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CORE AREA

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CORBETT TIGER RESERVE

1. Introduction of the Area:

Established through a special Act¹ in 1936, Corbett National Park holds the distinction of being mainland Asia's first National Park. It was also the launch site for post-independent India's most prestigious conservation project, 'Project Tiger' on 1st April 1973. Today, after years of successful management efforts, it holds the unique distinction of having the *highest density of tigers*² anywhere in the world. Simultaneously, Corbett can also be categorized as one of the India's most crucial gharial breeding sites. It also happens to be one of the last surviving stretches of untouched sub-Himalayan wilderness.

Originally maintained as a hunting block, the idea of protecting this area for wildlife was first mooted in 1907, however it was only due to the sustained efforts of famous hunter turned conservationist, Edward James 'Jim' Corbett and Sir Malcom Hailey, the then Governor General of United Province that 323.75 sq.km area of this landscape was carefully delineated and declared as a National Park. The park was initially named as *Hailey's National Park* to honour Sir Malcom Hailey who was the main force behind the formation of this park. It was later renamed as 'Ramganga National Park' in 1955 and subsequently as 'Corbett National Park' in 1956 after the death of Jim Corbett. The area of the park was increased to 520.82 sq. kms in 1966³ when some more areas from adjacent forest divisions were added to it. In 1991 Sonanadi Wildlife Sanctuary also came under the administrative control of Field Director Project Tiger, Ramnagar.

Earlier, the Corbett National Park, the Sona Nadi Sanctuary and the surrounding Reserve Forests were collectively referred as Corbett Tiger Reserve. Subsequently under the provisions of Wildlife Protection act 1972 (as amended in 2006), the Government of Uttarakhand, following the recommendation of the National Tiger Conservation Authority, notified the area as Corbett Tiger Reserve, on 26th February 2010. The total area of Corbett Tiger Reserve is 1288.31 sq. km. Of this, 821.00 sq kms

¹ UP National Park Act, 1935

² Status of Tigers, Co-Predators & Prey in India - 2010. NTCA/WII

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comprising Corbett National Park and Sonanadi Wildlife Sanctuary was declared as the core-critical area while the remaining Reserve forest area constituted the buffer area.

Corbett National Park (CNP)	:	520.82 Sq. km.	} Core-Critical Area : 821.99 Sq. km.
Sonanadi Wildlife Sanctuary (SNS)	:	301.17 Sq. km.	
Reserve Forest	:	466.32 Sq. km.	} Buffer Area : 466.32 Sq.km.
Corbett Tiger Reserve	:	1288.31 Sq. km	

1.1. Description of Tiger Conservation Unit / landscape and significance of the area for tiger conservation:

There are few places on earth as breathtaking as the Corbett Tiger Reserve. It is truly a living work of art. The interplay of rivers, *chaurs* (grasslands) and *sal* forests encourages a vast diversity of insect, bird and animal life to thrive. This tiger reserve has long been referred to as the land of roar trumpet and song. These attributes refer to the roar of tigers, the trumpet of elephants and the melodious song of birds.

The Corbett and Rajaji National Parks between them hold India's northwestern-most population of tigers, and one of the world's most significant populations of Asian Elephants. In this exquisite tiger land, birdwatchers can seek out nearly 550 species of birds out of the nearly 1300 reported from India. Every nook and cranny of this emerald wonderland is special. This forest of flowing rivers, blue waters and *sal*-dappled glades is a living legacy of conservation.

The benefits of forests such as Corbett include flood control, recharge of water table, soil fertility, air purification, sequestration of carbon and outdoor recreation. Sustainable tourism has enormous potential to enhance the state's per capita income and subsequently increase collection of revenue for the State.

The Corbett Tiger Reserve is a part of the greater Corbett landscape. The other areas of the landscape are the forest areas of Ramnagar Forest Division, Terai West Forest Division and Lansdowne Forest Division. The Corbett Tiger Reserve is the source population of tigers for the entire Corbett landscape, Tiger occupied forests in India have been classified into 6 landscape complexes; namely (a) Shivalik-Gangetic plains, (b) Central Indian Landscape Complex, (c) Eastern Ghats, (d) Western Ghats, (e)

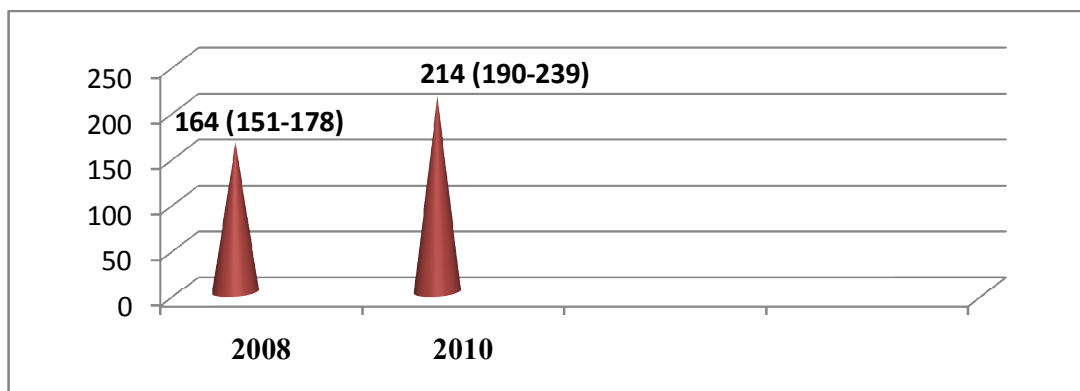
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North-eastern hills and Brahmaputra Plains and (f) Sunderbans. Tiger populations within these landscape complexes are likely to share a common gene pool since Tiger habitats within these landscape complexes were contiguous in the recent past. Within each landscape unit there exists a potential to manage some of the tiger populations as meta-populations. This enhances the conservation potential of each of the single populations and probability of their long term persistence. The Shivalik-Gangetic plain landscape complex is composed of two landscape units; (a) Kalesar to Kishenpur and (b) Dudhwa to Valmiki. Currently the tiger occupies 5080 sq.km of forested habitat with an estimated population size of 297 (259 to 335) in six separate populations.

