the Importance Value Index (IVI) the forest communities in the forest site were:

| | |
|---|---|
| 0-400 m | *T. grandis* and *Eucalyptus* (on opposite bank) |
| 400-800 m | *T. grandis- M. philippensis-Eucalyptus* |
| 800-1200 m | *T. grandis* |
| 1200-1600 m | *H. integrifolia- B. cieba- M. philippensis* |
| 1600-2000 m | *M. philippensis- Ehretia levis* |

Nineteen tree species were recorded from the forests along the proposed mining site (north of Dabka Bridge) with a density ranging from 159 trees ha$^{-1}$to 390 trees ha$^{-1}$. Most dominant species in the area was *S. robusta* (IVI 84.29) followed by *T. grandis* (IVI 45), *L. coromandelica* (IVI 31) and *H. integrifolia* (IVI 27). The highest density of trees was shown by *T. grandis* (59 trees ha$^{-1}$) followed by *S. robusta* (53 trees ha$^{-1}$) and *M. philippensis* (38 trees ha$^{-1}$). Species with highest girth class was *S. robusta* (16 m² ha$^{-1}$) and *H. integrifolia* (4 m² ha$^{-1}$). Across the gradient of distance, based on the Importance Value Index (IVI) the forest communities in the area were as follows:

| | |
|---|---|
| 0-400 m | *L. coromandelica- H. integrifolia and A. cordifolia* (opposite banks) |
| 400-800 m | *L. coromandelica- T. grandis* |
| 800-1200 m | *T. grandis - Kuda and M. philippensis - - S. robusta* (opposite banks) |
| 1200-1600 m | *L. coromandelica - T. grandis and S. robusta - H. integrifolia* (opposite banks) |
| 1600-2000 m | *M. philippensis - S. robusta - L. coromandelica* |

Fig. 5.3 shows no significant trend in tree density and TBA. For proposed mining site (north to Dabka Bridge), tree density and total basal area increased with distance as we go far from riverbed.

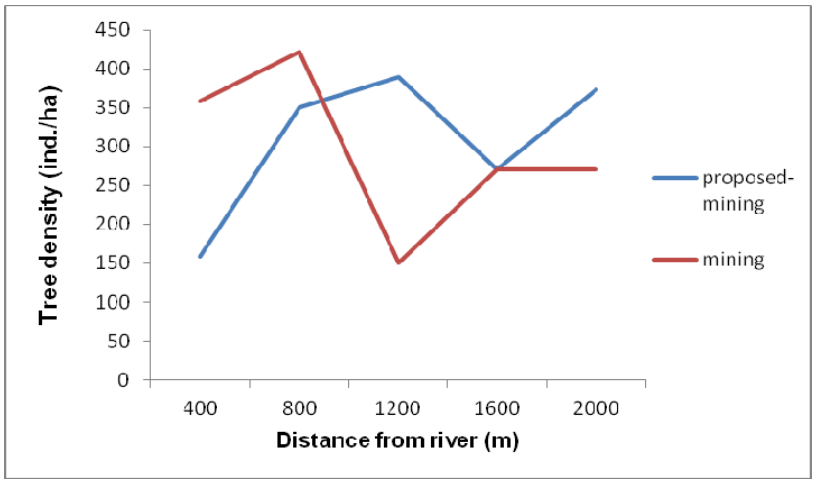


Fig. 5.3(a) Trends in tree density across the distance gradient

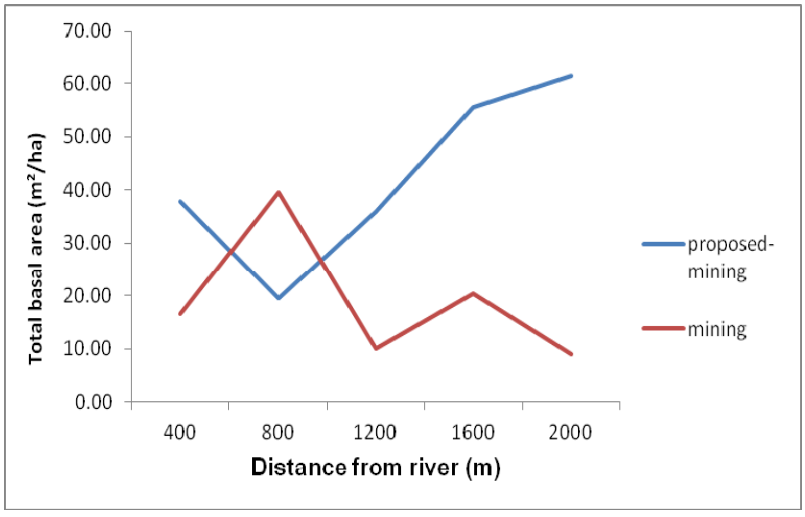


Fig. 5.3(b) Trends in Total basal area across the distance gradient

### *5.3.3 Shrub Abundance, tree regeneration and weed invasion*

In the site south to Dabka Bridge, *Eupatorium adenophorum* was the most abundant shrub species. Along with *Eupatorium adenophorum*, *Lantana camara* also had a consistent distribution along the distance gradient from the riverbed. Among others, *M. koenigii* was present in the plots near the riverbank, whereas *Salvadora persica* was found to be present in the far away plots. Among saplings of trees, *Tectona grandis* and *Mallotus philipensis* were found.

In site north to Dabka Bridge, *Lantana camara* was the most abundant shrub and it had a consistent distribution throughout the site. *M. koenigii* was the other shrub, which had a consistent distribution in the area. Other shrubs that had a small distribution in the area were *Tagetes patula* and *Cassia tora.* The area also had saplings of *Tectona grandis, Mallotus philipensis* and *Cassia fistula*.

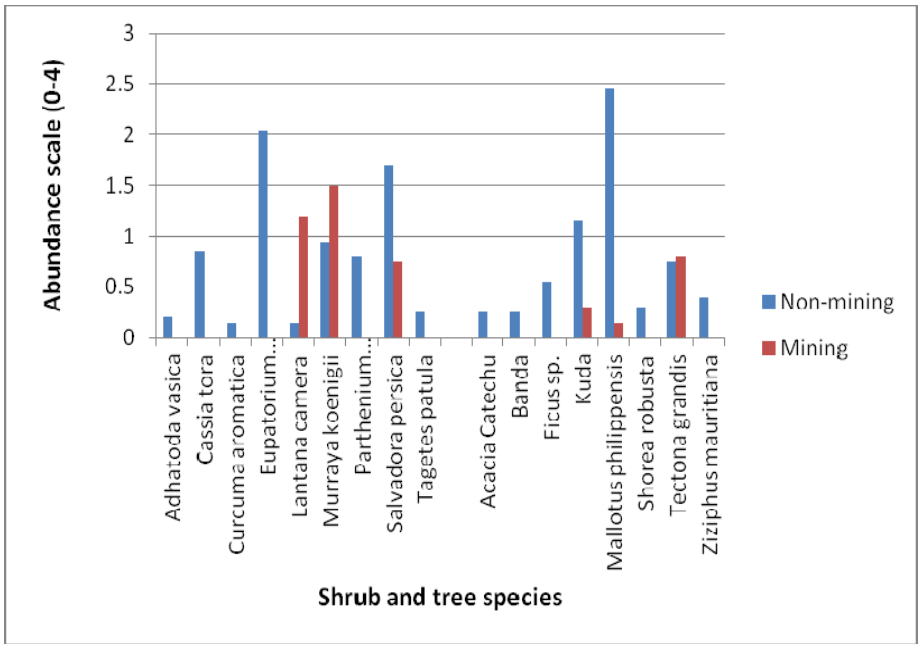


Fig. 5.4 Shrub abundance on a scale of 0-44 (<25% of cover =1, 26-50%=2, 51-75%=3, >76% of cover =4)

Weed species in the study area were *Lantana camara* and *Parthenium hysterophorus.* The highest percentage was shown by *Lantana camara*. Proposed mining site (north to Dabka Bridge) had comparatively less weed cover than that of mining site.

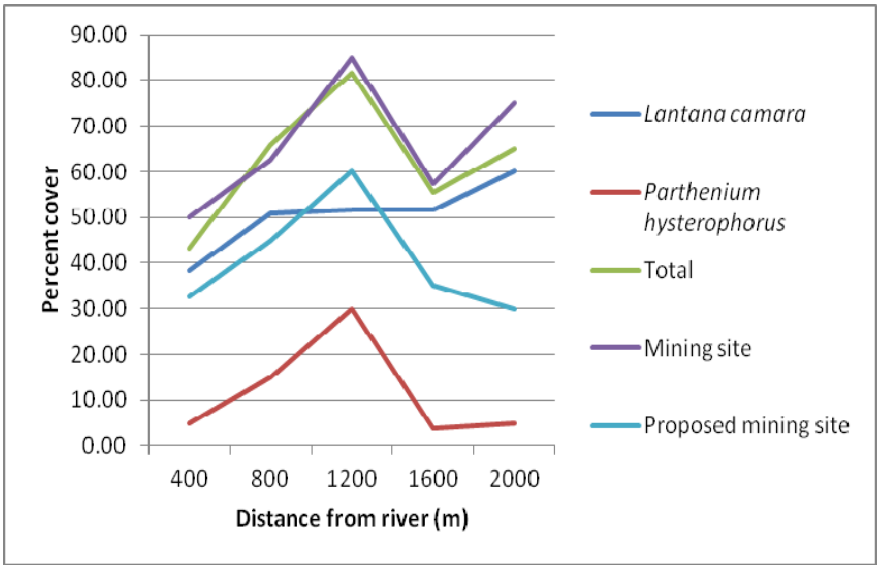


Fig. 5.5 Trends in weed percent cover along the distance gradient

### *5.3.4 Status of ground layer*

Herbs dominated the ground layer in the site south of Dabka Bridge. The presence of weeds and green grass was also substantial. In site north to dabka bridge, weeds had a higher distribution followed by green grass and herbs. The high percent cover of weeds (value) indicates the influence of anthropogenic activities like collection of firewood, livestock grazing, etc.

### *5.3.5 Assessment of anthropogenic pressure*

The data on anthropogenic pressure shows that the site south of Dabka Bridge is highly disturbed during the mining season since there are lot of laborers working in the area, which depend on the forest for resources like firewood. The other factors, which are common causes of disturbance in both sites are wood cutting, lopping and cattle grazing by the villagers living in the vicinity of the area. The data collected during monsoon season (non mining season) shows that the level of disturbance in both the sites was very low in this season.

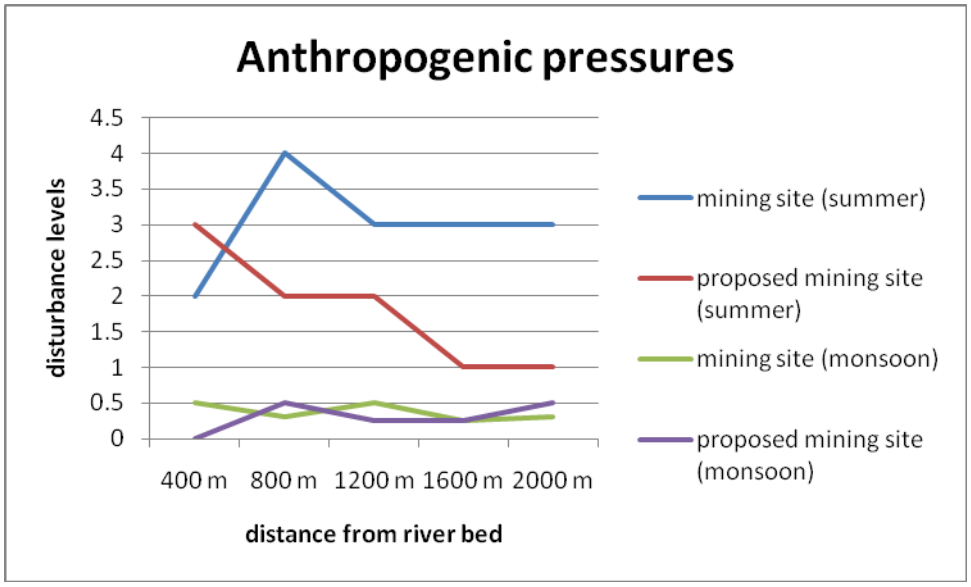


Fig. 5.5 Anthropogenic pressures on a scale of 0-4 (S- summer and M- monsoon season)

### *5.3.6 Wild animal signs*

At the study site south to dabka bridge, five species of ungulates were recorded during both the seasons. The signs of nilgai were encountered the most in this area during the mining season since it shows a positive relationship with disturbed areas whereas chital had the highest encounter rate at the site north to dabka bridge. During monsoon season the encounter rate of ungulates was low in both the sites probably because of quick degradation of pellets, heavy undergrowth and more spaced out distribution of the animals. The dung of Elephant was encountered in both the seasons in site north to the Dabka Bridge. This indicates that since the site north to the Dabka Bridge is less disturbed and also since it has more of natural forest vegetation as opposed to high level of plantation in the site south of Dabka Bridge, large bodied mammals like elephant use this area for movement and foraging.

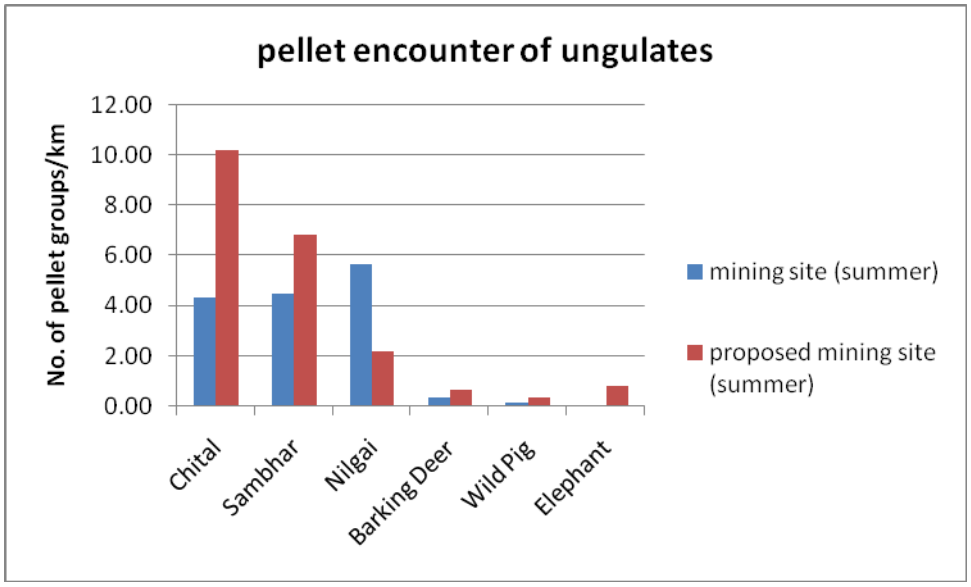


Fig. 5.6 Pellet encounter for ungulates

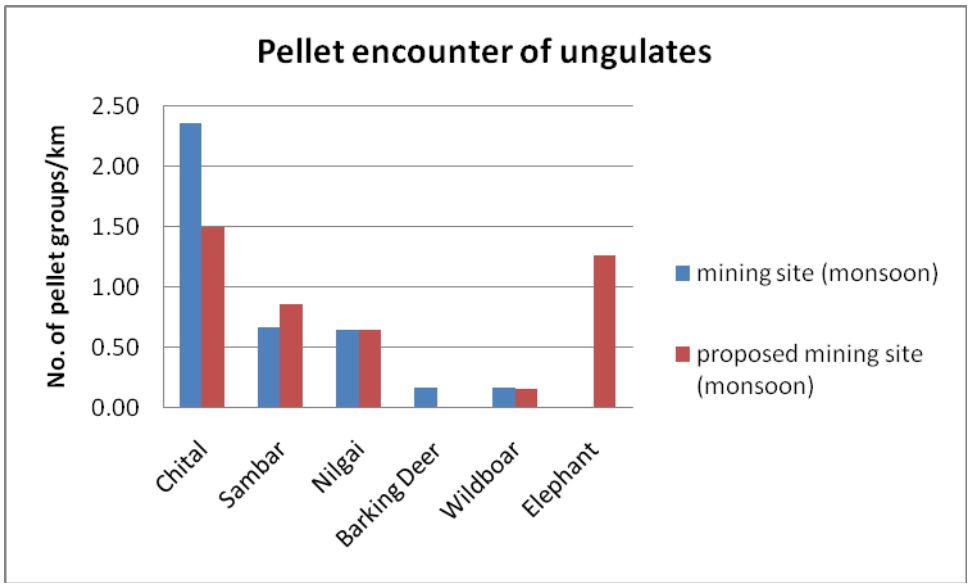


Fig. 5.7 Pellet encounter for ungulates

The Fig. 5.8 shows that on a whole in site south to the Dabka Bridge the ungulate signs show an increasing trend as we go away from the river bank suggesting that the presence of wild animals is negatively co-related to disturbance. In site north to the Dabka Bridge the ungulate signs are low in the plots near to the river bank because of disturbance but as the disturbance goes on decreasing along the distance gradient the ungulate signs increase and show a more or less consistent distribution for the rest of the plots.

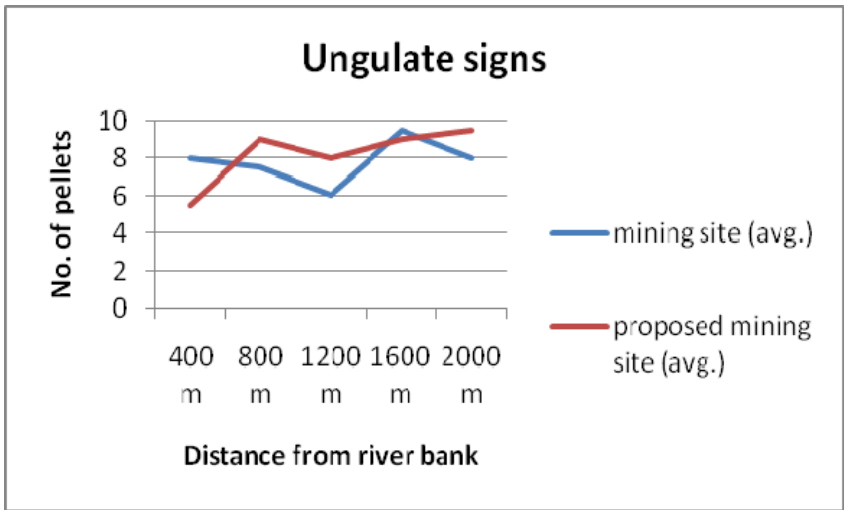


Fig. 5.8 Number of pellets of ungulates along the distance gradient

Among carnivores, leopard, smaller cats and jackal had a good distribution in the site south to the Dabka Bridge. It has been observed that these above mentioned carnivores can exist in areas with considerable amount of disturbance levels. On the other hand tiger being a large carnivore avoids areas with high disturbance; From the data it was concluded that there is a high presence of tiger signs in the less disturbed site north to the Dabka Bridge. This site is being used extensively by large mammals like tigers and elephants. This indicates better habitat conditions for wild animals in site north to the Dabka Bridge.