As per the **Status of Tigers, Co-predators and Prey in India – 2008** report of Wildlife Institute of India, the most important tiger population within this landscape is of Corbett Tiger Reserve, with an estimated population of **164 (151-178)**. The landscape is characterized by having the ability of sustaining high density tiger population for example, *Corbett National Park sustains 19.6 tigers per 100 sq. km.* (Ref: Status of Tigers, Co-Predators & Prey in India -2008 & 2010. NTCA/WII).

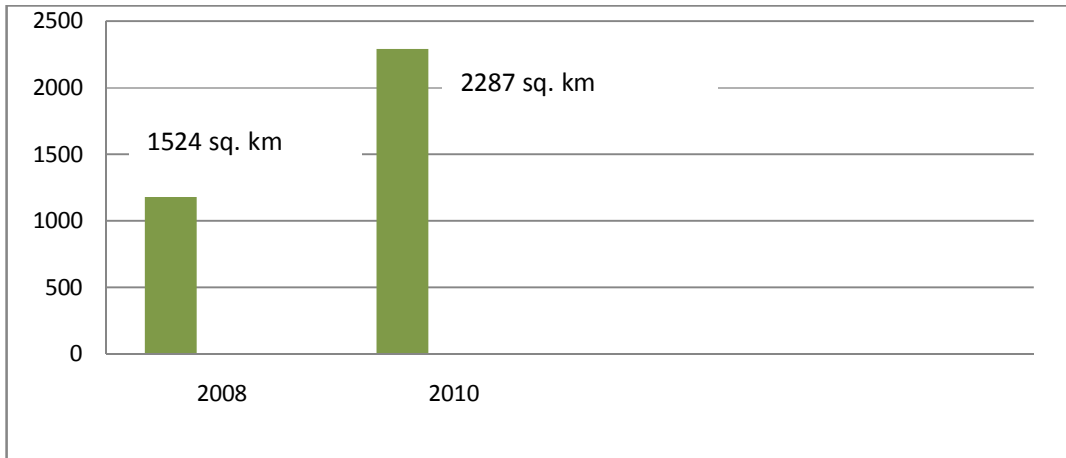
The **Status of Tigers, Co-predators and Prey in India – 2010** report also emphasized that the Corbett Population Block has the **highest tiger density in the world** (*9.4 tigers/100 Sq. Km. at the landscape scale*).

Tiger Abundance (2008 / 2010)



Tiger Conservation Plan, Core Zone

Occupied Area (2008 / 2010)



Importance of tigers can't be emphasised more. Tiger is not only a flag bearer of wildlife conservation but also an umbrella species for majority of eco-regions in the Indian sub-continent. Its role as a top predator is vital in regulating and perpetuating ecological processes and systems (Terborgh J. 1991, Sunquist et al. 1999). Tiger needs large undisturbed landscapes with ample prey to raise young and to maintain long term genetic and demographic viability (Seidensticker and McDogul 1993, Karanth and Sunquist 1995, Carbone et al 1999). Corbett Landscape in general and Corbett Tiger Reserve in particular qualify on the above parameters and thus are believed to be the most important stronghold of this critically endangered species. For tigers to still have a chance of survival in this part of the country, Corbett will have to act as the flag bearer in the conservation efforts of the country through best management practices and strong protection. (**Status of Tigers, Co-Predators & Prey in India -2008, NTCA/WII**).

Tiger Conservation Plan, Core Zone

1.2. Map of Tiger Conservation Unit/landscape:



1.3. Legal Provisions contained in the Wildlife (Protection) Act, 1972 regarding Tiger Conservation Plan and brief description of their relevance in the tiger conservation unit/landscape:

The relevant portions regarding tiger conservation plan of the Wildlife (Protection) Act 1972 (as amended 2006) is as follows

Section: 38V. Tiger Conservation Plan:

The State Government shall, on the recommendation of the Tiger Conservation Authority, notify an area as a tiger reserve.

- a. The provisions of sub-section (2) of Section 18, sub-section (2), (3) and (4) of Section 27, Section 30, 32 and clauses (b) and (c) of Section 33 of this Act shall, as far as may be, apply in relation to a sanctuary.*
- b. The state government shall prepare a Tiger Conservation Plan including staff development and deployment plan for the proper management of each area referred to in sub-section (1), so as to ensure;*

Tiger Conservation Plan, Core Zone

- (a) Protection of tiger reserve and providing site specific habitat inputs for a viable population of tigers, co-predators and prey animals without distorting the natural prey-predator ecological cycle in the habitat;*
- (b) Ecologically compatible land uses in the tiger reserves and areas linking one protected area or tiger reserve with another for addressing the livelihood concern of local people, so as to provide dispersal habitats and corridor for spill over population of wild animals from the designated core areas of tiger reserves or from tiger breeding habitats within other protected areas;*
- (c) The forestry operations of regular forest divisions and those adjoining tiger reserves are not incompatible with the needs of tiger conservation.*
- (d) Subject to the provisions contained in the act, the state government shall, while preparing a Tiger Conservation Plan, ensure the agricultural, livelihood, developmental and other interests of the people living in tiger bearing forests or a tiger reserve.*

For the purposes of this Section, the expression "tiger reserve" includes:

Core or critical tiger habitat areas of National Parks and sanctuaries where it has been established, on the basis of scientific and objective criteria, that such area are required to be kept as inviolate for the purposes of tiger conservation, without affecting the rights of the Scheduled tribes or such other forest dwellers, and notified as such by the State Government in consultation with an Expert Committee constituted for the purposes;

- a. Buffer or peripheral areas comprising of the area peripheral to critical tiger habitat or core area, identified and established in accordance with the provisions contained in explanation (i) of section 38V(4), where a lesser degree of habitat protection is required to ensure the integrity of the critical tiger habitat with adequate dispersal for tiger species, and which aim at promoting co-existence between wildlife and human activity with due recognition of livelihood, developmental, social and cultural rights of the local people, wherein the limits of such areas are determined on the basis of scientific and objective criteria in consultation with the concerned Gram Sabha and an expert committee constituted for the purpose.*
- b. Save as for voluntary relocation on mutually agreed terms and conditions, provided that such terms and conditions satisfy the requirements laid down in the sub-section,*

Tiger Conservation Plan, Core Zone

no Scheduled Tribes or other forest dweller shall be resettled or have their rights adversely affected for the purpose of creating inviolate areas for tiger conservation unless-

- (i) The process of recognition and determination of rights and acquisition of land or forest rights of the Scheduled Tribes and such other forest dwelling persons is complete.*
- (ii) The concerned agencies of the State Government, in exercise of their powers under this Act, establishes with the consent of the Scheduled Tribes and such other forest dwellers in the area, and in consultation with an ecological and social scientist familiar with the area, that the activities of the Scheduled Tribes and other such forest dwellers or the impact of their presence upon wild animals is sufficient to cause irreversible damage and shall threaten the existence of tigers and their habitat;*
- (iii) The State Government, after obtaining the consent of the Scheduled Tribes and other forest dwellers inhabiting the area, and in consultation with an independent ecological and social scientist familiar with the area, has come to a conclusion that other reasonable options of co-existence, are not available;*
- (iv) Resettlement or alternative package has been prepared providing for livelihood for the affected individuals and communities and fulfils the requirements given in the National Relief and Rehabilitation Policy;*
- (v) The informed consent of the Gram Sabha concerned, and of the person affected, to the resettlement programme has been obtained; and*
- (vi) The facilities and land allocation at the resettlement location are provided under the said programme, otherwise their existing rights shall not be interfered with.*

Corbett Tiger Reserve Map, showing the buffer and the Core area:

The adjoining landscape is composed of parts of the Ramnagar Forest Division, Terai West Forest Division, Haldwani Forest Division and Lansdowne Forest Division. It is a part of larger Shivalik Gangetic Plain landscape complex having an area of about 20,800 Sq. Km, of which the potential tiger habitat is about 5080 Sq. Km.