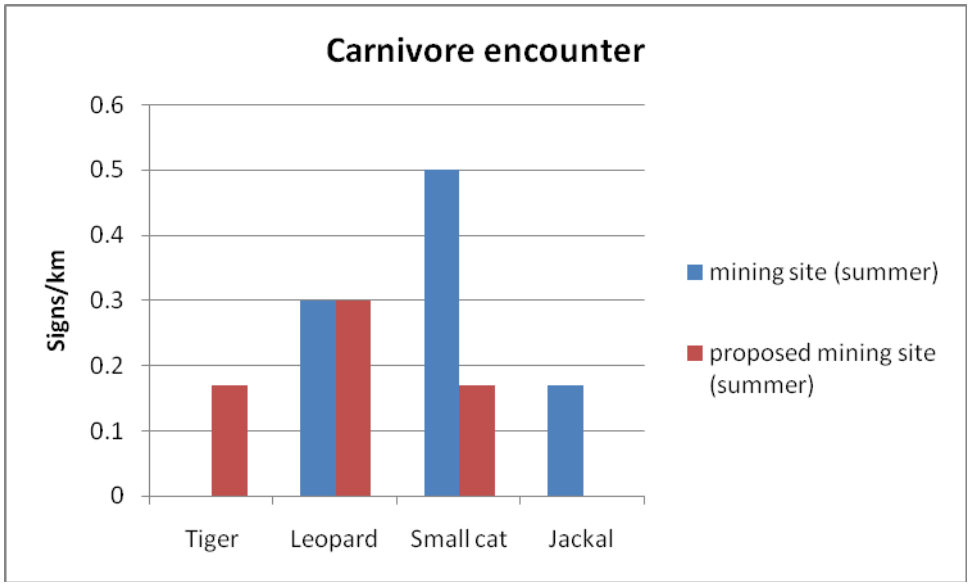


Fig. 5.9 Carnivore sign encounter

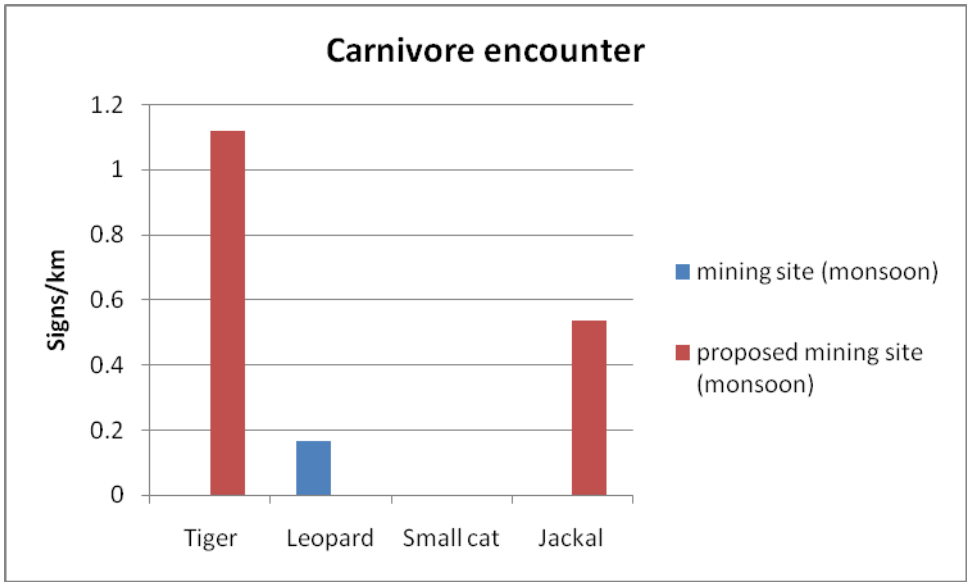


Fig. 5.10 Carnivore sign encounter

### *5.3.7 Possible impacts of non-mining*

The site where presently mining is going on in the Dabka River, the river flow was mainly confined to the middle of the river bed with a channel flow of less than 30 m. There are human settlements and cultivations near this site so non-mining in this site may cause the river waters to flood these areas but since this type of study was not under the scope of this survey no concrete conclusions can be made. In the proposed mining site in the Dabka (north to Dabka Bridge), the river bed was shallow and there were signs of water spreading and breaching of the river banks which is the characteristics of the rivers of *Bhabar* tract..

## 5.4 Conclusions

Along the Dabka River bed, two sites were surveyed, one where mining is presently going on (south to Dabka Bridge) and the other where mining is proposed (north to Dabka Bridge). It was observed that at the mining site, the presence of wild ungulates was considerable and it did show an increasing trend away from the river bed as the disturbance levels dropped. Thus, it showed a negative relationship with the disturbance levels. In the non-mining site, the presence of wild ungulates had a more consistent distribution.

The habitats adjoining the mining site are mostly plantation forests, whereas the non-mining site had a moist deciduous forest which is more conducive for wild animals. The presence of large mammals like tiger and elephant in the proposed mining area show that the habitat condition in this area is still suitable for the presence and movement of large bodied

mammals, whereas the absence of these animals from the mining area show that this habitat might have lost its conservation value in terms of large mammalian fauna. Tiger and elephant signs have been seen within 200 m of the Dabka Bridge which indicates that the Dabka River Corridor is functional from the Dabka Bridge till Dehchauri gate (WWF-India, 2011).

The proposed extraction of RBM from South of the Dabka Bridge may be allowed for mining subject to appropriate regulations with regard to depth of mining in this zone and guidelines issued by MoEF Vide letter No. 8-61/1999-FC dated 9th February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011 as applicable to this site

Mining activity North of the Dabka Bridge (upper catchment of Dabka) will have severe impact on the wildlife value of the area. This habitat connects the tiger population of Corbett Tiger Reserve to that of the Ramnagar forest division. The tiger population density in these two areas is very high and thus this habitat patch assumes a lot of conservation significance. Also this entire habitat patch enables the movement of tigers from Corbett TR and surrounding areas to the forests of Ramnagar and Haldwani division and up to Pilibhit forest division (Jhala et al. 2011). RBM extraction with respect to depth and lateral width along the river needs to be limited strictly to designated portions only. The entry and exit points would have to be the only way through which load is transferred. Presence of other unmapped entry and exit points needs to be checked as it would lead to undue disturbance along the protected forests.

# CHAPTER 6
# NIHAL RIVER

## 6.1 Background

The Nihal River originates from Sariya tal in District Nainital, Uttarankhand and flows through the Himalayan foothills near Kaladungi to Bhakda River in the Ramanagar Forest Division of Western Circle of Uttarakhand Forest Department. The total available area for proposed mining in the riverbed is 100 ha, which falls under Kaladungi Tehsil, District Nainital, Uttarakhand. It has been proposed that collection of minor-minerals will be carried out from 50% of the total area (50 ha) leaving 25% area on each side of the river banks for better channelization of the water during the rainy season. It has been proposed to collect approximately 4.3 lakh $m^3$ or 7.74 lakh tonnes of river bed material annually.

Sedimentation in this region over a very long period of time has led to widening of river, which poses threat to adjoining forest area, agricultural lands and settlements. Hence removal of River Bed Material from the centre portion of the bed is being proposed. The total available area for mining in the riverbed is 100 ha, which falls under Kaladungi Tehsil, District Nainital.

## 6.2 Approach

Three transects, two km in length were laid perpendicular to the river 300 m away from the bank for the data collection regarding wildlife values, vegetation and disturbance levels. The data collection was done twice, once during may 2011 and in July 2011 to assess the variations in the above mentioned parameters during summer and monsoon seasons.

## 6.3 Observations

### *6.3.1 Status of mining and river morphology*

The total available area for mining in the river bed is 100 ha, out of which collection of minor-minerals will be carried out from 50% of the total area (50 ha) leaving 25% area on each side of the river banks for better channelization of the water during the rainy season. Two gates will function during the mining activity, Nihal and Hanuman mandir gate. A

vehicle track connects Nihal reserve forest with Fatehpur reserve forest and is used by inhabitants of nearby areas for carrying sand and boulders in small trucks and trolleys.

The bed of Nihal River is strewn with pebbles and boulders which are brought down from the hills by the river water during monsoons. Due to the deposition of these materials, the water is likely to spread over a large area during monsoons when the amount of water in the river is high but seasonal flooding of the forests along a river/stream in the bhabar tract of Terai-Arc landscape is a natural phenomenon.

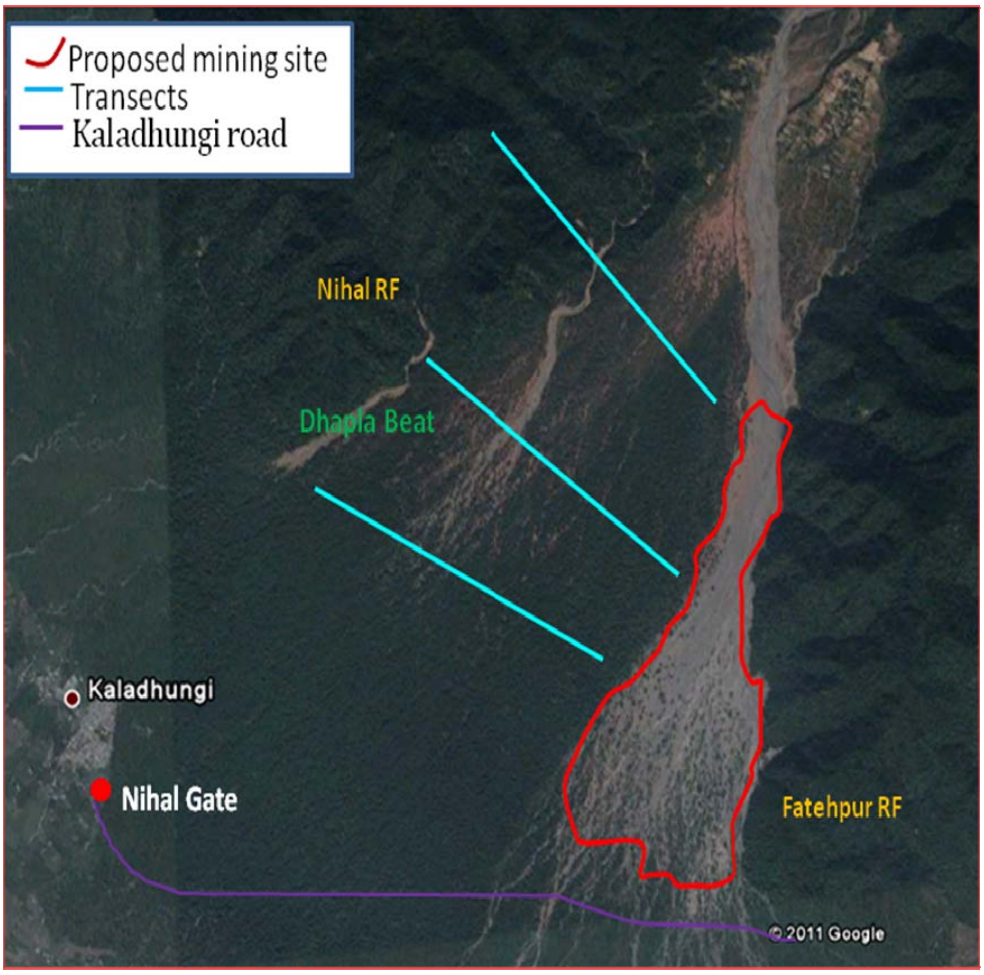


Fig. 6.1 Nihal River mining site

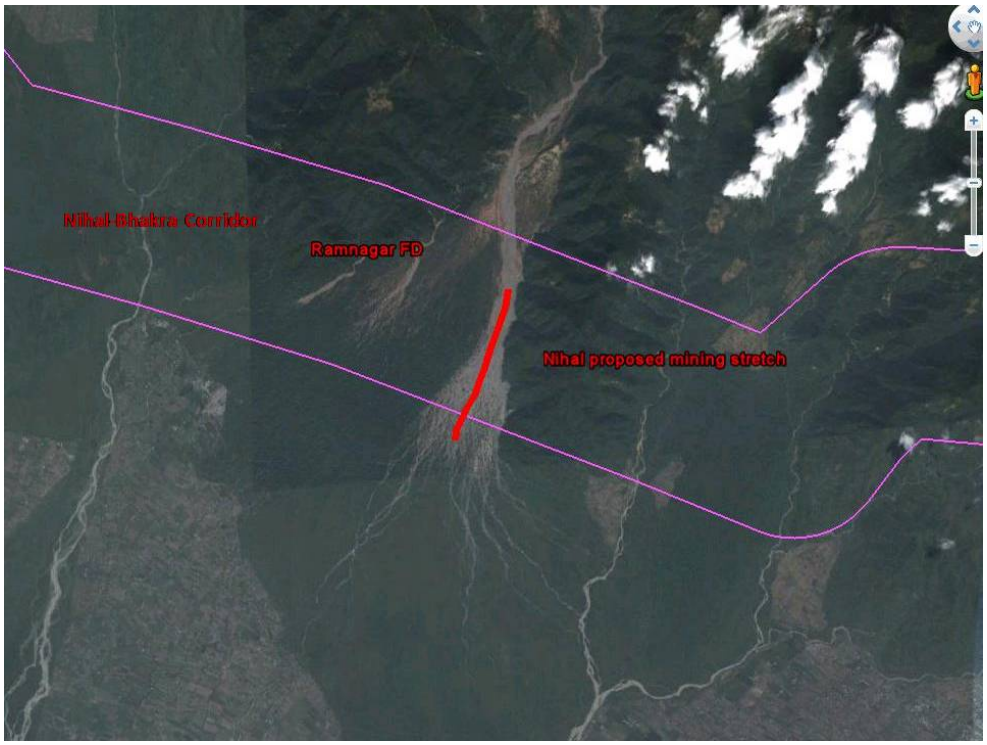


Fig. 6.2 The area inside the pink line shows the Nihal-Bhakra corridor which is important for tiger movement (Source: Jhala et al. 2011)

Plate 6.1 Nihal River bed

### *6.3.2 Forest structure*

A total of 15 plots were laid to assess the forest community of the study area. In all, 16 tree species were encountered. The density of trees in the entire study area across the gradient of distance ranged from 180-402 trees $ha^{-1}$ with an average density of 284 trees $ha^{-1}$. Similarly, the total basal area across the gradient of distance ranged from 10.8-70.6 $m^2$ $ha^{-1}$ with an average total basal area of 40 $m^2$ $ha^{-1}$. The Importance Value Index refers to the dominance of the species in a forest stand. In the study area *H. integrifolia* is the dominant species with maximum IVI value (89.92) followed by *Adina cordifolia* (43.79), *Dalbergia sissoo* (39.87) and *Ficus bengalensis* (32.3), while least dominance was shown by *Toona ciliata* (3.1) and *Anogeisus latifolia* (3.2). Total basal area of the forest was recorded 40.04 $m^2$ $ha^{-1}$, of which *F. bengalensis* contributed the maximum TBA (10.33 $m^2$ $ha^{-1}$) with low density (6 trees $ha^{-1}$) followed by *H. integrefolia* (IVI 9.94 $m^2$ $ha^{-1}$, density 112 trees $ha^{-1}$) and *A. cordifolia* (IVI 8.3 $m^2$ $ha^{-1}$, density 23 trees $ha^{-1}$).

Table 6.1. Species composition (density, total basal area and IVI) of study area forest.

| **Species** | **Density (trees ha-1)** | **TBA (m2 ha-1)** | **IVI** |
|---|---|---|---|
| *Accacia catechu* | 10.6 | 0.58 | 9.45 |
| *Adina cordifolia* | 23.33 | 8.28 | 43.79 |
| *Aegle marmelos* | 4.24 | 0.09 | 5.97 |
| *Anogeisus latifolia* | 2.12 | 0.15 | 3.25 |
| *Azadirachta indica* | 6.36 | 0.25 | 4.99 |
| *Grewia optiva* | 6.36 | 0.17 | 4.8 |
| *Cassia fistula* | 6.36 | 0.03 | 6.57 |
| *Dalbergia sissoo* | 46.65 | 2.58 | 39.87 |
| *Ficus bengalensis* | 6.36 | 10.33 | 32.3 |
| *Ficus* sp. | 25.45 | 5.78 | 29.78 |
| *Holoptelia integrifolia* | 112.4 | 9.94 | 89.92 |
| Ehretia levis | 16.97 | 0.19 | 10.71 |
| Kukait | 2.12 | 0.07 | 3.05 |
| *Mitragyna parvifolia* | 4.24 | 1 | 6.13 |
| Titmira | 8.48 | 0.41 | 6.15 |
| *Toona ciliata* | 2.12 | 0.17 | 3.3 |
| Total | 284.17 | 40.04 | 300 |

Across the gradient of distance based on the Importance Value Index (IVI) the forest communities in the study area were as follows:

| | |
|---|---|
| 0-400m | *H. integrifolia-F. bengalensis*- E. levis |
| 400-800m | *M. parviflora- D. sissoo-H. integrifolia* |
| 800-1200m | *H. integrifolia-A. cordiflora-Ficus* sp. |
| 1200-1600m | *F. bengalensis- H. integrifolia-A. cordiflora* |
| 1600-2000m | *H. integrifolia-D. sissoo-A. cordiflora* |

Among the trees, *H. integrifolia, Dalbergia sissoo* and *Adina cordifolia* are the dominant tree species in the study area. With increase in distance from the riverbed the tree density and TBA showed increasing trend.

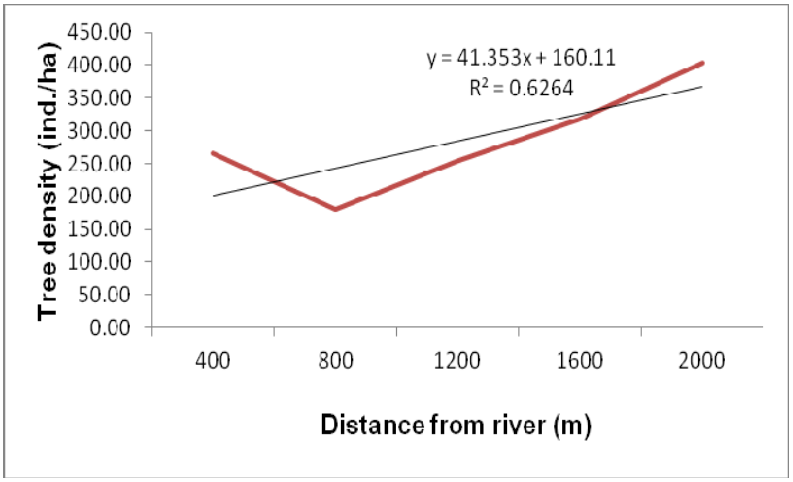


Fig. 6.3 (a) Trends in tree density across the distance gradient

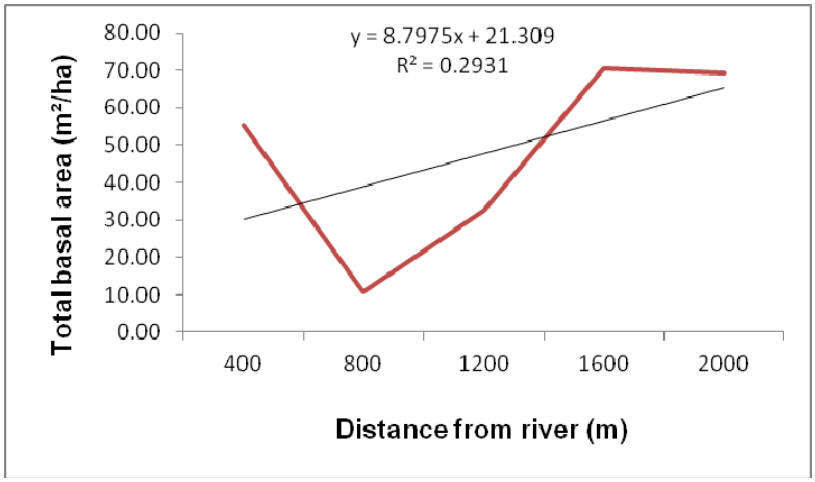


Fig. 5.3 (b) Trends in total basal area across the distance gradient

### *6.3.3 Shrub abundance, tree regeneration and weed invasion*

Among shrubs, *A. vasica* was the most abundant shrub in the area followed by *M. koenigii*. The presence of *L. camara* was recorded up to 1200m from the river bank.