Tiger Conservation Plan, Core Zone

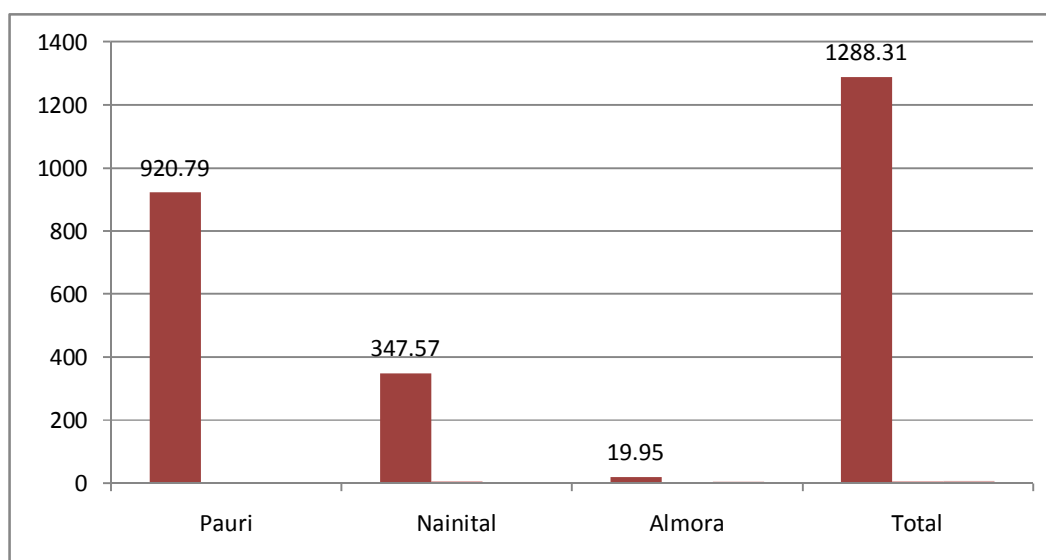
Part A: The Existing Situation

Chapter-1

Introduction of the Area

1.1. Location:

The Tiger Reserve lies between the latitudes $29^{\circ} 25' N$ to $29^{\circ} 40' N$ & longitudes $78^{\circ} 5' E$ to $79^{\circ} 5' E$. The Corbett Tiger reserve spreads through 3 districts, namely Pauri, Nainital and Almora. The total area being 1288.31 sq.km. The Corbett Tiger Reserves spreads in three districts:



Area in Sq. Km.

The headquarters of the Tiger Reserve is situated at Ramnagar, district Nainital, Uttarakhand. It is about 260 km. from New Delhi and 254 km. from Dehradun.

1.2. Constitution:

The core-critical tiger habitat of the Tiger Reserve encompasses the Corbett National Park and Sonanadi Sanctuary (821.99 sq.km.). The National Park was created on 8th August 1936 comprising of an area of 323.75 sq.km. An additional area of 197.07 Sq. Km. was added in the year 1966 (*Notification no. 4229/XIV-A-867-62 dated August 24, 1966*) bringing the area of the Park to 520.82 sq.km.

Tiger Conservation Plan, Core Zone

Sonanadi was declared as a Sanctuary vide notification No. 5434/14-3-139-82 Dt. 9th January 1987 and was put under the administrative control of Kalagarh Forest Division, Lansdowne. In 1991, an area of 796.686 sq.km. around Corbett National Park was transferred to the administrative control of Director, Corbett National Park vide G.O. No. 1540/14-3-139/82 Dt. 11th June 1991 and with it Sonanadi Sanctuary became part of Corbett Tiger Reserve. Until 2006 Sonanadi and Corbett National Park were managed as the core of this administrative unit. In the year 2006 a major amendment was carried out in the Wildlife Protection Act, 1972 which led to the creation of a new legal entity called Tiger Reserve. The Corbett National Park and Sonanadi Wildlife Sanctuary together with peripheral reserve forests was notified as **Corbett Tiger Reserve** under the provisions of the Act (Under section 38V (1)) vide notification No. WL-05/X-2-2010-19(34)/2006 dated 26th February 2010. Corbett National Park (CNP) and Sonanadi Sanctuary together formed the Core Zone and the reserve forests as Buffer Zone of Corbett Tiger Reserve.

Core -Critical Tiger Habitat	-	821.99 sq.km.
Buffer Area	-	466.32 sq. km.
Total Area	-	1288.31 sq. km.

1.3. Extent (Area Statement & legal Status):

The Tiger Reserve lies between the latitudes 29^o 25' N to 29^o 40'N & longitudes 78^o 5' E to 79^o 5' E. The boundaries of the TR are as follows ó

- 1. Eastern Boundary :** From the junction of Kotdwar-Ramnagar forest motor road with Parvatiya Sabha Lakhanpur, going up along the left bank of Ramnagar-Ranikhet motor road upto Mohan barrier, from Mohan barrier to Durgadevi, to Marchula along left side of river Ramganga to left side of Devta Nadi and upto Champapani.
- 2. Western Boundary :** Gujjar sot (Pakhro block), to Bandergarh, to Laldarwaza comp. no. 1,2,3,7,8,11 to Mandalti block comp. no. 1,2,22 to Kansur block comp. no. 7,6,5,3,2,1,23 to Kugadda block comp. no. 1,8 to Sendhikhal.
- 3. Northern Boundary :** Sendhikhal Bijorgad block comp. no. 8,7,6,5 to Haldigaddi block comp. no. 21,22,19,18,17,16,15,14,13 to Rathwadhab to Khadrasi along right side of Mandal river. Karia Block ó Pillar No. 43, 44 to 1-15; Mandal Block ó Pillar No. 1 to 18 and 17 and 20 to 127; Khadrasi to east Mandal block Comp.

Tiger Conservation Plan, Core Zone

No.2,3a,3b, 4,5,6,7a,7b,11,12 and Kalakhand Block 4,1,2 to Pillar No. 152 to 160 Champapani.

4. **Southern Boundary** : Ramnagar-Ranikhet P.W.D motor road pillar No. 503 to pillar No. 521 to southward Sawalده river along right side of the river, Plot no.1(70) upto plot no. 1(70) to Dhela Comp. No. 6 to Jaspur block Comp. No. 46,47,48,49 to Phika nala Laldhang Pillar No. 554. From Pillar No. 554 along the road on the left hand side from Lakarghat (Kalagarh) to Kalagarh Block Comp. No. 8 to Nalkatta block Comp. No. 7,5,3 to Kalushaheed Block Comp. No. 16,14,10,9,4 to Dhaukhand Block Comp. No. 14,6 and Pankhrao Block Comp. No. 8,3 to Gujjar sot.

Area statement of Core Critical area:

S.N.	Name of Division	Name of Range	Area Statement (Hact.)		Total Area in (Hact.)
			Corbett National Park	Sonanadi Sanctuary	
1	Ramnagar Tiger Reserve Division, Corbett Tiger Reserve, Ramnagar	Dhikala	7564.40	0.00	7564.40
		Sarpduli	9400.50	0.00	9400.50
		Bijrani	6602.63	0.00	6602.63
		Dhela	3550.30	0.00	3550.30
		Jhirna	6084.50	0.00	6084.50
		Kalagarh	15182.07	1836.90	17018.97
Total			48384.40	1836.90	50221.3
2	Kalagarh Tiger Reserve Division, Corbett Tiger Reserve, Lansdowne	Sonanadi	0.00	13228.10	13228.10
		Palain	0.00	5228.90	5228.90
		Mandal	0.00	0.00	0.00
		Adnala	0.00	7236.60	7236.60
		Maidavan	3698.00	2587.10	6285.1
		Total	3698.00	28280.70	31978.7
		G.Total	52082.40	30117.60	82220 Ha. Or 822 Sq. km

Note: 36.98 sq. km area of Corbett National Park is administered by the Kalagarh Forest Division. 9.91 sq. km is under Kanda Block, 8.21 sq. km is under Tariya IInd, and 18.86 sq. km is under Toliya block. Similarly only 20 hectare of reserve forest of Sonanadi Sanctuary is under Kalagarh Range of Ramnagar Tiger Reserve Division.

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1.4. Notification:

The Government of Uttarakhand has issued notification under section 38V (1) vide notification no. WL-05/X-2-2010-19(34)/2006 dated 26th February 2010 declaring constitution of Corbett Tiger Reserve. A copy of the notification has been provided in **Annexure-1/1**.

1.5. Approach & Access:

The Tiger Reserve being situated on the foothills of the Himalayas is easily accessible by road, rail and air routes. The nearest Railway Stations are Ramnagar and Kotdwar and the nearest airports are Pantnagar and Dehradun. The Reserve has six entrance gates namely ó Amdanda, Dhangarhi, Durgadevi, Dhela, Kalagarh and Rathuadhav. The entry to the core area is possible from any of the above mentioned entrance gates. Dhikala is connected to Kalagarh by water route also. The Tiger Reserve has a good network of fair-weather motor roads but during monsoon most of the area becomes inaccessible for vehicular movement.

Headquarters of all Forest Ranges except Kalagarh, Dhikala and Sarpduli are situated in the buffer area. The southern boundary of the Tiger Reserve shares its boundary with the villages of Uttarakhand and Uttar Pradesh. A cart road is the main access along the southern boundary.

1.6. Statement of Significance:

Tiger is not only a flag bearer of conservation but also an umbrella species for majority of the eco-regions in the Indian sub-continent. Its role as a top predator is vital in regulating and perpetuating ecological processes and systems (Terborgh J. 1991, Sunquist at el. 1999). The tiger needs large undisturbed landscapes with ample prey to raise young and to maintain long term genetic and demographic viability (Seidensticker and McDogul 1993, Karanth and Sunquist 1995, Carbone at el 1999). The Corbett Landscape in general and Corbett Tiger Reserve in particular fully qualifies on all the above parameters and thus is believed to be the most important stronghold of the Tiger. Some of the significant attributes of the area are as below:

1. Corbett Tiger Reserve has highest density of wild tigers in the world and also supports a very high density of prey species.
2. Corbett Tiger Reserve has one of the largest and one of the very few 'Genetically Viable' populations of wild tigers.

Tiger Conservation Plan, Core Zone

3. Corbett's Tiger population acts as a source population of tigers for the entire landscape. The connected forest areas of Lansdowne Forest Division, Tarai West Forest Division and Ramnagar Forest Divisions also have very high density of tigers.
4. Corbett also has one of the largest populations of Asian Elephants with an extremely healthy Male: Female ratio.
5. With approx 550 recorded species of birds, it is one of the Important Bird Areas in the country.
6. Corbett Tiger Reserve has approximately 20% of the wild adult Gharial Population of the World which is stable and breeding successfully.

Hence it can be stated that for long term survival of Tigers and associated species in this part of the world, Corbett leads the conservation efforts of the country.

Year	Tiger Number/Range	Area covered
2001	137	1288.31 sq. kms of CORBETT TIGER RESERVE
2003	143	1288.31 sq. kms of CORBETT TIGER RESERVE
2005	141	1288.31 sq. kms of CORBETT TIGER RESERVE
2008*	164 (Range 151-178)	1524 sq. km of Corbett Landscape which includes CORBETT TIGER RESERVE
2010*	214 (Range 190-239)	2288 sq. km of Corbett Landscape which includes CORBETT TIGER RESERVE

*As per new estimation methodology adopted by WII-NTCA.