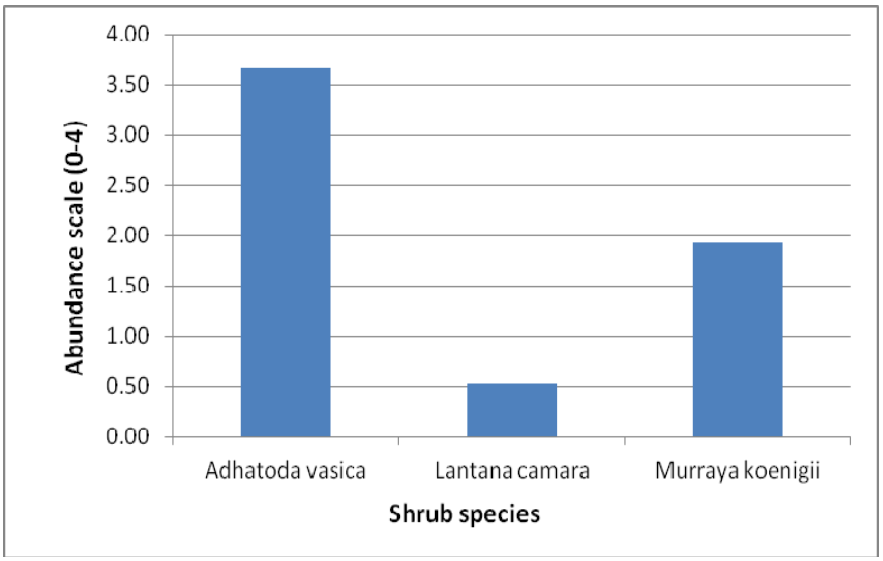


Fig. 6.4 Shrub abundance on a scale of 0-44 (<25% of cover =1, 26-50%=2, 51-75%=3, >76% of cover =4)

### *6.3.4 Status of ground layer*

Among the parameters recorded for ground cover, weeds had maximum cover percentage along the entire distance gradient. Similar trend was observed for dry leaf litter, where as herbs had a medium distribution and the presence of green grass was least.

### *6.3.5 Assessment of anthropogenic pressure*

The data on anthropogenic pressure shows that this forest area is not highly disturbed. It is seen that the level of disturbance is slightly higher during the summer months. The main activities leading to disturbance are lopping and livestock grazing.

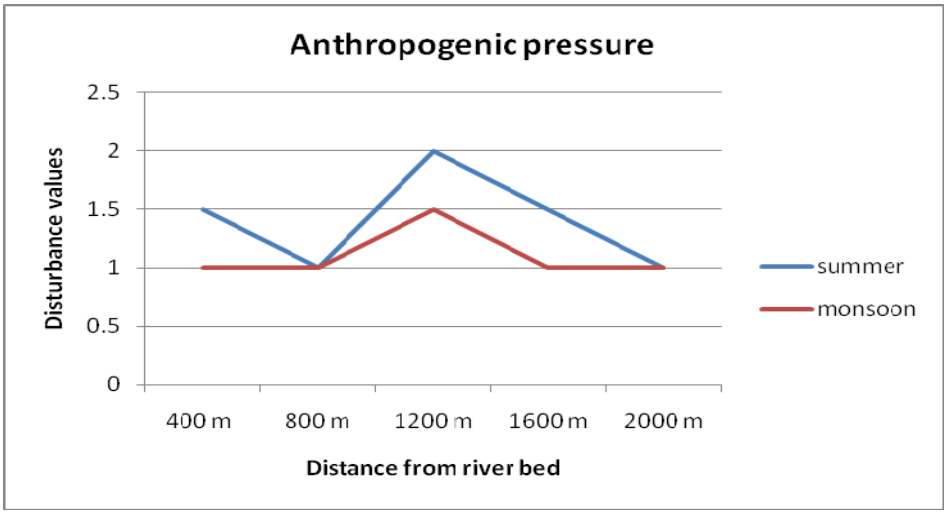


Fig. 6.5 Anthropogenic pressures on a scale of 0-4

### *6.3.6 Wild animal signs*

Six species of herbivores were recorded in the study area. Encounter of pellets during the rainy season was less probably due to the quicker degradation of pellets and because of high undergrowth. The area had a good distribution of nilgai, sambar and chital. Elephant movement is also considerable in the area during the summer months. Overall the ungulate signs showed a gradual increasing trend along the distance gradient away from the river bank.

Since this area has a considerable number of ungulate population, presence of large carnivores was also seen in this area. The carnivores recorded were tiger, leopard, smaller cats and jackal.

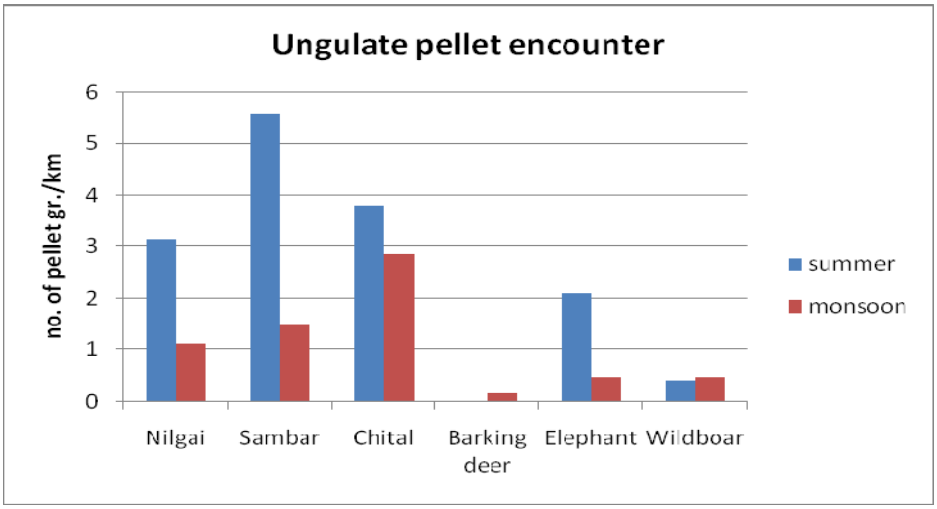


Fig. 6.6 Pellet encounter rate of ungulates

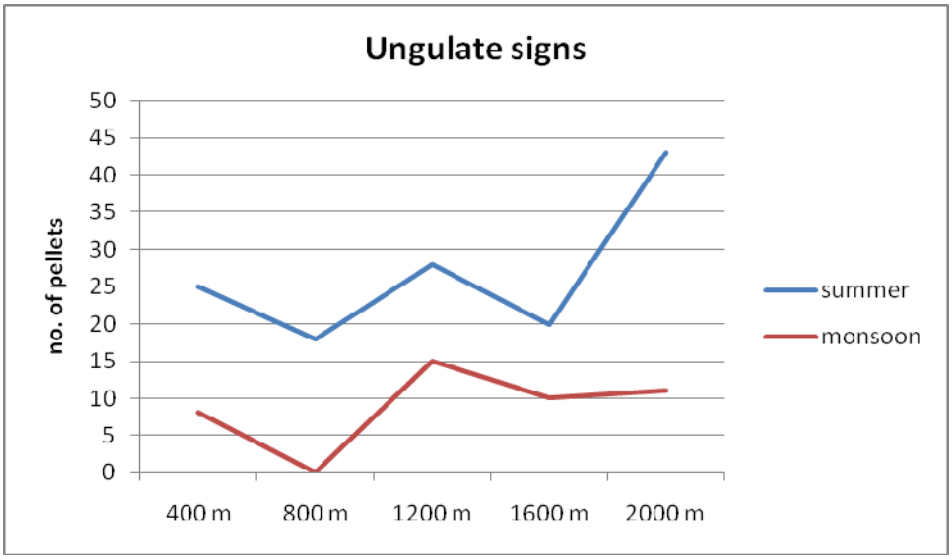


Fig. 6.7 Number of pellets of ungulates across the distance gradient

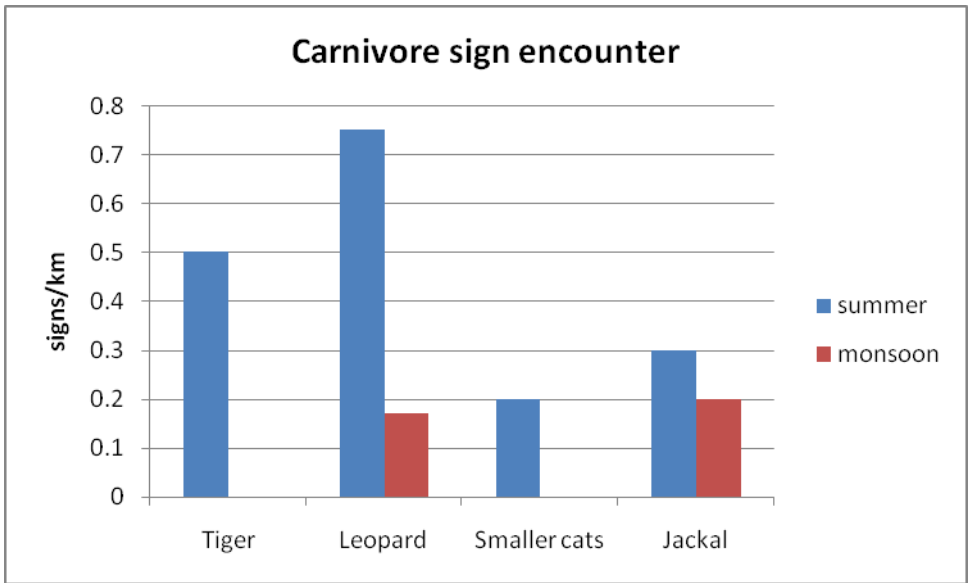


Fig. 6.8 Carnivore sign encounter rate

### *6.3.7 Possible negative impacts of non-mining*

The mining area in Nihal River has a shape of a river delta with riverbed width going upto 1500 m as can be seen from Fig. 6.1. This is due to the gradual spreading of the water over the years. The river bed is shallow and hence when water flow increases during monsoon, it is bound to spread over a larger area. On the river banks there were no signs of erosion which suggests that the water might not be breaching the banks. Thus, it seems that there would be no negative impacts of non-mining in this area. To get a detailed understanding of the river morphology and associated factors was beyond the scope of this study.

## 6.4 Conclusions

Along the Nihal River, the forest area has riverine vegetation and has good wildlife values. The level of disturbance in the area is low and it goes on decreasing as we go away from the river bank. The distribution of wild animals also shows a slight increasing trend as the distance from the river bank increases and hence is negatively co-related to the disturbance levels.

Since this area is not disturbed, large mammals like tiger and elephant still use this area. However, if mining activity starts, the disturbance levels are likely to increase. This will have negative impact on the movement of large mammals in the area.

The "All India Tiger Population Monitoring Project, 2010" has also identified this forest patch as an important corridor for the dispersal of tigers from the Corbett Tiger Reserve. This area has been referred to as the Nihal-Bhakra corridor (Jhala et al. 2011).

This area is an important forest patch with regards to the movement of large bodied mammals like tiger and elephant and has a high conservation value as a wildlife corridor especially for tigers.

The conservation of corridors is of vital importance since today most of the protected areas harboring considerable populations of large mammals (tiger & elephant) have become islands in a vast matrix of human dominated landscape (Johnsingh et al. 2004). In Uttarakhand, Corbett Tiger reserve has a viable population of tigers and it acts as a source population of tigers from which tigers disperse to adjacent forest areas (Jhala et al. 2011). The Nihal-Bhakra corridor enables tiger movement from Corbett tiger reserve to Pilibhit Forest Division which also forms a part of an important tiger population in the Terai-Arc landscape (Jhala et al. 2011). Because of the above reasons, mining in this area will have detrimental impact on the wildlife value of the area and should not be permitted.

# CHAPTER 7
# KIRODA NULLAH

## 7.1 Background

The Kiroda Nullah originates in the Champawat District of Uttarakand. It flows through the foothills in the Haldwani Forest Division of Western Circle of Uttarankhand Forest. The total length of KirodaNullah under the project is approximately 3.5 km. The site of mining in Kiroda Nullah falls in the Shivalik region. The total available area for mining in Kiroda Nullah is 72 ha, which falls under Tehsil Purnagiri (Tanakpur), District Champawat, Uttarakhand. The collection of minor-minerals will be carried out from 36 ha area with proposed extraction of about 4.8 lakh $m^3$ or 8.64 lakh tonnes per annum of river bed material.

The proposed project is a manual opencast mining project classified as "Category-A" by the Ministry of Environment and Forests, New Delhi as per the EIA notifications. Geographically, the site lies between $29^0$ 04'59" to $29^0$ 06' 18" N latitudes and $80^0$ 05' 27" to $80^0$ 06' 59" E longitudes which comes under the toposheet 62C/4. It is 256.52 m above sea level. The nearest railway station is Tanakpur which is 3 km from the site. The extraction sites were selected on the basis of maximum debris deposition. No mining activity will be undertaken during the monsoon season. So the river bed material will be replenished during the monsoon season every year.

## 7.2 Approach

Three transects each in beats Kakrali 1 and Kakrali 2, of two km length were sampled systematically, perpendicular to the river course, at an interval of 1 km, 300 m away from the river. Two islands in the middle of the riverbed were sampled making a total of 8 transects to assess the wildlife population status.

## 7.3 Observations

### *7.3.1 Status of mining and river morphology*

In the 3.5 km river stretch downstream of the kiroda Bridge, sand/boulder mining has been carried out on a small scale during some of the past years but still it has not been started on a regular basis.

Kiroda Nullah is a seasonal stream in the *Bhabar* tract which runs parallel to the Shiwalik hills (Himalayan foot hills). It remains mostly dry during summers with little flow of water but during the monsoons the water flows in the stream in a powerful deluge. During monsoons the water coming from the hills brings boulders and pebbles along with it and thus the Kiroda stream bed is full of pebbles and boulders. Due to the deposition of these materials and because of the presence of two islands in the middle of the stream bed the stream has been divided into three main channels along with many sub-channels, all of which finally drain into the Sharda River.

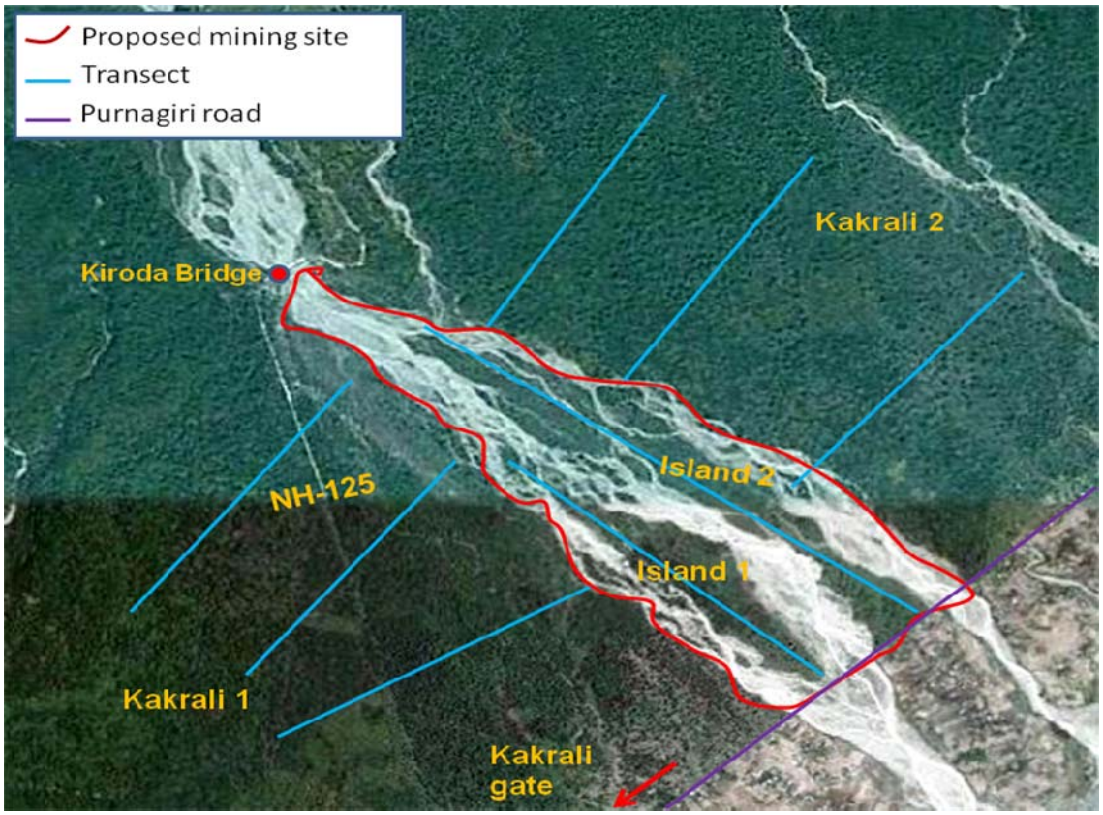


Fig. 7.1 Kiroda Nullah mining site

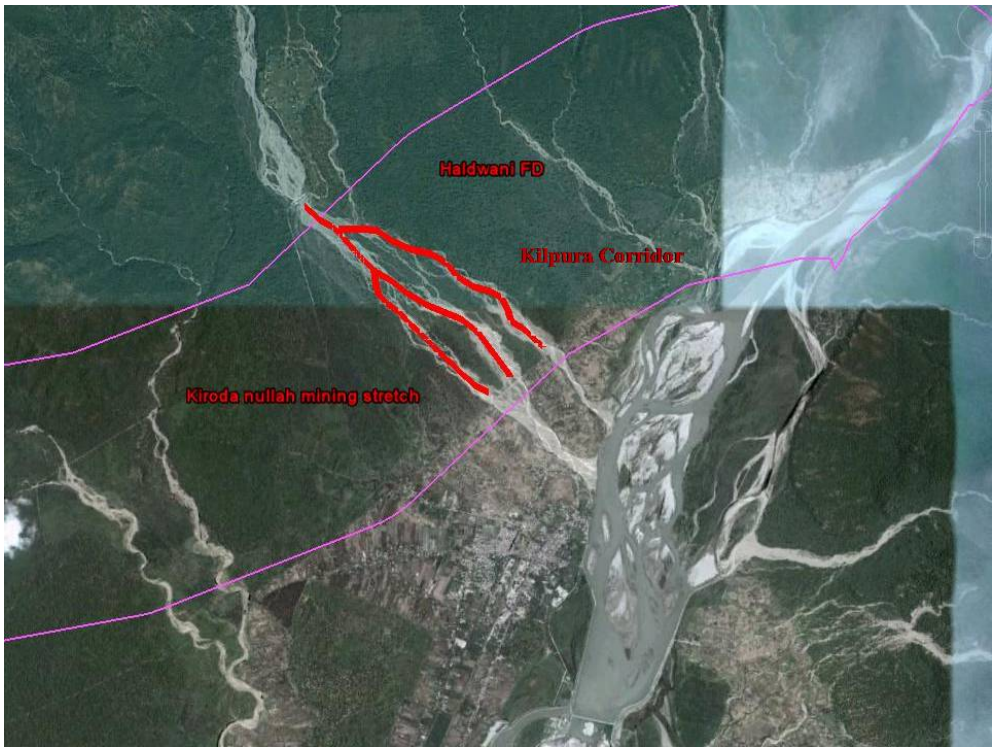


Fig. 7.2 The area inside the pink line shows the Kilpura corridor which is very important for the movement of elephant and tiger (Source: Jhala *et al*. 2011)

Plate7.1 Kiroda Nullah and the adjoining forest

### *7.3.2 Forest structure*

A total of 22 species of trees were recorded from both Kakrali 1 and Kakrali forests of the area. Average tree density in the study area was 674.37 trees/ ha with the highest density shown by *M. philippensis* (216.31 trees $ha^{-1}$) followed by *H. integrifolia* (114.52 trees $ha^{-1}$), *S. robusta* (76.34 trees $ha^{-1}$). Study area also had Teak plantation at few places that had a density of 67.86 trees $ha^{-1}$. Most dominant species in the area was *H. integrifolia* (IVI 78.82) followed by *M. philippensis* (IVI 53.87) and *S. robusta* (IVI 26.09). *H. integrifolia* also fell in highest girth class with an average basal area of (13.86 $m^2$ $ha^{-1}$).

Table 7.1 Species composition (density, total basal area and IVI) of study area

| **Species** | **Density (Trees $ha^{-1}$)** | **TBA (m2 $ha^{-1}$)** | **IVI** |
|---|---|---|---|
| *Acacia catechu* | 19.09 | 0.60 | 11.20 |
| *Adina cordifolia* | 10.60 | 1.38 | 10.39 |
| *Aegle marmelos* | 2.12 | 0.03 | 1.49 |
| *Ailanthus excels* | 4.24 | 0.03 | 1.78 |
| *A. pendula latifolia* | 19.09 | 2.72 | 17.17 |
| *Bombex ceiba* | 6.36 | 0.54 | 3.80 |
| *Cassia fistula* | 2.12 | 0.01 | 1.42 |
| *Cordia myxa* | 2.12 | 0.04 | 1.52 |
| *Dalbergia sissoo* | 2.12 | 0.02 | 1.45 |
| *Erythrina suberosa* | 33.93 | 0.07 | 9.50 |
| *Ficus sp.* | 2.12 | 0.36 | 2.59 |
| *Holoptelia integrifolia* | 114.52 | 13.86 | 78.82 |
| *Syzygium cuminii* | 25.45 | 0.96 | 17.59 |
| *Lannea coromandelica* | 6.36 | 0.02 | 2.09 |
| *M. philippensis philippensis* | 216.31 | 1.76 | 53.87 |
| *Mitragyna parvifolia* | 2.12 | 0.03 | 1.49 |
| *Schleichera oleosa* | 19.09 | 2.92 | 16.74 |
| *S. robusta robusta* | 76.34 | 2.21 | 26.09 |
| *Tectona grandis* | 67.86 | 0.99 | 19.71 |
| *Trewia nudiflora* | 21.21 | 1.39 | 13.05 |
| *Wrightia tinctoria* | 19.09 | 0.15 | 6.50 |
| *Zizyphus mauritiana* | 2.12 | 0.12 | 1.76 |
| Total | 674.37 | 30.21 | 300.00 |

A total of 14 tree species were recorded from the forests of kakrali 1 with a density ranging from 190.86 trees $ha^{-1}$ to 434.74 trees $ha^{-1}$. Most dominant species in the area was *H. integrifolia* dominating the area upto a distance of 800 m with *M. philippensis, S. robusta and T. nudiflora.* Highest density of trees was shown by *M. philippensis* species (100 trees $ha^{-1}$) followed by *H. integrifolia* (81 trees $ha^{-1}$), *S. robusta* (32 trees $ha^{-1}$). Trees in higher girth class were *H. integrifolia* (16 $m^2$ $ha^{-1}$), *S. robusta,* (4 $m^2$ $ha^{-1}$).

Across the gradient of distance based on the Importance Value Index (IVI) the forest communities in Kakrali 1 are as follows:

| | |
|---|---|
| Upto400 m | *H. integrifolia-A. cordifolia- A. pendula* |
| 400-800 m | *H. integrifolia- M. philippensis-A. catechu* |
| 800-200 m | *M. philippensis- T. nudiflora- S. robusta- A. cordifolia* |
| 1200-1600 m | *T. grandis- M. philippensis-S. robusta- H. integrifolia* |
| 1600-2000 m | *M. philippensis-S. robusta- A. pendula* |

Thirteen tree species were recorded from the forests of kakrali 2 with a density ranging from 254.48 trees $ha^{-1}$ to 296.89 trees $ha^{-1}$. Most dominant species in the area was *H. integrifolia*, other dominant species being *M. philippensis, T. grandis, L. coromandelica , S. cuminii, S. robusta* and *T. nudiflora* species .Highest density of trees was shown by *M. philippensis* (129 $treesha^{-1}$) followed by *T. grandis* (50 trees ha-1), S. robusta (45 $treesha^{-1}$). Trees in higher girth class were *T. grandis* (7 $m^2$ $ha^{-1}$) followed by *H. integrifolia* (6.8 $m^2$ $ha^{-1}$) and *S. robusta*, (4 $m^2$ $ha^{-1}$). Across the gradient of distance based on the Importance Value Index (IVI) the forest communities in Kakrali 2 are as follows:

| | |
|---|---|
| 0-400 m | *H. integrifolium- S. cuminii -M. philippensis-A. catechu* |
| 400-800 m | *M. philippensis-T. grandis-A. catechu- Adina- H. integrifolium* |
| 800-1200 m | *S. robusta- A. marmelos-M. philippensis-T. grandis* |
| 12-1600 m | *M. philippensis-T. grandis-S. cuminii* |
| 1600-2000 m | *M. philippensis-S. cuminii- M. parviflora-T. grandis* |

### *7.3.3 Shrub abundance, tree regeneration and weed invasion*

Most abundant shrub in the area was *M. koenigii* followed by *A. vasica* and *Lantana camara.* Saplings of trees like *M. philippensis, S. robusta, S. cuminii and Z. mauritiana,* were also present indicating regeneration of these species in the area.

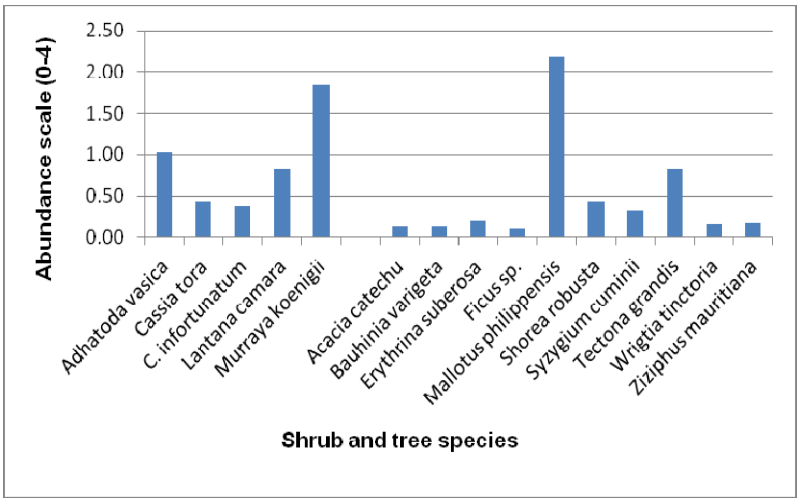


Fig. 7.3 Shrub abundance on a scale of 0-4

*H. integrifolium* and *A. cordifolia* with having high seedling density and *M. philippensis, D. sissoo, B. ceiba, S. cuminii, S. robusta* and *M. azadirach* with low seedling density were recorded in open, bouldary, stable and elevated areas of the Kiroda nala near the Kiroda Bridge on western bank. Given proper protection to the site, the regenerating individuals may develop in to trees and form riverine forest over the period.

Table. 7.2 Regenerating individuals in the Kiroda dry riverbed

| **Species** | **Density seedlingha$^{-1}$** |
|---|---|
| *Holoptilia integrifolia* | 1311.04 |
| *Adina cordiofolia* | 238.85 |
| *Mallotus philippensis* | 7.96 |
| *Syzygium cuminii* | 2.65 |
| *Dalbergia sisso* | 5.31 |
| *Bombyx ceba* | 2.65 |
| *Shorea robusta* | 2.65 |
| *Milea azadirach* | 2.65 |

Weed species in the study area were *Lantana camara, Clerodendron infortunatum, Parthenium hysterophorus* and *Cassia tora.* Highest percentage was shown by *Lantana*

*camara* covering 14% of a 10m radius plot on an average. Generally, weeds are showing a decreasing trend as we go away from the riverbed till 1600m plot and than increases at the end of the transect, which could be due to anthropogenic disturbance (human habitation is nearer).

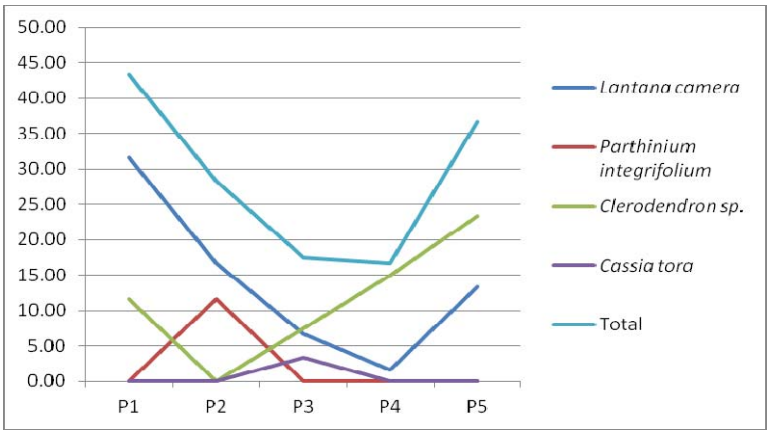


Fig. 7.4 Trends in weed percent cover across the distance gradient

### *7.3.4 Status of Ground layer*

There was an uneven trend in the ground cover and was bare in most of the plots. Dry grass was present in only one plot. Highest herb and weed percentage were recorded at a distance of 400 m which could be due to open canopy. Similarly, leaf litter increases with increase in distance and was maximum between 1600-2000 m distance. However, high weed cover was recorded between 400-1200 m far from the river bed, may be because of high disturbance and low canopy cover.

### *7.3.5 Anthropogenic pressure*

It can be seen from Fig. 7.6 that overall level of disturbance is low during the monsoon season. It is evident that there is considerable disturbance in the forest near the riverbed. As we go away from the riverbed disturbance level decreases 1200 m and increased again. This increase is due to the presence of roads, settlements towards the end of the transects. The main activities leading to disturbance are wood cutting and livestock grazing.

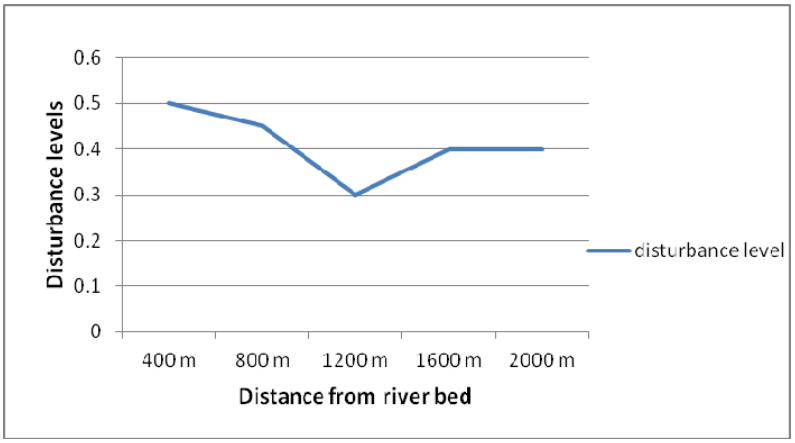


Fig. 7.5 Anthropogenic pressures on a scale of 0-4

### *7.3.6 Animal signs*

The data of ungulate species was expressed as pellet encounter rates. During the survey six species of ungulates were recorded, the forest area is extensively used by wild animals.

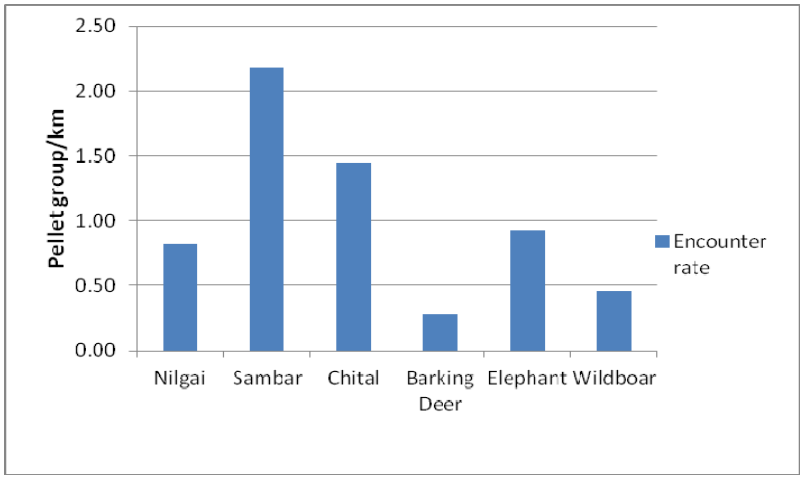


Fig. 7.6 Pellet encounter of ungulates across the distance gradient

Fig. 7.7 shows that there is no particular trend in the distribution of ungulates over the distance gradient from the river bed. The ungulate signs are more or less consistent over the distance gradient decreasing slightly towards the further end of the transect. Old elephant signs were encountered on the transects and the forest dept. informed that the elephant activity increases in the area during winters which indicates that this area is used as a corridor by these large mammals.

Among carnivores, signs of leopard and sloth bear were recorded along with small cats. In the riverbed there are two to three well forested islands which facilitate the passage of wildlife through the river bed.

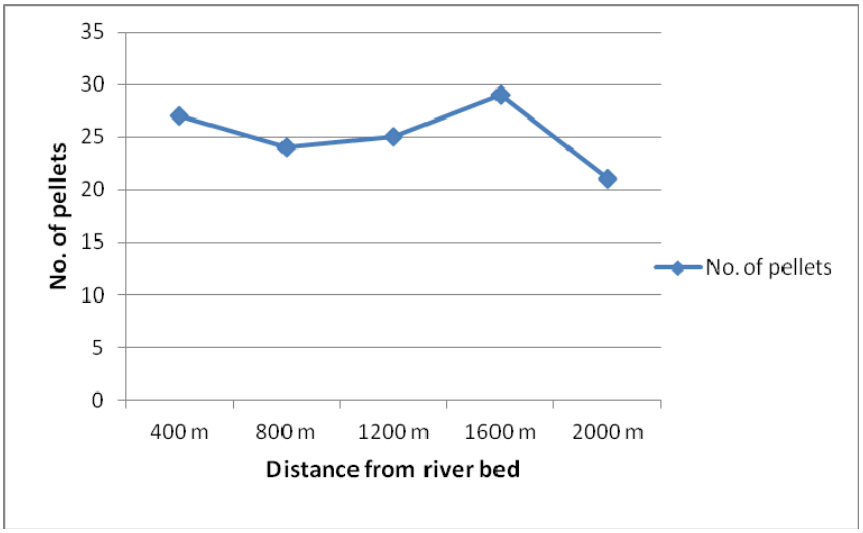


Fig. 7.7 Ungulate signs with relation to distance from river bed

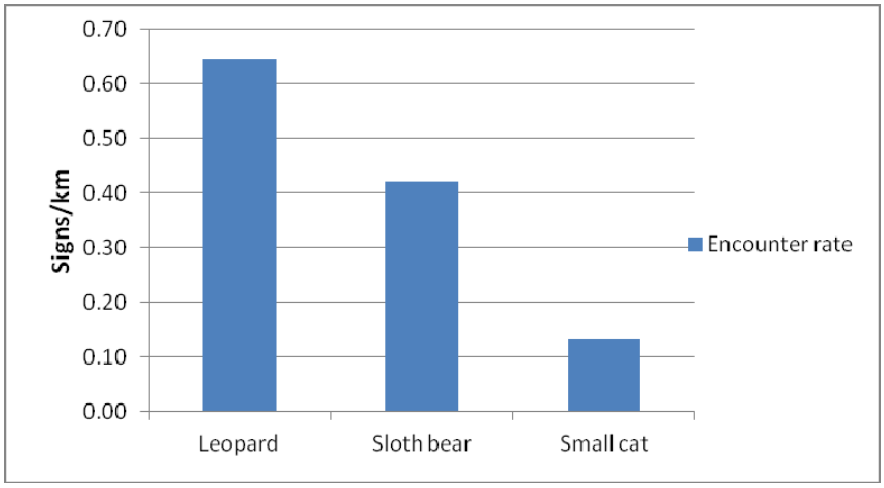


Fig. 7.8. Carnivore encounter rate

### *7.3.7 Possible negative impacts of non-mining*

The Kiroda Nullah had a channel width of 20-40 m with a riverbed width between 150-1000 m (with islands in between). The amount of water flowing in the Kiroda stream increases during the monsoon seasons. Since the stream bed is strewn with boulders and pebbles and hence it is shallow. The height of the stream bank is four feet on an average. Thus, if a large amount of water flows in the stream, it is bound to spread in the surrounding forest area. However seasonal flooding of forest situated at the Himalayan foothills in the *Bhabar* tract is a natural phenomenon and since there are no human settlements and agriculture fields nearby, flooding of the forest area, if and when it happens, should not be seen as a problem. Hence, non-mining in this site is not supposed to have any negative impacts on the surrounding area.

## 7.4 Conclusions

The habitat along the Kiroda Nullah had riverine vegetation with good forage resources for large mammals like elephants. The distribution of wild animals was seen to be consistent throughout much of the distance gradient from the riverbed. The presence of well-forested islands in the middle of the riverbed helps in the movement of the wild animals from one side of the stream to other.

It was observed that the forests surrounding the Kiroda Nullah had good wildlife values and the habitat is important for wildlife. This area is a part of the Kilpura corridor, which connects the forests of Tanakpur to those of Nepal which facilitates the movement of elephants and tigers. A branch of this corridor also connects with the Pilibhit Tiger Reserve (Jhala *et al*. 2011). This corridor is vital for elephant conservation since it provides a chance for the elephants in the Haldwani Forest Division to migrate to Suklaphanta reserve in Nepal (Johnsingh et al. 2004). Hence, mining activity in this area will have negative impact on the wildlife value of the area and is likely to destroy the functionality of this corridor. Thus mining in this area needs to be avoided.

# CHAPTER 8
# YAMUNA AND TONS RIVER

## 8.1 Background

The Doiwala Cooperative Labour Contract Committee Ltd. (Doiwala Shram Sanvida Samiti Ltd.) submitted a proposal to Ministry of Environment and Forests, Government of India to obtain approval for collection of river bed materials for ten years from 11.50 ha area of Plot No. 3 in river bed of Yamuna River (Rampur Mandi) in Chakrata Forest Division and 25 acre (10.11 ha) area of Plot No. 2 in Kalsi Block in river bed of Tons River in Uttarakhand (vide letter No. 4326/1G-2554 dated 23.06.2010). After a meeting convened under the Chairmanship of the Director General of Forests and Special Secretary on 03.11.2010, the Ministry directed the State Government of Uttarakhand to assess/identify and suggest appropriate ameliorative measures to eliminate/minimize the adverse impact, if any, on the wildlife in general. Under this direction of the Ministry, Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden, Uttarakhand, commissioned Wildlife Institute of India to assess the impact of proposed sand/boulder mining in the above mentioned sites.