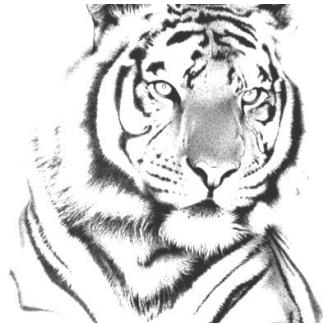
This comparative study reveals that Corbett has been very successful in achieving the objectives of its establishment. Today Corbett not only holds a thriving and viable population of Tigers but is also a custodian of the floral and faunal diversity of Terai-Bhabar landscape. The staff of Corbett Tiger Reserve and the local communities have played a key role in the protection of this natural heritage. The local people understand the significance and are most supportive to the cause of conservation. At the same time the staff of Tiger Reserve is dedicated to protection of wildlife even in the remotest and most inaccessible areas.

Tiger Conservation Plan, Core Zone

Tourism in the Corbett Tiger Reserve is highly significant for the economy of Ramnagar and adjoining areas. There has been marked growth in tourist inflow since the formation of Uttarakhand.

As per the **Status of Tigers, Co-predators and Prey in India – 2010** report of Wildlife Institute of India, this landscape has an estimated tiger population of 214 (190-239). The landscape is characterized by having the ability of sustaining a very high density tiger population e.g. Corbett 19.6 tigers per 100 sq.km. The report also emphasized that the Corbett Block (2287 sq. km) has the highest density of tiger ó 9.4 tigers per 100 sq. km. at the landscape level, which is highest in the world. Thus with continued good management and protection, Corbett Tiger Reserve can serve an important role in tiger conservation.

The recent tiger estimation report released by the NTCA indicated appreciable increase in tiger population to 227 in comparison to earlier estimation of 164. However, it must be stated here that the earlier area sampled was 1524 sq. km, which in 2010 increased to 2287 sq. km.



..... there is however, one point on which I am convinced that all sportsmen- no matter whether their viewpoint has been a platform on a tree, the back of an elephant or their own feet- will agree with me, and that is, that the tiger is a LARGE-HEARTED GENTLE MAN with boundless courage and that when he is exterminated-as exterminated he will be unless public opinion rallies to his support- India will be poorer by having lost the finest of her Fauna.

Jim Corbett in Man-eaters of Kumaon

Chapter-2

Background Information & attributes

2.1. Geology, Rock & Soil:

The general sequence of geological formations of the area may typically be represented in ascending order as follows:-

(1) Recent Deposits

- (A) Horizontal River gravel alluvium.
- (B) Deposits of Bhabar Zone.

(2) Shivalik Series

- (A) Upper Shivalik Conglomerates.
- (B) Middle Shivalik Sand Rock.
- (C) Lower Shivalik (Nahan) Sandstone.
- (D) Great Boundary Fault.

(3) Older Himalayan Rock

- (A) Upper Tal
- (B) Lower Tal
- (C) Basic effusive
- (D) Karol
- (E) Infra Karol
- (F) Naghthat
- (G) Chandpur
- (H) Metamorphic

The Geological distribution has a significant influence on the distribution of various forests types because of related differences in drainage, soil depth, fertility and topography.

2.1.1. Terrain:

The terrain of the area is generally undulating, comprising of a series of ridges running NW to SE interspersed with several valleys. The Ramganga, Palain and Sonanadi river flow through these valleys.

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1. Upper Shivalik conglomerate:

It is composed of semi consolidated material, very much resembling the gravel and cobbles of the Bhabar zone. Usually large and rounded quartzite pebbles, set in ferruginous sand of buff or dark yellow colour, forms the bulk of the rock but there are subordinate clay and loamy partings of brown and yellow color. A very constant character of conglomerate is the alternation of coarse and fine bands and of sandy, loamy and clay beds with it. Its thickness is very variable, but across the ridge, south of the Patlidun, it has been calculated to be up to 900 m. thick.

In the Sonanadi valley, the upper Shivlik conglomerate outcrops only in a narrow and very thin band less than 0.5km in width local interruptions down the general course of the Sonanadi river. Thus the lower part of Sheeshamkhatta block in the Sonanadi valley consists of Shivalik conglomerate.

2. Middle Shivalik Sand Rock:

The sand rock has a pure, slightly, ferruginous and some time felspathic sand as its basis. It is of sugary texture and without jointing or other divisional planes. It consists of greyish and greyish white medium grained sand stone with calcareous, occasional pebble beds and clayey shale. In this formation, knife edges ridges, landslip and bare rock faces are common. The thickness of sand rock is very great and appears to vary inversely as the thickness of the upper Shivalik conglomerate. It has been calculated to be about 2200 meter along the Ramganga River. The middle Shivalik sand rock is the prevailing geological formation in the southern part of the Sanctuary. Hathikund, Motasal blocks, major part of Laldarwaja, Chiplighati and Sheeshamkhatta blocks are mostly formed of middle Shivalik sand rock and it also occur in the lower part of Mandalti and Bailanala blocks.

3. Lower Shivalik (Nahan) Sandstone :

Nahan sandstone is, as a rule, much more indurate than the sand rock. It is generally darker; with brownish and greenish brown tints prevailing some time a bluish gray. It is very micaceous and occasionally felspathic.