## 8.2 Approach

The approach for the assessment was based on the question whether the area of interest has any wildlife value. To determine this, each site was visited in late winters, twice each during morning and evening, to collect information on occurrence and abundance of birds. Transects of 2 km length were laid along the banks, at both the sites for recording bird species. Sites were also visited in summer. Individual counts of each species were made only for large waterbirds. Apart from direct sightings of animal counts, habitat use of wildlife in the proposed sites and their surroundings were also assessed based on track plot census technique. Coordinates of the proposed mining sites were also collected and maps were prepared.

Based on the findings of the above, the ameliorative measures to minimize adverse effects on wildlife and habitats have been proposed. The question for occurrence of bird species were investigated in the contexts of (a) past records of species, especially birds, of conservation significance and (b) observations during the present assessment. The specific methods *inter-*

*alia* involved review of existing information such as assessment reports, Management Plan for ACR and topographic maps of Survey of India and satellite data.

### 8.3 Mining site: Rampur Mandi, Yamuna River

River Yamuna originates from Yamunotri glacier at a height of 6,387 m in the Banderpooch peaks of Himalaya in Uttarakhand. It is the largest tributary of the Ganga in northern India traveling a total length of 1,376 kilometers before merging with the Ganga in Allahabad. The mining site at the Chakrata Forest Division falls within the boundary of the Asan Conservation Reserve (ACR) on River Yamuna situated at around 1 km upstream from the confluence of Yamuna and Asan Rivers on the Right side of the National Highway 72 (Fig. 8.1). Adjacent to the proposed mining site are two reserve forests: western Yamuna R.F. and Ramnagar R.F. The Ramnagar R.F. comes inside the conservation reserve.

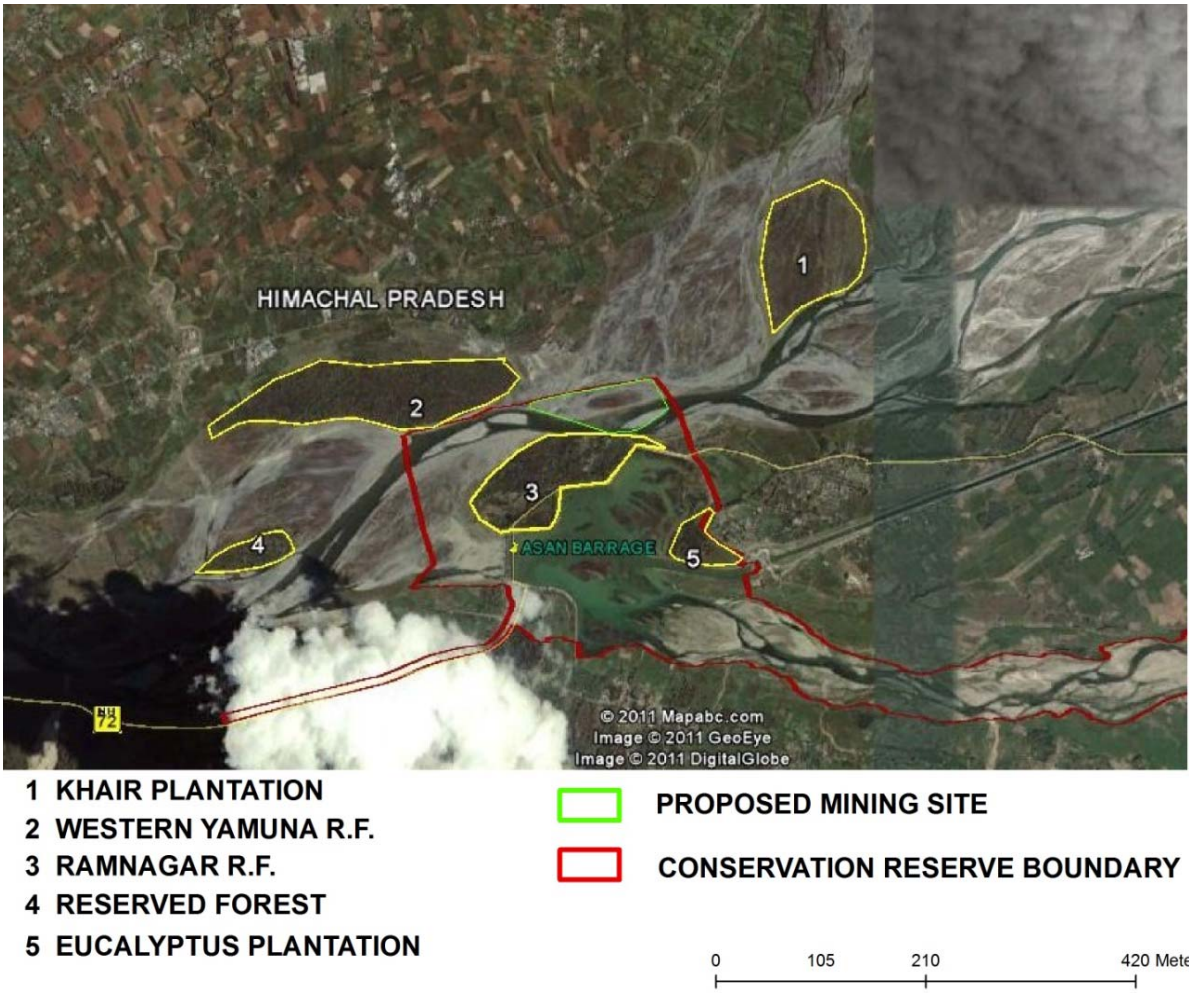


Fig. 8.1 Asan Conservation Reserve showing location of the proposed mining site and Reserve boundary

### *8.3.1 Asan Conservation Reserve*

The Asan Conservation Reserve (ACR) comprises of a fresh water reservoir on Asan River, adjoining Reserve Forest Area (Rampur Mandi Forest Block which also includes adjoining Yamuna River bed where the mining site is located), a stretch of river bed of Yamuna River and Yamuna hydel canal near village Dhalipur in Dehra Dun district. Geographically, the Reserve lies between $30^0$ 25'35.7" N and $30^0$ 26'46" latitudes and $77^0$ 38' 48" E and $77^0$ 43' 20" E longitudes. The total area of the Reserve is 444.40 hectares. The Barrage which is situated across the river Asan is 287.5 m long, the river bed being 389.4 m above sea level, with minimum and maximum water levels at 402.4 m and 403.3 m asl respectively. The reservoir area is under the control of Irrigation Department, Uttarakhand whereas the Reserve Forest area is controlled by Forest Department, Uttarakhand. The reservoir area is under the control of Irrigation Department, Uttarakhand whereas the Reserve Forest area is controlled by Forest Department, Uttarakhand. As described in the notification, the Northern boundary of the Reserve starts from Boundary pillar no. A1 and moves along inter State boundary of Uttarakhand and Himachal Pradesh (mid of Yamuna River) up to pillar no 4 of Rampur Mandi Forest Block. The Eastern boundary starts from the Northern corner of the Asan Bridge built near km stone no. 116 on Herbertpur-Saharanpur National Highway No. 72, it crosses the Asan River and reaches the southern corner of this Bridge. The Southern boundary starts from the southern corner of Asan Bridge built on National Highway no. 72, it moves along the left bank of the Asan river and runs along the southern boundary of the Asan reservoir to join the bund (embankment) built on the south-eastern boundary of the reservoir, where as the Western boundary starts from Boundary pillar No. 8 it moves along the western boundary of Rampur Mandi Forest Block and meets the Boundary pillar no. A1.

The ACR attracts a large assemblage of water birds. The high species diversity of birds in the Reserve and presence of many of globally threatened species make this area an important wetland for the conservation of biodiversity. ACR not only supports large number of species of birds but also supports them in good number. With just 60 ha of water spread area in the reservoir, as many as 8000 water birds have been counted in mid winter season. This area is one of the best-known sites for the congregation of the Ruddy Shelduck (*Tadorna ferruginea*). Considering this fact, the site was recognized as an Important Bird Area (IBA) based on global standard criteria of Wetlands International 2002 (site having at least 1% of

bio-geographic population of a species). The Reserve is important in terms of ornithology and attracts a large number of tourist and bird watchers, especially from the region. As many as 251 species of birds have been reported from the Reserve. Owing to a large diversity of birds of which many are rare and endangered, it is a preferred destination for birdwatchers. Being a wetland, it also performs a host of other ecological and environmental functions as well, which though not fully understood yet, are critical for the future well being and existence of the wildlife and to humanity.

### *8.3.2 Observations*

During the field survey 62 species of birds were recorded in late winters while 30 species were recorded during summer from the Yamuna River in the Rampur Mandi section of the Asan Conservation Reserve (Annexure II). The bird list contains two Near Threatened (NT) species viz. Ferruginous Pochard (*Aythya nyroca*) and Painted Stork (*Mycteria leucocephala*). Both the species were observed just 300-400 m upstream of the proposed 28.43 acre area of plot No. 3, Rampur Mandi. A congregation of 150-200 Ruddy Shelducks (*Tadorna ferruginea*) was also observed at this site.

On the day of field observations, as many as six Great Stone Plover (*Esacus recurvirostris*) were observed. In winters, flocks of up to 30 birds have been sighted in this habitat. The patch of the forest where mining is proposed is also a nesting ground for this species. In recent past Common Mergansers (*Mergus merganser*) were also seen feeding at the small rapids in this part of the Yamuna River (WII 2009). Table 2 summarizes the Threatened birds of the Reserve.

Table 8.1. Threatened birds of Asan Conservation Reserve (Source: WII 2009)

| **Category** | **Species** | **Scientific name** |
|---|---|---|
| Critically Endangered | White-rumped Vulture | *Gyps bengalensis* |
| | Slender billed Vulture | *Gyps tenuirostris* |
| | Red-headed Vulture | *Sarcogyps calvus* |
| Endangered | Egyptian Vulture | *Neophron percnopterus* |
| Vulnerable | Marbled Teal | *Marmaronetta angustirostris* |
| | Baer's Pochard | *Aythya baeri* |
| | Lesser White-fronted Goose | *Anser erythropus* |

| | | |
|---|---|---|
| | Pallas's Fish Eagle | *Haliaeetus leucoryphus* |
| | Greater Spotted Eagle | *Aquila clanga* |
| | Oriental Darter | *Anhinga melanogaster* |
| | Painted Stork | *Mycteria leucocephala* |
| Near – Threatened | Black-necked Stork | *Ephippiorhynchus asiaticus* |
| | Black-headed Ibis | *Threskiornis melanocephalus* |
| | Cinereous Vulture | *Aegypius monachus* |
| | Ferruginous Pochard | *Aythya nyroca* |
| | Black-tailed Godwit | *Limosa limosa* |

In a survey by the ZSI team (Hussain 2003); forty species of fish were collected from Asan River (Annexure III). Four species of frogs and toad were collected from Asan by the ZSI team during their surveys in the 1990. These were Skipping Frog (*Rana cyanophlyctis*), Cricket Frog (*R limnocharis*), Ornate Frog (*Microhyla ornata*) and Common Toad (*Bufo melanostictus*). The only snakes known from the reserve are the Chekerred Keel-back (*Xenochropus piscator*), which loves moist locations including the wetland and Rat Snake (*Ptyas mucosa*), which is seen in the forest and scrubland. The Conservation Reserve is not known for any spectacular mammal. However, certain common mammals viz. Common Mongoose, Jackal and Rhesus Macaque, Five striped Palm Squirrel are occasionally seen.

Plate 8.1 Mining activities near proposed mining site by Himachal Pradesh

## 8.4 Mining site 2: Kalsi Block, Tons River

The proposed mining site is located upstream of the confluence of Yamuna and Tons Rivers. The proposed site has private land on right bank and the left bank has running river channel. The Tons River is the largest tributary of the Yamuna River. Tons River originates as the two feeder streams - the Supin River rises in the Northern part of the Tons catchment near the Himachal Pradesh and Uttarakhand border and the Rupin river rises from a glacier at the head of the famous Har-Ki-Dun valley in the North-North Eastern part of the Tons catchment. These two feeder streams merge near the mountain hamlet of Naitwar and the channel downstream of Naitwar is known as Tons River. The river flows along a 'V' shaped valley.

It flows through Garhwal, the western part of the Himalayan state of Uttarakhand, bordering Himachal Pradesh (H. P.). The river joins Yamuna at Kalsi in the Northwestern part of Dehradun valley, which is approximately 48 km away from Dehra Dun. The Yamuna River after passing through the Dakpatthar has a mild sloppy bed at Rampur Mandi. The proposed site for mining of river bed materials is right at the confluence of these two rivers (Fig. 8.2) having 25 acre area of plot No. 2 in Kalsi Block.


Fig. 8.2 Tons-Yamuna confluence showing location of the proposed mining site and Dakpatthar Barrage

### *8.4.1 Observations*

At the proposed mining site at Kalsi, 42 species of birds were observed which include breeding population of river lapwing during the monsoon (Annexure II). The habitat at the confluence consisted of boulder beds, sand and a channel of flowing water of around 50 m. Around 5 km downstream to the mining site the Dakptthar Barrage exists, which has significant conservation value in terms of waterbirds. North-western parts of the proposed mining site i.e. towards Tons River, was sporadically used by leopard, jackal, hyena and barking deer. Indirect evidences such as pug marks and pellets of these species were found on this part of the proposed mining site. Moreover, fingerlings of golden mahseer, snow trout and *Barilius* spp. were also found in both Tons and Yamuna Rivers near the proposed mining site.

The Central Soil and Water Conservation Research and Training Institute in their consultancy report have recommended 59073 $m^3$ of River bed material to be extracted from 9.945 ha area of this site (CSWCRT 2010). During our visit in late summers, it came to notice that mining is going on presently at this site during night, as evident from wheel marks of big vehicle and informal talks with locals.

### *8.4.2 Possible negative impacts of non-mining*

Tons River at the mining site is a single channel meandering river with a channel width not more than 35 m. The mining site is at the confluence of Rivers Yamuna and Tons and riverbed was 150- 650 m wide. Channel was comparatively calm with depth not more than 2 feet but there were signs of floods going upto nearby settlements (orchards) and causing erosion.


Plate 8.2 Deposition of sand and boulders in the nearby areas caused due to flood

## 8.5 Conclusions

Our assessment suggests that the proposed mining site within ACR has significant wildlife value in terms of habitat for migratory as well as resident waterbirds; as roosting and breeding ground for large number of migratory waterbirds. The open water area of the Reserve within Yamuna River is approximately 22.43 ha and the Riverbed area comprises of 60.16 ha of which 11.5 has been proposed to be mined. This accounts for 19% of the land within the Yamuna River part of the Reserve that will be used for mining.

The present study suggests that during mining more than 19% area of the Asan Conservation Reserve will be affected which is substantial. The mining site has significant conservation value. Hence, mining in this part will compromise with the objectives of creation of the Reserve. It is suggested that the proposed mining site be shifted away from the boundary of the Conservation Reserve so as to minimize adverse impact of mining.

Site in Kalsi Forest Block on River Tons has relatively low wildlife value. Though the mining site is an important corridor for golden mahseer, snow trout and *Barilius* species during monsoon. Hence, mining subject to the appropriate regulations with regard to depth of mining in this zone and guidelines issued by MoEF Vide letter No. 8-61/1999-FC dated 9th February 2010, letter No. Z-11012/3/2009-IA.II (M) dated 1st June 2010 and letter No. 8-61/1999-FC dated 8th April 2011 as applicable to this site will reduce the impact of mining. Hence, mining in this site may be allowed. But mining at this site during early and late monsoon should be avoided.

There should not be any kind of mining activity near the flowing water channel of the river. In this regards, it is suggested to have a 200 m buffer area which should be maintained from the east bank high tide level of Tons River to the north-west part of proposed mining site. There should not be any kind of processing unit established in and around the project sites i.e. on the river bed. There should not be any labour camps on the river bed or along the boundary of the Reserve. The exact mining location needs to be demarcated on the ground. It is further suggested not to allow camping of labourers on the riverbed especially during the winter months at the nearby water channel attracts migratory waterbirds. This study did not look into the intensity of impact of mining on river banks erosion especially on Kalsi village, which needs to be assessed separately by concerned agencies having relevant expertise in this field. The Uttarakhand Forest Department will need to monitor the extent of mining and its possible impacts on the river bed morphology periodically by constituting a committee of appropriate stature.

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ANNEXURE - I

**Year-wise details of extraction by different agencies.**

| Sl. No. | Year | Extracting Agency | Quantity Extracted In $m^3$ (lacs) | Royalty Rs.(Crore) |
|---|---|---|---|---|
| I | 1990-91 | Departmental | 16.02 | 1.15 |
| 2 | 1991-92 | Contractors | 19.67 | 1.38 |
| 3 | 1992-93 | KMVN, UP Van Nigam | 18.09 | 1.63 |
| 4 | 1993-94 | UP Van Nigam | 2.70 | 0.24 |
| | | Departmental | 18.73 | 2.63 |
| 5 | 1994-95 | Lease Holders | 12.22 | 1.18 |
| 6 | 1995-96 | Contractors | 7.75 | |
| | | Contractors | 21.57 | 7.85 |
| 7 | 1996-97 | Contractors | 23.10 | |
| 8 | 1997-98 | Contractors | 14.61 | |
| 9 | 1997-98 | Contractors | 8.51 | 4.25 |
| 10 | 1998-99 | Contractors | 28.50 | |
| 11 | 1999-2000 | Departmental | 7.35 | 1.62 |
| | | Contractors | 17.56 | 3.62 |
| 12 | 2000-01 | Departmental | 9.36 | 2.45 |
| | | Contractors | 0.10 | 0.02 |
| | | UA FDC | 1.99 | 0.29 |
| 13 | 2001-02 | UA FDC | 27.71 | 4.47 |
| 14 | 2002-03 | UA FDC | 31.94 | 6.76 |
| 15 | 2003-04 | UA FDC | 29.62 | 6.72 |
| 16 | 2004-05 | UA FDC | 48.98 | 12.09 |
| 17 | 2005-06 | UA FDC | 60.83 | 16.65 |
| 18 | 2006-07 | UA FDC | 64.47 | 17.99 |
| 19 | 2007-08 | UA FDC | 61.82 | 17.14 |
| 20 | 2008-09 | UA FDC | 62.00 | 17.27 |

ANNEXURE - II

**Checklist of birds observed during bird survey in proposed mining sites in Rivers Yamuna and Tons.**

| S.No. | Common Name | Scientific Name | Rampur Mandi | Kalsi |
|---|---|---|---|---|
| 1 | Grey Francolin | *Francolinus pundacerianes* | + | |
| 2 | Ruddy Shelduck | *Tadorna ferruginea* | + | |
| 3 | Ferruginous Pochard | *Aythya nyroca* | + | |
| 4 | Spot-billed Duck | *Anas poecilorhyncha* | + | |
| 5 | Northern Shoveller | *Anas clypeata* | + | |
| 6 | Little Grebe | *Tachybaptus ruficollis* | + | |
| 7 | Painted Stork | *Mycteria leucocephala* | + | |
| 8 | Little Bittern | *Ixobrychus minutus* | | + |
| 9 | Indian Pond Heron | *Ardeola grayii* | + | + |
| 10 | Little Egret | *Egretta garzetta* | + | + |
| 11 | Intermediate Egret | *Mesophoyx intermedia* | + | |
| 12 | Little Cormorant | *Microcarbo niger* | + | + |
| 13 | Black Kite | *Milvus migrans* | + | + |
| 14 | Great Stone Plover | *Esacus recurvirostris* | + | |
| 15 | Black-winged Stilt | *Himantopus himantopus* | + | |
| 16 | River Lapwing | *Vanellus duvaucelii* | + | + |
| 17 | Common Redshank | *Tringa totanus* | + | |
| 18 | Common Greenshank | *Tringa nebularia* | + | + |
| 19 | Common Sandpiper | *Actitis hypoleucos* | + | + |
| 20 | Pallas's Gull | *Larus ichthyaetus* | + | |
| 21 | River Tern | *Sterna aurantia* | + | |
| 22 | Rose-ringed Parakeet | *Psittacula krameri* | + | + |
| 23 | Greater Coucal | *Centropus sinensis* | + | + |
| 24 | Common Hawk Cuckoo | *Hierococcyx varius* | | + |
| 25 | House Swift | *Apus nipalensis* | + | |
| 26 | Indian Roller | *Coracias benghalensis* | + | |

| | | | | |
|---|---|---|---|---|
| 27 | Pied Kingfisher | *Ceryle rudis* | + | + |
| 28 | White-throated Kingfisher | *Halcyon smyrnensis* | + | + |
| 29 | Green Bee-eater | *Merops orientalis* | + | + |
| 30 | Common Hoopoe | *Upupa epops* | + | + |
| 31 | Indian Grey Hornbill | *Ocyceros birostris* | | + |
| 32 | Brown Headed Barbet | *Megalaima zeylanica* | | + |
| 33 | Coppersmith Barbet | *Megalaima haemacephala* | + | + |
| 34 | Lineated Barbet | *Megalaima lineata* | + | |
| 35 | Black rumped Flameback | *Dinopium benghalense* | | + |
| 36 | Long-tailed Shrike | *Lanius schach* | + | |
| 37 | Black Drongo | *Dicrurus macrocercus* | + | + |
| 38 | Spangled Drongo | *Dicrurus hottentottus* | + | |
| 39 | Rufous Treepie | *Dendrocitta vagabunda* | + | + |
| 40 | Great Tit | *Parus major* | + | + |
| 41 | Himalayan Bulbul | *Pycnonotus leucogenys* | + | + |
| 42 | Red whiskered Bulbul | *Pycnonotus jocosus* | + | |
| 43 | Red vented Bulbul | *Pycnonotus cafer* | + | + |
| 44 | Plain Martin | *Riparia paludicola* | + | |
| 45 | Sand Martin | *Riparia riparia* | + | + |
| 46 | Barn Swallow | *Hirundo rustica* | + | + |
| 47 | Red Rumped Swallow | *Cecropis daurica* | + | |
| 48 | Ashy Prinia | *Prinia socialis* | + | |
| 49 | Plain Prinia | *Prinia inornata* | + | |
| 50 | Tailor Bird | *Orthotomus sutorius* | + | + |
| 51 | Striated Babbler | *Turdoides earlei* | + | |
| 52 | Jungle Babbler | *Turdoides striata* | + | + |
| 53 | Wallcreeper | *Tichodroma muraria* | | + |
| 54 | Bank Myna | *Acridotheres ginginianus* | + | + |
| 55 | Common Myna | *Acridotheres tristis* | + | + |
| 56 | Pied Starling | *Gracupica contra* | + | + |
| 57 | Chestnut-tailed Starling | *Sturnia malabarica* | + | |
| 58 | Blue whistling Thrush | *Myophonus caeruleus* | | + |

| | | | | |
|---|---|---|---|---|
| 59 | Indian Robin | *Saxicoloides fulicatus* | + | + |
| 60 | Oriental magpie Robin | *Copsychus saularis* | + | + |
| 61 | Plumbeous Water Redstart | *Rhyacornis fuliginosa* | | + |
| 62 | White Capped Redstart | *Chaimarrornis leucocephalus* | | + |
| 63 | Pied Bushchat | *Saxicola caprata* | + | + |
| 64 | Common Stonechat | *Saxicola torquata* | + | |
| 65 | Purple Sunbird | *Cinnyris asiaticus* | + | + |
| 66 | Red Avadavat | *Amandava amandava* | + | |
| 67 | White Wagtail | *Motacilla alba* | + | + |
| 68 | Grey Wagtail | *Motacilla cinerea* | + | + |
| 69 | Citrine Wagtail | *Motacilla citreola* | + | |
| 70 | White Browed Wagtail | *Motacilla madaraspatensis* | + | + |
| 71 | Paddyfield Pipit | *Anthus rufulus* | + | |

ANNEXURE - III

**List of Fishes reported from Asan Conservation Reserve (Husain, 2003)**

| Sl. No. | Species |
|---|---|
| | **Class** OSTEICHTHYES |
| | **Order** CYPRINIFORMES |
| | **Family** CYPRINIDAE |
| | **Subfamily** CYPRININAE |
| 1 | *Chagunius chagunio* (Hamilton-Buchanan) **Pathal** |
| 2 | *Labeo dero* (Hamilton-Buchanan) **Kalabans** |
| 3 | *L. dyocheilus* (McClelland) **Boala** |
| 4 | *Puntius carletoni* (Fowler) **Phuti** |
| 5 | *P. chola* (Hamilton-Buchanan) **Phuti** |
| 6 | *P. conchonius* (Hamilton-Buchanan) **Phuti** |
| 7 | *P. sophore* (Hamilton-Buchanan) **Phuti** |
| 8 | *P. tic to* (Hamilton-Buchanan) **Phuti** |
| 9 | *Tor chelynoides* (McClelland) **Kali-machhi** |
| 10 | *T. putitora* (Hamilton-Buchanan) **Mahseer** |
| 11 | *T. tor* (Hamilton-Buchanan) **Makhani** |
| | **Subfamily** RASBORlNAE |
| 12 | *Aspidoparia morar* (Hamilton-Buchanan) **Chal** |
| 13 | *Barilius barna* (Hamilton-Buchanan) **Childi** |
| 14 | *B. bendelisis* (Hamilton-Buchanan) **Chilwa** |
| 15 | *B. vagra* (Hamilton-Buchanan) **Chalra** |
| 16 | *Brachydanio rerio* (Hamilton-Buchanan) **Dharidar** |
| 17 | *Danio devaoir* (Hamilton-Buchanan) **Chand** |
| 18 | *Esomus danricus* (Hamilton-Buchanan) **Chal** |
| 19 | *Parluciosoma daniconius* (Hamilton-Buchanan) **Bhuri** |
| | **Subfamily** SCHlZOTHORACINAE |
| 20 | *Schizothorax richardsonii* (Gray) **Asela** |
| | **Subfamily** GARRINAE |
| 21 | *Crossoochilus latius latius* (Hamilton-Buchanan) **Sakena** |

| | |
|---|---|
| 22 | *Garra gotyla gotyla* (Gray) **Dhanaura** |
| | **Family** BALITORIDAE |
| | **Subfamily** NEMACHEILINAE |
| 23 | *Nemacheilus beavani* (Gunther) **Gadera** |
| 24 | *N. boria* (Hamilton-Buchanan) **Gadera** |
| 25 | *N. corica* (Hamilton-Buchanan) **Gadera** |
| 26 | *N. doonensis* (Tilak & Husain) **Gadera** |
| | **Family** COBITIDAE |
| | **Subfamily** COBITINAE |
| 27 | *Lepidocephalus coudofurcatus* (Tilak & Husain) **Ghiwa** |
| 28 | *L. guntea* (Hamilton-Buchanan) **Ghiwa** |
| | **Order** SILURIFORMES |
| | **Family** BAGRIDAE |
| 29 | *Mystus bleekeri* (Day) **Kater** |
| 30 | *M. vittatus* (Bloch) **Tenngan, Tengara** |
| | **Family** AMBLYCIPITIDAE |
| 31 | *Amblyceps mangois* (Hamilton-Buchanan) **Singhi** |
| | **Family** Bagridae |
| 32 | *Bagarius yarrellii* (Sykes) **Goonch** |
| 33 | *Glyptothorax pectinopterus* (McClelland) **Patharchati** |
| | **Family** HETEROPNEUSTIDAE |
| 34 | *Heteropneustes fossilis* (Bloch) **Singhi** |
| | **Order** CYPRINODONTIFORMERS |
| | **Suborder** EXOCOETOIDEI |
| | **Family** BELONIDAE |
| 35 | *Xenentodon cancila* (Hamilton-Buchanan) **Sua** |
| | **Order** PERCIFORMES |
| | **Suborder** PERCOIDEI |
| | **Family** NANDIDAE |
| | **Subfamily** BADINAE |
| 36 | *Badis badis* (Hamilton-Buchanan) **Chiri, Kali** |
| | **Suborder** CHANNOIDEI |
| | **Family** CHANNIDAE |

| | |
|---|---|
| 37 | *Ophiocephalus gachua* (Hamilton-Buchanan) **Dawla** |
| 38 | *O. punctatus* (Bloch) **Sauli** |
| | **Family** MASTACEMBELIDAE |
| 39 | *Mastacembelus armatus* (Lacepede) **Bam** |
| 40 | *Macrognathus pancalus* (Hamilton-Buchanan) **Bam** |

ANNEXURE - IV

**Ungulate pellet encounter rates**

Dabka River (summer)

| Species | Encounter rate (mining site) | Encounter rate (non-mining site) |
|---|---|---|
| Chital | 4.3(0.4) | 10.2(1.5) |
| Sambar | 4.5(0.2) | 6.8(1.5) |
| Nilgai | 5.7(0.8) | 2.2(0.8) |
| Barking deer | 0.3(0.1) | 0.7(0.3) |
| Wild pig | 0.1(0.1) | 0.3(0.1) |
| Elephant | 0.0 | 0.8(0.1) |

Dabka River (monsoon)

| Species | Encounter rate (mining site) | Encounter rate (non-mining site) |
|---|---|---|
| Chital | 2.4(0.9) | 1.5(0.6) |
| Sambar | 0.7(0.4) | 0.9(0.1) |
| Nilgai | 0.6(0.5) | 0.6(0.4) |
| Barking deer | 0.2(0.2) | 0.0 |
| Wild pig | 0.1(0.1) | 0.1(0.1) |
| Elephant | 0.0 | 1.3(0.6) |

Gola River

| Species | Encounter rate (mining season) | Encounter rate (non-mining season) |
|---|---|---|
| Chital | 5.0(0.9) | 1.1(0.3) |
| Sambar | 6.6(0.8) | 2.9(0.7) |
| Nilgai | 16.0(1.6) | 2.2(1.2) |
| Barking deer | 1.3(0.3) | 0.1(0.1) |
| Wild pig | 2.2(0.6) | 0.8(0.3) |
| Elephant | 0.0 | 0.1(0.1) |

Kosi River

| Species | Encounter rate (mining season) | Encounter rate (non-mining season) |
|---|---|---|
| Chital | 2.9(0.6) | 0.4(0.1) |
| Sambar | 2.8(0.3) | 0.4(0.1) |
| Nilgai | 7.1(1.7) | 0.8(0.3) |
| Barking deer | 0.3(0.2) | 0.0 |
| Wild pig | 0.2(0.1) | 0.3(0.1) |

Nihal River

| Species | Encounter rate (summer) | Encounter rate (monsoon) |
|---|---|---|
| Chital | 3.8(0.7) | 2.9(0.9) |
| Sambar | 5.5(0.9) | 1.5(0.5) |
| Nilgai | 3.1(0.4) | 1.1(0.6) |
| Barking deer | 0.0 | 0.1(0.1) |
| Wild pig | 0.4(0.1) | 0.5(0.3) |
| Elephant | 2.1(0.7) | 0.5(0.3) |

Sharda River

| Species | Encounter rate (monsoon) |
|---|---|
| Chital | 1.1(0.6) |

Kiroda Nullah

| Species | Encounter rate (monsoon) |
|---|---|
| Chital | 1.5(0.4) |
| Sambar | 2.2(0.5) |
| Nilgai | 0.8(0.3) |
| Barking deer | 0.3(0.2) |
| Wild pig | 0.5(0.3) |
| Elephant | 0.9(0.3) |

ANNEXURE - V

**Carnivore sign encounter rates**

Dabka River (summer)

| Species | Encounter rate (mining site) | Encounter rate (non-mining site) |
|---|---|---|
| Tiger | 0.0 | 0.2(0.2) |
| Leopard | 0.3(0.1) | 0.3(0.2) |
| Smaller cats | 0.5(0.1) | 0.2(0.2) |
| Jackal | 0.2(0.2) | 0.0 |

Dabka River (monsoon)

| Species | Encounter rate (mining site) | Encounter rate (non-mining site) |
|---|---|---|
| Tiger | 0.0 | 1.1(0.9) |
| Leopard | 0.2(0.2) | 0.0 |
| Jackal | 0.0 | 0.5(0.1) |

Gola River

| Species | Encounter rate (mining season) | Encounter rate (non-mining season) |
|---|---|---|
| Leopard | 0.3(0.1) | 0.3(0.1) |
| Jackal | 0.4(0.1) | 0.0 |

Kosi River

| Species | Encounter rate (mining season) | Encounter rate (non-mining season) |
|---|---|---|
| Leopard | 0.3(0.1) | 0.1(0.1) |
| Jackal | 0.4(0.1) | 0.3(0.1) |

Nihal River

| Species | Encounter rate (summer) | Encounter rate (monsoon) |
|---|---|---|
| Tiger | 0.5(0.1) | 0.0 |

| | | |
|---|---|---|
| Leopard | 0.8(0.2) | 0.2(0.2) |
| Smaller cats | 0.2(0.1) | 0.0 |
| Jackal | 0.3(0.1) | 0.2(0.1) |

Sharda River

| Species | Encounter rate (monsoon) |
|---|---|
| Jackal | 0.7(0.7) |

Kiroda Nullah

| Species | Encounter rate (monsoon) |
|---|---|
| Leopard | 0.6(0.5) |
| Sloth bear | 0.4(0.3) |
| Smaller cat | 0.1(0.1) |

ANNEXURE – VI

**Guidelines issued by MoEF for extraction of RBM from Gola River.**

F. No. 8-61/1999-FC
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi - 110003.
Dated: 09th February, 2010.

To

The Principal Secretary (Forests),
Forest and Revenue Department,
Government of Uttarakhand,
Dehradun.

Sub: Permission for extraction of minor minerals from Gaula river beds on 1497.00 ha of forest land in Western Circle, Nainital district, Uttarakhand in favour of Uttarakhand Forest Development Nigam.

Sir,

I am directed to refer to Government of Uttarakhand's letter No. 208/1G-2726 (Naini) dated 20th July, 2009 on the above mentioned subject, wherein prior approval of the Central Government for the permission for extraction of minor minerals from Gaula river beds on 1497.00 ha of forest land in Western Circle, Nainital district, Uttarakhand in favour of Uttarakhand Forest Development Nigam, was sought, in accordance with Section 2 of the Forest (Conservation) Act, 1980. This diversion proposal has been examined and approval was issued by the Central Government under Section 3 of the aforesaid Act vide even no dated 12th January, 2010. Now the State Government has sent the compliance vide 2311 /1G-2726 (Naini) dated 29th January, 2010.

2. After careful consideration of the compliance of the State Government of Uttarakhand, the Central Government hereby grant approval for the permission for extraction of minor minerals from Gaula river beds on 1497.00 ha of forest land in Western Circle, Nainital district, Uttarakhand in favour of Uttarakhand Forest Development Nigam, subject to the fulfillment of the following conditions:-

1. The legal status of forest land shall remain unchanged.

2. 25% of revenue realised from disposal of material from river beds shall be spent on river training and treatment of catchment area.

3. Compensatory Afforestation will be raised over **1497.00 ha** of degraded forest land over approved period of 10 years @ 149.7 ha of plantation/treatment each year, from the funds so collected/realised from sale of the materials.

5. Adequate number of temporary check posts will be established at entry and exit points before start of work, and proper record of material collected and removed will be maintained.

6. Extraction of material should be from the middle of the river bed after leaving one-fourth of the river bed on each bank untouched.

7. There shall be no labour camp in the forest area for the labour involved in the extraction work.

8. No explosive shall be used while extracting the material and only hand-tools will be used for the collection of boulders, bajri, etc.

9. Collection time shall be from sun-rise to sun-set.

10. Breaking of boulders will be done outside the forest boundaries.

11. The labourers engaged in collection work will be provided free fuelwood/alternate source of energy to avoid any pressure on adjoining forest areas.

12. There shall be no extraction of material from the river beds during monsoon period, i.e., from June to October each year.

13. The forest area shall not be used for any other purpose other than that specified in the proposal.

14. Detailed proposal for restoration of Gola Elephant Corridor in consultation with ITBP, IOC and Railways shall be submitted.

15. The circumstances under which the forest land transferred to Railways has been given to IOC without prior approval under the Forest (Conservation) Act, 1980 shall be investigated and be reported.

16. A corpus at the disposal of Chief Wild life Warden wherein earning from the extraction of minor minerals should be put in to do work for wildlife

management and forest protection in the area, shall be created within six months.

17. On both sides of the Gola corridor in length of 2.5 km will be excluded from collection of Sand and bajari by the State Forest Corporation as discussed in the FAC. In case of transportation also, the elephant reserve area and corridors should be avoided so that elephants can move freely.

18. The present revenue sharing mechanism shall be revisited to optimise the return to the Forest Department to be ploughed back to the corpus mentioned above.

19. The present permission will be valid for one year during which condition nos. 14, 15, 16, 17 & 18 shall be complied with so that further period can be further considered by FAC.

20. Any other conditions that the CCF(C), Regional Office, Lucknow may impose from time to time in the interest of Afforestation and protection of flora and fauna in that area shall also be valid.

21. All other conditions under different rules, regulations and guidelines including environmental clearance and rehabilitation of tribal and other forest dweller shall be complied with.

Yours faithfully,

(B. K. Singh)
Sr. Assistant Inspector General of Forests

Copy to:
1. The Principal Chief Conservator of Forests, Government of Uttarakhand, Dehradun.
2. The Nodal Officer, Forest Department, Government of Uttarakhand, Dehradun.
3. The Chief Conservator of Forest, Regional Office, Lucknow
4. User Agency
5. Monitoring Cell, Ministry of Environment and Forests
6. Guard File.

(B. K. Singh)
Sr. Assistant Inspector General of Forests

ANNEXURE – VII

## Guidelines on Sustainable mining of minor minerals from MoEF

**Guidelines on Sustainable Mining of Minor Minerals from MoEF Vide D.O. No. Z-11012/3/2009-IA.II (M) dated 1st June, 2010**

**D.O. No. Z-11012/3/2009-IA.II (M)** **June 1st, 2010**

**Subject: Sustainable Mining of Minor Minerals**

As you are aware, the mining of minor minerals has been increasing over the years and this has begun to have significant adverse impact on our ecology. Since there is currently no uniform framework to regulate the mining of minor minerals, my Ministry had constituted a Group under the Chairmanship of Secretary, Ministry of Environment & Forests to evolve guidelines for sustainable mining of minor minerals. The group, after detailed deliberations, had finalized and submitted its report in March 2010. A copy of the report is enclosed for your kind perusal.