Nahan sandstone occupies the greater part of the area north of the Ramganga and Sonanadi and extends up to the great boundary fault which separates it from the older Himalayan rocks. The southern boundary follows a line to the south of the ridge between the Mandalti and Sonandi valleys. In the area west of the Ramganga river, the

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longitudinal ridges which lie on the south of the Sonanadi , one between Sonanadi and Mandalti and a third to the north to the Mandalti are composed of the harder nahan sandstone; whilst the intervening valleys of the Sonanadi and Mandalti part are composed of the softer sand rocks. Thus the entire or a major part of the Gaujera, Bailanala, Adnala, Mandalti, Tumaria and the main ridges of Mandalti, Kalagarh, Hathikund and the upper part of Laldarwaja, Chapli ghati and Sheeshamkhatta consist of nahan sand stone.

2.2. Hydrology & water sources:

Corbett Tiger Reserve is spread in the Bhabar and lower Shiwalik region and has typical hydrology of these areas. The land is very porous and is composed of boulder and sand deposits. The water received through rainfall easily seeps-off and then resurfaces in the Terai area which lies down below the Corbett Tiger Reserve boundary. The water table is very deep. Still the area has some perennial water sources like River Ramganga, Palain, Mandal and Sonanadi besides a number of streams. Most of streams become dry after the rainy season. Ramganga river is the lifeline of Corbett Tiger Reserve and the major perennial source of water. It flows almost parallel to the northern boundary before entering Corbett National Tiger Reserve near Mohan. The banks of these rivers and streams have many types of grassland and some good patches of reverain miscellaneous forest. The Kosi river is another perennial water source for the wildlife of Corbett Tiger Reserve though it runs outside and along the eastern boundary of the TR. From Mohan to Ramnagar the river runs very close to Corbett Tiger Reserve and is regularly visited by the wild animals of the Tiger Reserve.

The core of the Tiger Reserve also has a good network of man-made waterholes some of which are *kachha* and some are *pacca*. It also has many temporary dug-out ponds spread across the beds of *sots*. The Kalagarh dam constructed at about 24 km. from Dhikala has created a vast reservoir spread over an area of about 80 sq. km. of which 42 sq km. falls in Corbett National Park and the rest in Sonanadi sanctuary. There are also some natural pools such as Nakatal, Malanital and Phoortal. Artificial borings have also been done at Dhikala, Khinanauli and Bijrani campuses, which are being used for drinking water facility as well as for supplying water for the waterholes.

The Palain, Mandal and Ramganga rivers, contains water all year around. Apart from these, there are some perennial water sources like streams, nallahs and ponds

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besides numerous seasonal watercourses which are usually dry from March to the onset of rainy season. Water scarcity is seen in many parts of the buffer forest especially in the southern area. To augment water supply in these areas water-holes both temporary and permanent have been created. During summer months water is fed using water tankers or collecting water of a small stream. The list of waterholes has been given in **Annexure-2/1**.

2.3. Vegetative cover types:

The distribution & occurrence of vegetative cover (Forest types) in Corbett Tiger Reserve can be summarized in the following table (Champion & Seth's classification),

Forest type	Nomenclature	Area in hactares
<u>Sub-Gr. 3c</u>	<u>Northern Tropical moist deciduous</u>	
3C/C2a	Moist Siwalik Sal	11,236.10
3C/C2b(1)	Moist Bhabar Dun Sal	4,725.10
3C/C3a	Western Gangetic Moist mixed deciduous	701.20
3/ISI	Alluvial Savannah woodland (Bombmax-Albizia)	403.80
Total Sub-Gr 3C		17,066.20
<u>Sub-Gr.5B</u>	<u>Northern Tropical Dry Deciduous</u>	
5B/C1a	Dry Siwalic Sal	23,504.04
5B/C2	Northern Dry Mixed deciduous	7,921.04
5/IS 2	Khair Sissoo Forest	201.00
Sub-Gr.9	Himalayan Sub-Tropical Pine Forests	
9/C1a	lower Siwalik Chir Pine Forest	169.10
Total Sub-Gr.9		169.10
	Area under submergence of Ramganga Reservoir	4,220.20
Grand total		52,082.40

The above distribution shows that the Corbett Tiger Reserve is covered predominantly with sal Forests which extent to nearly 75% of the total area.

The extensive alluvial savannah woodlands(forest type) ISI) and Khair Sissoo forest (5/ISI) which used to provide extensive grazing ground for the ungulates have now shrunk to only about 600 hectares because major portion of the area of the Tiger Reserve now under submergence in Ramganga reservoir (4,220.20 hectares) consisted

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of forest type 3/ISI and 5/IS2. Thus the ungulates are the real sufferers with this shrinkage of the fodder potential.

SUB-GROUP 3C- North Indain tropical moist deciduous forests

(1) 3C/C2 a- moist shiwalik Sal forests:

Most of the Sal forests in the Sonanadi W.L.S, Malani block, Dhikala block and Kalagarh block belong to this type which occupies the whole of Malani, Jamunagwar, Dhikala, Sarpdulli, Gaujera , Bailanala, Adnala, Tumeria, Sheeshamkhata, Chiplighatti, Lal Darwaza, Hathikund, Motasal and Mandalti. It occurs on the lower Shiwalik (Sand Stone) Upper Shiwalik conglomerates and the older Himalyan rock formations. The soil is fairly deep, sandy loam to loam and well drained but is shallower and more sandy on southern exposed aspects. Humus is generally present though scanty at places. The ground consists of steep slopes alternating with rounded ridges and small plateaus with flats occurring in valleys. At places the terrain is simply undulating and not too rugged.