Some key recommendations of the group include:

- Minimum size of mine lease should be 5 ha
- Minimum period of mine lease should be 5 years
- A cluster approach to mines should be taken in case of smaller mine leases operating currently
- Mine plans should be made mandatory for minor minerals as well
- A separate corpus should be created for reclamation and rehabilitation of mined out areas
- Hydro-geological reports should be prepared for mining proposed below groundwater table
- For river bed mining, leases should be granted stretch wise, depth may be restricted to 3m / water level, whichever is less, and safety zones should be worked out
- The present classification of minerals into major and minor categories should be re-examined by the Ministry of Mines in consultation with the States

I would request you to examine the report and issue necessary instructions for incorporating the recommendations made in the report in the Mineral Concession Rules for mining of minor minerals, framed by your Government under Section 15 of the Mines and Minerals (Development and Regulation) Act, 1957.

With regards,

Yours sincerely,

Sd-
**(Jairam Ramesh)**

To : All Chief Ministers

# Environmental Aspects of Quarrying of Minor Minerals

## Report of the Group

**March, 2010**

**Government of India**
**Ministry of Environment & Forests**
**New Delhi**

**Contents**

**Environmental aspects of quarrying of minor minerals – Evolving of Model Guidelines**

**1.0 Background:**

Mines and Minerals (Development & Regulation) Act, 1957, under Section 15, empowers the State Governments to make rules in respect of minor minerals. There have, however, been reports regarding adverse impacts on lakes, river beds and groundwater due to quarrying / mining of minerals. Concerns have therefore been raised to address the issues and evolve guidelines for sustainable mining of minor minerals. It has also been felt that while proposals for mining of major minerals typically undergo rigorous environment impact assessment and environmental clearance procedure, less attention has been given to environmental aspects of mining of minor minerals.

While Environment Impact Assessment Notification, 1994 did not apply to mining of minor minerals; however, realizing the potential of such projects to adversely affect the different components of environment, minor minerals were brought under the ambit of the new re-engineered Environment Impact Assessment Notification, 2006. As per the provisions of this Notification, mining of minerals with lease area of 5 ha and above require prior environmental clearance under the provisions thereof.

**2.0 Constitution of the Group:**

Ministry of Environment & Forests vide order dated 24th March, 2009 had constituted a Group under the Chairmanship of Secretary (E&F) to look into the environmental aspects associated with mining of minor minerals. A copy of the said order is at Annexure-I.

The terms of reference of the Group so constituted are as under:

(i) To consider the environmental aspects of mining of minor minerals (quarrying as well as river bed mining) for their integration into the mining process.

(ii) Specific safeguard measures required to minimize the likely adverse impacts of mining on environment with specific reference to impact on water bodies as well as groundwater so as to ensure sustainable mining.

(iii) To evolve model guidelines so as to address mining as well as environmental concerns in a balanced manner for their adoption and implementation by all the mineral producing States.

**3.0 Working of the Group:**

The ~~Committee~~ *Group* held its meeting on 7th July, 2009, wherein the issues relating to mining of minor minerals were brought out and deliberated. All the members / participants were requested to send their views / comments / inputs on the issues so identified. The minutes of the meeting are at Annexure-II. Based on the discussion held during the meeting and the subsequent inputs received, a draft report was prepared and circulated to all the members for their inputs. The report was further discussed during the meeting of the Group on 29th January, 2010 for its finalization. The observations / comments made during the meeting were incorporated in the report and again circulated to all the members for their concurrence. Based on the inputs received on the draft so circulated, the report has been finalized.

**4.0 Issues and Recommendations:**

**4.1 Definition of Minor Mineral:**

The term minor mineral is defined in clause (e) of Section 3 of MMDR Act, 1957 as "minor mineral means building stones, gravel, ordinary clay, ordinary sand other than sand used for prescribed purposes and any other mineral which the Central Government may, by Notification in the Gazette of India declare to be a minor mineral". The term

'ordinary sand' used in clause (e) of Section 3 of the MMDR Act, 1957 has been further clarified in rule 70 of the MCR, 1960 as "sand shall not be treated as minor mineral when used for any of the following purposes namely; (i) purposes of refractory and manufacture of ceramic, (ii) metallurgical purposes, (iii) optical purposes, (iv) purposes of stowing in coal mines, (v) for manufacture of silvicrete cement, (vi) manufacture of sodium silicate and (vii) manufacture of pottery and glass.

Additionally, the Central Government has declared the following minerals as minor minerals: (i) boulder, (ii) shingle, (iii) chalcedony pebbles used for ball mill purposes only, (iv) limeshell, kankar and limestone used in kilns for manufacture of lime used as building material, (v) murrum, (vi) brick-earth, (vii) fuller's earth, (viii) bentonite, (ix) road metal, (x) reh-matti, (xi) slate and shale when used for building material, (xii) marble, (xiii) stone used for making household utensils, (xiv) quartzite and sandstone when used for purposes of building or for making road metal and household utensils, (xv) saltpeter and (xvi) ordinary earth (used or filling or leveling purposes in construction or embankments, roads, railways, building).

It may thus be observed that minerals have been classified into major and minor minerals based on their end use rather than level of production, level of mechanization, export and import etc. There do exist some minor mineral mines of silica sand and limestone where the scale of mechanization and level of production is much higher than those of industrial mineral mines. Further, in terms of the economic cost and revenue, it has been estimated that the total value of minor minerals constitutes about 10% of the total value of mineral production whereas the value of non metallic minerals comprises only 3%. It is, therefore, evident that the operation of mines of minor minerals need to be subjected to ~~similar~~ *some* regulatory parameters as that of mines of major minerals.

Further, unlike India there does not exist any such system based on end usage in other countries for classifying minerals into major and minor categories. Thus, there is a need to relook at the definition of "minor" minerals per se.

**It is, therefore, recommended that Ministry of Mines along with Indian Bureau of Mines, in consultation with the State Governments may re-examine the classification of minerals into major and minor categories so that the regulatory aspects and environment mitigation measures are appropriately integrated for ensuring sustainable and scientific mining with least impacts on environment.**

### 4.2 Size of the Mine Lease:

Area for grant of mine lease varies from State to State. Maximum area which can be held under one or more mine lease is 2590 ha or 25.90 sq. miles in Jammu & Kashmir. Rajasthan prescribed a minimum limit of 1 ha for a lease. Maximum area prescribed for permit is 50x50 m. In most of the States area of permit is not specified in the rules. It has recently been observed by Punjab and Haryana High Court in its order dated 15.5.2009 that State Government are apparently granting short term permits by dividing the mining area into small zones in effect avoids environmental norms.

There is, thus a need to bring uniformity in the extent of area to be granted for mine lease so as to ensure that eco friendly scientific mining practices can be adopted. **It is recommended that the minimum size of mine lease should be 5 ha. Further, preparation of comprehensive mine plan for contiguous stretches of mineral deposits by the respective State Governments may also be encouraged. This may suitably be incorporated in the Mineral Concession Rules, 1960 by Ministry of Mines.**

### 4.3 Period of Mine Lease:

The period of lease varies from State to State depending on type of concessions, minerals and its end use. The minimum lease period is one year and maximum 30 years. Minerals like granite where huge investments are required, a period of 20 years

is generally given with the provisions of renewal. Permits are generally granting for short periods which vary from one month to a maximum one year. In States like Haryana, minor mineral leases are auctioned for a particular time period. Mining is considered to be capital intensive industry and considerable time is lost for developing the mine before it attains the status of fully developed mine. If the tenure of the mine lease is short, it would encourage the lessee to concentrate more on rapid exploitation of mineral without really undertaking adequate measures for reclamation and rehabilitation of mined out area, posing thereby a serious threat to the environment and health of the workers and public at large.

There is thus, a need to bring uniformity in the period of lease. **It is recommended that a minimum period of mine lease should be 5 years, so that eco friendly scientific and sustainable mining practices are adopted. However, under exceptional circumstances arising due to judicial interventions, short term mining leases / contracts could be granted to the State Agencies to meet the situation arising there from.**

**4.4—Cluster of Mine Approach for Small Sized Mines:**

Considering the nature of occurrence of minor mineral, economic condition of the lessee and the likely difficulties to be faced by Regulatory Authorities in monitoring the environmental impacts and implementation of necessary mitigation measures, **it may be desirable to adopt cluster approach in case of smaller mine leases being operated presently. Further, these clusters need be provided with processing/crusher zones for forward integration and minimizing excessive pressure on road infrastructure. The respective State Governments / Mine Owners Associations may facilitate implementation of Environment Management Plans in such cluster of mines.**

**4.5 Requirement of Mine Plan for Minor Minerals:**

At present most of the State Governments have not made it mandatory for preparation of mining plan in respect of minor minerals. In some States like Rajasthan, eco friendly mining plans are prepared, which are approved by the State Mining Department. The eco friendly mining plan so prepared, though conceptually welcome, are observed to be deficient and need to be made comprehensive in a manner as is being done for major minerals. Besides, the aspects of reclamation and rehabilitation of mined out areas, progressive mine closure plan, as in vogue for major minerals could be introduced for minor minerals as well.

**It is recommended that provision for preparation and approval of mine plan, as in the case of major minerals may appropriately be provided in the Rules governing the mining of minor minerals by the respective State Governments. These should specifically include the provision for reclamation and rehabilitation of mined out area, progressive mine closure plan and post mine land use.**

**4.6 Creation of Separate Corpus for Reclamation / Rehabilitation of Mines of Minor Minerals:**

Mining of minor minerals, in our country, is by and large unorganized sector and is practiced in haphazard and unscientific manner. At times, the size of the leasehold is also too small to address the issue of reclamation and rehabilitation of mined out areas. It may, therefore, be desirable that before the concept of mine closure plan for minor minerals is adopted, the existing abandoned mines may be reclaimed and rehabilitated with the involvement of the State Government. **There is thus, a need to create a separate corpus, which may be utilized for reclamation and rehabilitation of mined out areas. The respective State Governments may work out a suitable mechanism for creation of such corpus on the 'polluter pays' principle. An**

**organizational structure may also need to be created for undertaking and monitoring these activities.**

### 4.7 Depth of Mining:

Mining of minerals, whether major or minor have a direct bearing on the hydrological regime of the area. Besides, affecting the availability of water as a resource, it also affects the quality of water through direct run of going into the surface water bodies and infiltration / leaching into groundwater. Further, groundwater withdrawal, dewatering of water from mine pit and diversion of surface water may cause surface and sub surface hydrologic systems to dry up. An ideal situation would require that quarrying should be restricted to unsaturated zone only above the phreatic water table and should not intersect the groundwater table at any point of time. However, from the point of view of mineral conservation, it may not be desirable to impose blanket ban on mining operation below groundwater table.

**It is, therefore, recommended that detailed hydro-geological report should be prepared in respect of any mining operation for minor minerals to be undertaken below groundwater table. Based on the findings of the study so undertaken and the comments / recommendations of Central Ground Water Authority / State Ground Water Board, a decision regarding restriction on depth of mining for any area should be taken on case to case basis.**

### 4.8 Uniform Minor Mineral Concession Rules:

The economic value of the minor minerals excavated in the country is estimated to contribute to about 9% of the total value of the minerals whereas the non metallic minerals contribute to about 2.8%. Keeping in view the large extent of mining of minor

minerals and its significant potential to adversely affect the environment, **it is recommended that Model Mineral Concession Rules may be framed for minor minerals as well and the minor minerals may be subjected to a simpler regulatory regime, which is, however, similar to major minerals regime.**

### 4.9 River Bed Mining:

4.9.1 Environment damage being caused by un regulated river bed mining of sand, bazari and boulders is attracting considerable attention including in the courts. The following recommendations are therefore made for river bed mining.

(a) **In the case of mining leases for river bed sand mining, specific river stretches should be identified and mining permits / lease should be granted stretch wise, so that the requisite safeguard measures are duly implemented and are effectively monitored by the respective Regulatory Authorities.**

(b) **The depth of mining may be restricted to 3 m / water level, whichever is less.**

(c) **For carrying out mining in proximity to any bridge and/ or embankment, appropriate safety zone should be worked out on case to case basis, taking into account the structural parameters, locational aspects, flow rate etc. and no mining should be carried out in the safety zone so worked out.**

### 5.0 Conclusion:

Mining of minor minerals, though individually, because of smaller size of mine leases is perceived to have lesser impact as compared to mining of major minerals. However, the activity as a whole is seen to have significant adverse impacts on

environment. It is, therefore, necessary that the mining of minor minerals is subjected to simpler but strict regulatory regime and carried out only under an approved framework of mining plan, which should provide for reclamation and rehabilitation of the mined out areas. Further, while granting mining leases by the respective State Governments, location of any eco-fragile zone(s) within the impact zone of the proposed mining area, the linked Rules / Notifications governing such zones and the judicial pronouncements, if any, need be duly noted. The Union Ministry of Mines along with Indian Bureau of Mines and respective State Governments should therefore make necessary provisions in this regards under the Mines and Minerals (Development and Regulation) Act, 1957, Mineral Concession Rules, 1960 and adopt model guidelines to be followed by all the States.

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**Annexure-I**

No. Z-11012/3/2009-IA.II(M)
Government of India
Ministry of Environment and Forests

Paryavaran Bhavan
CGO Complex, Lodi Road,
New Delhi-110003

**Dated: 24th March, 2009**

**ORDER**

**Sub: Environmental aspects of quarrying of mining minerals – Evolving of Model Guidelines.**

Cases have been coming to light from various parts of the country regarding damage to lakes, river beds and groundwater leading to drying up of water beds and causing water scarcity on account of quarry / mining leases and mineral concessions granted under the Mineral Concession Rules framed by the State Governments under Section 15 of the Mines and Minerals (Development and Regulation) Act, 1957. It appears that there is less attention on environmental aspects of mining of minor minerals as the leases / concessions individually are considered to have relatively small impact, although their collective impact in a particular area over a period of time may be significant.

In the above background, it has been decided to constitute a Group under the Chairmanship of Secretary (E&F) to look into the environmental aspects associated with mining of minor minerals. The composition of the Group is as under:-

| | | | |
|---|---|---|---|
| 1. | Secretary (E&F) | - | Chairman |
| 2. | Representative of M/o Mines | - | Member |
| 3. | Representative of M/o Water Resources | - | Member |
| 4. | Representative of CGWA | - | Member |
| 5. | Secretary (Env.), Govt. of Rajasthan | - | Member |
| 6. | Secretary (Mines), Govt. of Rajasthan | - | Member |

| | | | |
|---|---|---|---|
| 7. | Secretary (Env.), Govt. of Haryana | - | Member |
| 8. | Secretary (Mines), Govt. of Haryana | - | Member |
| 9. | Secretary (Mines), Govt. of Jharkhand | - | Member |
| 10. | Secretary (Env.), Govt. of Uttarakhand | - | Member |
| 11. | Secretary (Mines), Govt. of Chhattisgarh | - | Member |
| 12. | Secretary (Env.), Govt. of Karnataka | - | Member |
| 13. | Secretary (Mines), Govt. of Tamil Nadu | - | Member |
| 14. | Secretary (Env.), Govt. of Gujarat | - | Member |
| 15. | IGF (FC), MoEF | - | Member |
| 16. | Advisor (NB), MoEF | - | Member Secretary |

2. The terms of reference of the proposed Group will be as under:

(i) To consider the environmental aspects of mining of minor minerals (quarrying as well as river bed mining) for their integration into the mining process.

(ii) Specific safeguard measures required to minimize the likely adverse impacts of mining on environment with specific reference to impact on water bodies as well as groundwater so as to ensure sustainable mining.

(iii) To evolve model guidelines so as to address mining as well as environmental concerns in a balanced manner for their adoption and implementation by all the mineral producing States.

3. The tenure of the Group will be for 6 months or till the Group submits its report / recommendations whichever is earlier. The Group may submit interim report, if so decided.

4. The Chairman of the Group may co-opt / invite any other Expert for the meeting as it may deem appropriate.

This issues with the approval of the competent authority.

Sd/-..
(Dr. S.K. Aggarwal)
Director

**To**

1. PPS to Secretary (E&F)

2. The Secretary, Ministry of Mines, Shastri Bhawan, New Delhi with a request to nominate a suitable Officer for the Group.
3. The Secretary, Ministry of Water Resources, Shram Shakti Bhawan, Rafi Marg, New Delhi with a request to nominate a suitable Officer for the Group.
4. The Secretary, Central Ground Water Authority (CGWA), Kasturba Gandhi Marg, New Delhi with a request to nominate a suitable Officer for the Group.
5. The Secretary (Environment), Govt. of Rajasthan, Secretariat, Govt. of Rajasthan, Jaipur-302 005.
6. The Secretary (Mines), Govt. of Rajasthan, Secretariat, Govt. of Rajasthan, Jaipur-302 005.
7. The Secretary (Environment), Govt. of Haryana, Secretariat, Chandigarh.
8. The Secretary (Mines), Govt. of Haryana, Secretariat, Chandigarh.
9. The Secretary (Mines), Govt. of Jharkhand, Secretariat, Ranchi.
10. The Secretary (Environment), Govt. of Uttarakhand, Secretariat, Dehradun.
11. The Secretary (Mines), Govt. of Chhattisgarh, Secretariat, Raipur.
12. The Secretary (Environment), Govt. of Karnataka, Secretariat, Bangalore.
13. The Secretary (Mines), Govt. of Tamil Nadu, Secretariat, Chennai.
14. The Secretary (Environment), Govt. of Gujarat, Sachivalaya, Gandhi Nagar.
15. IGF (FC), MoEF
16. Advisor (NB), MoEF

**Copy for information to:-**

1. PS to Principal Secretary to Prime Minister
2. PS to MOS (E)
3. PS to AS (JMM)

Annexure-II

Ministry of Environment & Forests
(IA Division)
*****

**Sub: Summary record of the 1st Meeting of the Group to evolve model guidelines regarding environmental aspects of quarrying of minor minerals.**

The first meeting of the Group constituted to evolve model guidelines regarding environmental aspects of quarrying of minor mineral was held on 7th July, 2009 at Paryavaran Bhawan, New Delhi under the Chairmanship of Shri Vijai Sharma, Secretary (E&F). The list of participants is annexed.

Welcoming all the participants, the Secretary (E&F) & the Chairman of the Group briefly highlighted the genesis for constituting the said Group. The Chairman said that while projects relating to major minerals are subjected to detailed EIA process; however, the projects relating to minor minerals, although covered under the provisions of the EIA Notification, 2006, do not address the environmental concerns and issues comprehensively. He pointed out that quarrying / mining of minor minerals have a potential to have significant adverse impact on river beds and groundwater leading to drying up of water beds. He further observed that individual mines of minor minerals, being small in size may have insignificant impacts; however, their collective impacts, taking into consideration various mines on a regional scale may have significant adverse impacts. Having recognized the potential environmental issues associated with mining of minor minerals, the said Group has been constituted. It was also brought out by the Chairman, in his opening remarks that some of the members have sent their inputs which have been collated. It would, therefore be necessary to consider these inputs and brainstorm on the various issues and come out with a comprehensive list of issues which could be deliberated in depth and discussed to find a way forward for evolving guidelines, which could be adopted and followed by all the States / UTs to address the environmental concerns for ensuring sustainable and scientific mining of minor minerals.

After the opening remarks of Chairman, a presentation was made by Director (Mining), Ministry of Environment & Forests, which highlighted the genesis of constitution of the Group, its terms of reference, the issues brought out in the inputs received from various members of the Group and based on their input and the experience and expertise available in house, the possible issues for consideration of the Group were brought out.

The issues so brought out inter-alia included; (i) the need to relook the definition of minor mineral, (ii) minimum size of lease for adopting eco friendly scientific mining practices, (iii) period of lease, (iv) cluster of mine approach for addressing and implementing EMP in case of small mines, (v) depth of mining to minimize adverse impact on hydrological regime, (vi) requirement of mine plan for minor minerals, similar to major minerals, and (vii) reclamation of mined out area, post mine land use, progressive mine closure plan etc.

The issues were deliberated and discussed by all the participants present during the meeting. The Chairman requested all the participants to send their views comments and inputs on the various issues discussed during the meeting as also on any additional issue relevant to the subject within 15 days so that a draft report could be prepared and circulated to all the members for their consideration and discussion thereafter before its finalization. All the participants agreed to send their inputs within a week to 10 days.

The meeting ended with a vote of thanks to the Chair.

******

**Annexure**

**List of Participants**

1. Shri Vijai Sharma, Secretary (E&F) - Chairman
2. Shri J.M. Mauskar, Additional Secretary, MoEF
3. Shri A.R. Singh, CCF(Environment), Govt. of Uttarakahnd
4. Shri Sankatha Prasad, Additional Secretary, Govt. of Rajasthan
5. Shri V.N. Baitha, Addl. Director (Mines), Govt. of Jharkhand
6. Dr. V.K. Joshi, A.S.O. UEPPCB, Dehradun
7. Shri Ravinder Kumar, CCF, Govt. of Uttarakhand
8. Shri Kanwerpal , Secretary (Ecology & Env), Govt. of Karnataka
9. Shri V.K. Mishra, Joint Director, Directorate of Geology & Mining, Govt of Chhattisgarh.
10. Shri Ram Mohan Mishra, Joint Secretary, M/o Water Resources, New Delhi
11. Shri R.K. Sinha, Controller of Mines, Indian Bureau of Mines, Nagpur
12. Shri B.R.K. Ranga, Govt. of Rajasthan
13. Shri S. Bhattacharya, Scientist D, Central Ground-Water Authority, New Delhi
14. Ms Mythili K. Rajendran, Deputy Secretary (Mines), Industries Department, Govt. of Tamil Nadu
15. Shri Radhe Shyam, Scientist (Env), Govt. of Haryana
16. Dr. S.K. Nanda, Principal Secretary, Govt. of Gujarat
17. Shri Pravesh Sharma, State Mining Engineer, Mines & Geology Department, Govt. of Haryana
18. Dr. Nalini Bhat, Advisor, MoEF
19. Dr. S.K. Aggarwal, Director, MoEF

*****

ANNEXURE – VIII

**Guidelines issued by MoEF for extraction of RBM from Gola River**



Pg. 1-17/Corr.

F. No. 8-61/1999 - FC
Government of India
Ministry of Environment & Forests
(FC Division)

Paryavaran Bhawan,
CGO Complex,
Lodhi Road, New Delhi-110 003
Dated: 8th April, 2011.

To,

The Principal Secretary (Forests)
Forest and Revenue Department,
Government of Uttarakhand,
Dehradun

Sub: Proposal to obtain prior approval of the Central Government under the Forest (Conservation) Act, 1980, for collection of stone, boulders and other *minor minerals* from 1497 ha. area in river bed of Gola river for a period of ten years by the Uttarakhand Forest Development Corporation.

Sir,

I am directed to refer to the Addl. Principal Chief Conservator of Forests & the Nodal Officer, Forest (Conservation) Act, 1980, Government of Uttrakhand's letter No. 208/ IC-2726 (Naini) dated 20.07.2010 on the above mentioned subject seeking prior approval of the Central Government under Section-2 of the Forest (Conservation) Act, 1980 and to say that the said proposal has been examined by the Forest Advisory Committee constituted by the Central Government under Section-3 of the aforesaid Act.

2. After careful consideration of the proposal of the State Government of Orissa and on the basis of the recommendations of the Forest Advisory Committee, the Central Government hereby accords **stage-I** approval of the Central Government under the Forest (Conservation) Act, 1980 for collection of minor minerals from **1497 ha.** (to be further verified after receipt of actual area calculation and map from the state Government of Uttarakhand) **forest land located in river bed of Gola river, till the end of the next working season** (*i.e. till 31.05.2012*), *subject to* the fulfilment of the following conditions:

(i) Legal status of the diverted forest land shall remain unchanged;

(ii) Compensatory afforestation over the degraded forest land double in extent to the forest land being diverted shall be raised and maintained by the State Forest Department at the cost of the User Agency;

(iii) The User Agency shall transfer the cost of raising and maintaining the compensatory afforestation, at the current wage rate, to the State Forest Department;

(iv) The State Government shall charge the Net Present Value (NPV) of the forest area diverted under this proposal from the User Agency as per the Orders of the hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 05.02.2009 in this regard, if the same has not been paid so far;

(v) At the time of payment of the Net Present Value (NPV) at the present rate, the User Agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India;

(vi) All the funds received from the User Agency under the project shall be transferred to Ad-hoc CAMPA in Account Number CA 01001580 of the Corporation Bank, CGO Complex, Lodhi Road, New Delhi;

(vii) The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required, as per the provisions of the Environmental (Protection) Act, 1986;

(viii) The State Government and the user agency shall work with local residents of Bindu Katha to give safe and interrupted passage to the wild animals passing through the Gola corridor, expedite payment of compensation in case of any damage to property etc. and generally increase awareness of the methods of co-existence of man and wildlife;

(ix) The State Government shall not allow any new facility/ structure within the Gola corridor to ensure its restoration in future. The State Government shall also ensure that the boundary of the ITBP battalion headquarters be shifted towards south so as to ensure that it is located entirely on southern side of the Gola corridor and that the corridor is maintained free of fresh obstructions from the Highway/ Railway line upto the Bindu Katha settlement;

(x) To eliminate disturbance from collection of minor minerals on movement of wild animals along the Gola corridor, collection of minor minerals in a 2.50 km long stretch of the river bed located on the Gola corridor shall be prohibited;

(xi) The State Government shall assess the exact area of portion of the forest land identified for collection of minor mineral after excluding the said 2.50 km long stretch located on both sides of the Gola corridor and shall before issue of final approval intimate the same to the Ministry of Environment & Forests along with a duly authenticated Survey of India toposheet, in original, in 1:50,000 scale indicating the boundary of the forest land identified for collection of minor mineral and the said 2.50 km long no collection zone;

(xii) To ensure long term survival of the wildlife in the important habitats located on Northern side of the Ramnagar - Haldwani State Highway the State Government shall initiate appropriate measures to improve conservation status of the areas such as Pawalgarh and Nandhor by notifying them as Wildlife Sanctuaries. This should be done in the time bound manner before applying for further extension of this permission;

(xiii) The State Government shall constitute a committee under Chairmanship of the Principal Chief Conservator of Forests, Government of Uttarakhand and having the representative of the Ministry of Environment & Forests, Wildlife Institute of India, Central Soil & Water Conservation Research & Training Institute, Dehradun and NGOs such as Sanskara, WWF-India, WTI, IUCN etc. as its members to review annually the status of compliance of the stipulated conditions and issue appropriate direction to the user agency in case of any deviation as well as any hazard due to non-removal of minor minerals from the protected corridor;

(xiv) To ensure extraction of minor minerals in a sustainable manner the user agency shall formulate a transparent and unbiased procedure to engage labourers for extraction of the minor minerals from the forest land proposed for diversion;

(xv) Fifty percent of the net profit earned by the user agency from the collection of minor minerals shall be deposited to a Special Purpose Vehicle (SPV) to be constituted by the State Government under the Chairmanship of the Chief Wildlife Warden, Government of Uttarakhand. The amount to be deposited in the SPV shall be used exclusively for river training activities and management & protection of forest & wildlife in vicinity of forest land diverted for collection of minor minerals;

(xvi) The total quantity of minor minerals extracted during a year shall not be more than 54.25 lakh cubic meter;

(xvii) Extraction of minor minerals shall be restricted to the middle half of the of the width of river bed after leaving intact one-fourth of width of the river bed along its each bank;

(xviii) To ensure maintenance of river geometry, collection of minor minerals during a working season shall start from centre of the river width and shall gradually extend to the boundary of the permissible area. The maximum permissible depth for collection of minor minerals at centre of the river width shall be limited to 3m and it shall gradually be reduced till it reaches boundary of the permissible zone;

(xix) To regulate and maintain record of the quantity of minor minerals extracted during a season, the State Forest Department shall set up adequate number of check posts during the collection season;

(xx) Extraction of minor mineral shall be restricted from 1st October to 31st May of the subsequent year. The present permission covers the working period up to 31st May 2011, and subsequently from 1st October 2011 to 31st May 2012, after which the matter will be considered again by the FAC, on application and receipt of compliance;

(xxi) Minor minerals shall be collected by manually by using hand tools. Use of explosive and heavy machineries for breaking/collection of minor minerals shall be strictly prohibited;

(xxii) Collection time shall be from sun-rise to sun-set;

(xxiii) No labour camp shall be set up in the forest area for the labourers engaged in collection of the minor minerals;

(xxiv) Breaking of boulders shall be undertaken outside the forest boundaries;

(xxv) The labourers engaged in collection work shall be provided free of cost, fuel wood/alternate source of energy to avoid any pressure on adjoining forests;

(xxvi) The boundary of the forest land being diverted shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, DGPS coordinates, forward and back bearing, and distance from adjoin pillars etc.

(xxvii) The forest land shall not be used for any purpose other than that specified in the proposal;

(xxviii) The State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence as prescribed by this Ministry in it's letter No. 11-9/1998-FC (pt.) dated 03.08.2009, in support thereof;

(xxix) Any other condition that the Central Regional Office of this Ministry, Lucknow and the State Government of Uttarakhand may stipulate, from time to time, in the interest of conservation, protection and development of forests & wildlife; and

(xxx) The User Agency and the State Government shall ensure compliance to provisions of the all Acts, Rules, Regulations and Guidelines, for the time being in force, as applicable to the project.

3. After receipt of a report on compliance to the conditions stipulated in Paragraph -2 above, from the State Government of Uttarakhnad, final/stage-II approval of the Central Government, in accordance with section 2 of the Forest (Conservation) Act, 1980, will be issued

by this Ministry. Till receipt of the said final/ stage-II approval of the Central Government from this, transfer of the said forest land to the User Agency shall not be affected by the State Government.

Yours faithfully

(H.C. Chaudhary)
Assistant Inspector General of Forests

Copy to:

1. The Principal Chief Conservator of Forests, Government of Uttarakhand, Dehradun.
2. The Nodal Officer, Forest Department, Government of Uttarakhand, Dehradun.
3. The Chief Conservator of Forest, Regional Office, Lucknow.
4. User Agency.
5. Monitoring Cell, Ministry of Environment and Forests.
6. Guard File.

(H. C. Chaudhary)
Assistant Inspector General of Forests

ANNEXURE – IX

**A brief assessment of mining in the rivers of Uttarakhand by WWF-India**

## Mining in the rivers of Uttarakhand: A brief assessment by WWF-India

**August 2011**

WWF-India's field team in the state of Uttarakhand conducted a rapid survey to assess the mining situation in the rivers of Uttarakhand in mid-2011. Though legal mining operations are presently closed due to the monsoon, some illegal mining continues across the year. This brief report covers five important rivers in the Terai Arc Landscape.

**Kosi River**

Here mining was reportedly allowed only in downstream areas beyond Ramnagar town keeping wildlife movement in consideration. Though in the upper catchment no legal mining is permitted, some resort owners and villagers do extract sand and boulders illegally from the river bed whenever required for their own construction purposes. The extraction and its disturbance in lower catchment falling in the Ramnagar range of the Terai West Forest Division does not have a major implication on wildlife movement as the wildlife corridor falls in the upper catchment of the Kosiriver in the Ramnagar Forest Division. The corridor is functional both for tiger and elephant beyond the Sundarkhal settlement till Kumeria as kills and crop raids have been reported from the villages around the Kosi river.

**Dabka River**

Here sand and boulder extraction was seen in the middle of the corridor. This is most likely to obstruct wildlife movement due to the presence of large number of labourers both during day and night who are staying in temporary hutments along the corridor. However, since the past two years mining has been banned in the upper catchment of Dabka, as a result of which wildlife movement is once again seen in that area. Tiger and elephant signs can be seen within 200m of the Dabka bridge. This corridor is functional from the Dabka bridge till Dehchauri gate. Presently mining is permitted 2 km downstream of the bridge around *Jwalavan* in South Gaibua beat of the Bailparo range under the Terai WestForest

Division.

**Nihaal River**

Mining for commercial purposes is not done here. It is allowed for local people for their own requirements on specific permits issued by the state forest department. However, some mining for commercial purposes is reported from this area and it falls in the heart of the Nihaal-Bhakhra wildlife corridor. Illegal mining has been the major cause of deterioration of this corridor. Movement of tiger and elephant has been very less in the recent times in the corridor. During 2011, we haven't received any report of elephants crossing Baur river till date.

**Gola River**

Here mining has been continuing in an approximately 29km long stretch between Haldwani to Lalkuwan except the 2km stretch adjacent to the Gola wildlife corridor. Frequent crop raiding by elephant herds near this corridor has been reported in the local newspapers in recent times. Though elephant and tiger signs have not been reported from this corridor, leopards and ungulates have been found using this corridor.

**Sharda River**

Here mining is being carried out at an area parallel to the Tanakpur town adjacent to the Boom-Bhramdev corridor. As a result of this, 60% of the small islands which were habitat corridors of tiger and elephants between Boom to Bhramdev have been lost. A couple of years back Sharda Range had around 43 islands out of which only 15 are left presently. These islands have been lost due to intensive mining. Also the proposed extension of mining areas upto the Kirodanullah will have significant many negative impacts on wildlife movement in this corridor, sand and boulder mining should not be allowed there.

**Conclusion**

Encounter rate of tiger was maximum in the Kosi river corridor followed by the Dabka and Nihal rivers. Prey species diversity was also comparatively high in the Kosi river corridor. Elephant

presence was considerable in Dabka and Nihal area. Based on the above-mentioned findings, WWF suggests that –

Mining should not be allowed in any wildlife corridor. If at all mining is considered essential, it should be done in the downstream areas where there are low impacts on the corridors and wildlife movement.

Mining labourers should not be allowed to camp on the river beds, as they work during the days and occasionally go on hunting wild animals during night. The construction of temporary settlements also blocks wildlife movement along the corridors.

Results of the sign surveys carried in the selected wildlife corridors during August is attached in the appendix.

## Appendix I

Wildlife sign surveys were carried out in the wildlife corridors along Kosi, Dabka and Nihal rivers. A distance of 10km each in Kosi & Dabka and 6km in Nihaal was walked by two teams. Though surveys along Kosi could not be conducted because of the flood, the seasonal streams perpendicular to the Kosi were walked for a distance of 2km each in Sukha sot, Teda sot, Bangajhala, Jhajjarand Janerianalla (Table 1). Two trails of 5km each were walked along Dabka from Chhoibridge to Kyari and Kyari to Pawalgarh while one trail of 6km was walked in Nihaal by the team. During the surveys, indirect evidences like tracks, pellets, scats and dung piles of wild and domestic animals were recorded on a datasheet following the NTCA guidelines for sign surveys. Encounter rates for each species were calculated by pooling the data corridor wise, which are presented below (Fig. 1, 2 & 3).

| Corridor's name | Track ID | Latitude (beginning) | Longitude (beginning) | Latitude (ending) | Longitude (ending) |
|---|---|---|---|---|---|
| Kosi | Janeria sot | 29 26 53.7 | 78 09 03.5 | 29 26 57.2 | 78 10 03 .5 |
| Kosi | Bangajhala sot | 29 27 58.8 | 78 09 17.7 | 29 28 30.3 | 78 10 13.4 |
| Kosi | Sukha sot | 29 23 59.1 | 79 09 15.6 | 29 23 59.9 | 79 09 13.0 |
| Kosi | Teda sot | 29 25 22.7 | 79 08 41.8 | 29 25 26.1 | 79 09 49.8 |
| Kosi | Jhajjar sot | 29 29 37.1 | 79 08 39.5 | 29 30 09.1 | 79 09 28.1 |
| Dabka | Bridge to Kyari | 29 20 49.3 | 79 09 9.2 | 29 21 33.5 | 79 11 53.4 |
| Dabka | Kyari to Pawalgarh | 29 21 30.4 | 79 11 45.5 | 29 22 03.3 | 79 14 21.1 |
| Nihal | NihalNalla | 29 17 41.7 | 79 22 24.3 | 29 14 43.1 | 79 21 47.4 |

Table 1: Geo-coordinates and details of survey tracks

### Kosi River

Here the encounter rates of tiger and elephant was 0.5/km and 0.2/km respectively. Encounter rate of spotted deer was found to be the highest among the wild prey. Cattle and domestic dogs were also encountered. Four labourers were found loading boulders on a tractor from the Sukha sot. Such incidences were also regularly witnessed in this area along the right bank of the Kosi river near the Janerianalla and Bangajhala during the camera trapping exercise carried out by WWF-India between December 2010 and January 2011.

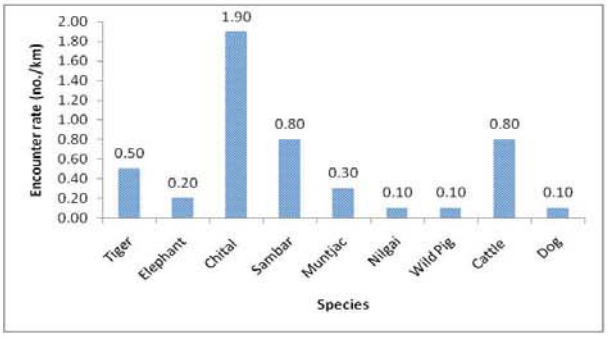


Figure 1: Encounter rate of signs of wild and domestic animals along the Kosiriver corridor

**Dabka River**

Here encounter rate for tiger, leopard and elephant was calculated to be 0.2/km, 0.1/km and 0.5/km respectively. Among the prey species, sambar was encountered more frequently.

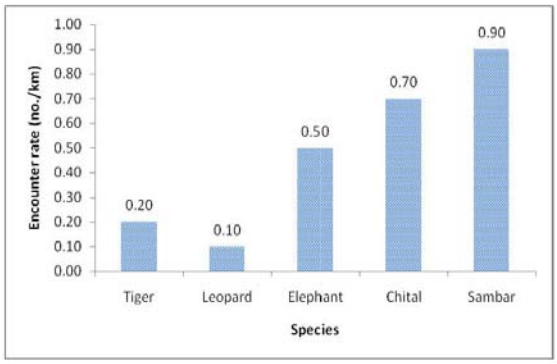


Fig. 2: Encounter rate (no./km) of carnivores and herbivores in Dabka River

**Nihal River Corridor**

Tiger encounter rate was calculated to be 0.17/km while elephant signs were encountered more frequently in this corridor. Among prey species sambar was encountered to be the highest 0.83/ km.

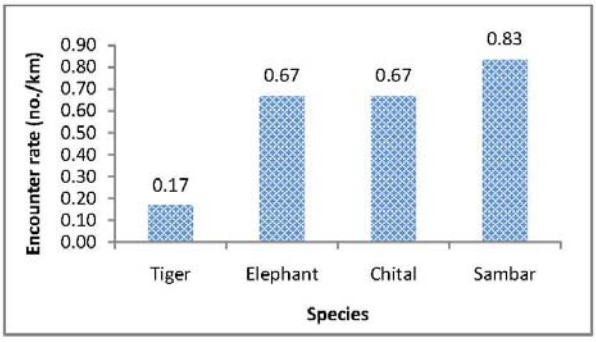


Fig. 3: Encounter rate (no./km) of carnivore and herbivores in Nihaal River