The top canopy consists of Sal (*Shorea robusta*), Sain (*Terminalia alata*), occasionally Jhingan (*Linnea coromandelica*), Bahera (*Terminalia ballerica*), Jamun (*Syzygium cumini*), etc. and rarely Chir (*Pinus roxburghii*), on northern slopes and higher ridges tops. The middle storey contains Sandhan (*Ouginia oojeinensis*), Rohini (*Mallotus philippensis*), Bhilawa (*Semecarpus anacardium*), Karhbhillawa (*Buchanania lanzan*), Kura (*Hollarhena antidysenterica*), Chilla (*Casaeria tomentosa*), Amaltas (*Cassia fistula*), Aonla (*Emblia officinalis*), Bauhinia spp. etc. and in moister valleys Gair (*Olea glandulifera*), Kaula (*Machilus odoratissima*), Garhmahua (*Engelhardtia colebrookiana*) etc.

Bamboo occurs in patches and is dense at places. The undergrowth is moderate and consists chiefly of Bindu (*Colebrookia oppositifolia*), Gandhela (*Murraya koenigii*), Karu (*Calerodendrum viscosum*), Raudera (*Pogostemon plectranthoides*), Dhaula (*Woodfordia fruticosa*), Daia (*Callicarpa macrophalla*), etc. and occasionally Kilmora (*Berberis* spp.), Tushiari (*Debregezia velutina*), Tilphara (*Coculus laurifolius*), Sakina (*Indigofera* spp.) etc. The common climbers are Maljhan (*Bauhinia vahlii*), Gauj (*Milletia auriculata*). Grasses are scarce the common being Ullansu (*Thysanolaena maxima*) in shady places and Guria (*Chrysopoxon montanus*), Kumeria (*Heteropogon controtus*) etc. on exposed parts.

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On steeper ground on southern aspects, Sal (*Shorea robusta*) is scarce and often non-existent, the crop usually consisting of Bakli (*Anogeissus latifolia*), Dhauri (*Lagerstroemia parviflora*), Khair (*Acacia catechu*), Amaltas (*Cassia fistula*), Bauhinia species. Tendu (*Diospyros melonoxylon*), Bhilawa (*Semecarpus anacardium*), Kathbhilawa (*Buchanania lanzan*) etc. with some Kura (*Hollarhena antidysenterica*), and Kathber (*Zizyphus glaberrima*). The whole crop on such location is often open and poor. Sal being usually stunted, short boled and physically mature at a low diameter. On the lower altitude, the slope usually becomes gentler and the proportion and quality of Sal increases.

In this type, Sal is of quality II to III/IV, the average being about III. Sal regeneration is often plentiful and is present almost everywhere. Pure patches of young pole and sapling crop are found on all shapes, gentler slopes and other favorable localities.

(2) 3C/C2b(1)- Moist Bhabhar-Dun Sal forest:

This type of forest has limited distribution in Corbett National Park and Sonanadi Sanctuary and occupies the top canopy. It consists of almost pure Sal with occasional *Sain*, *Dhauri*, *Haldu*, *Bahera*, *Ficus* spp., *Jamun*, *Jhingun*, etc., the middle story consists of *Rohni* and occasionally *Dudhi*, *Sandhan*, *Kura*, *Chilla*, *Koda*, *Bhillwa*, *Amaltas*, etc, the undergrowth is generally quite dense, commonest shrubs being Karu, Gandhela, *Daia*, *Raudera*, *Basinga*, *Pilu*, *Marorphali* etc. *Bomboo* is generally scattered but fairly dense near the ridge tops. In grassy blanks, which are very few, moderate to heavy grass, notably, *siru* (*Imprata cylindrica*), *panni*, etc. are found *Maljhan* and *Goaj*, climbers are fairly common and *Genthi*(*Dioscorea* spp.) climber is almost a pest in some area.

Sal is usually well grown, with middle aged trees. The site quality varies from Ist to IIIrd, the average being almost IInd. The best Sal forests of the core are of this type. Sal regeneration is deficient and established saplings and poles are rarely seen over most of the area. Un-established regeneration in whippy and sub whippy stages is sporadic and does not appear promising due to (i) closed canopy condition, (II) grazing by wild animals and (iii) less humid conditions and dense shrubby growth.

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(3) 3C/C3 a Moist Mixed Deciduous Forest:

This type of forest occurs sporadically throughout the Moist Siwalik Sal forests and is confined to favorable localities where *sal* is unable to establish itself and is characterized by good growth of *Sain*, *Bahera*, *Tun* (*Toona ciliata*), *Kharpat*, *Safed siris* (*Albizzia procera*), in the top canopy, with an under storey of *Rohini*, *Sandan*, *Aonla* etc. with scattered bamboo clumps. *Maljhan* climber is occasionally present.

(4) 3/ISI Alluvial Savannah Woodland (Bombax Albizzia):

This type occurs on the more stable riverine flats along the banks of Ramganga submerged areas, which were previously covered by the savannah woodlands (since mostly clear felled), include Kalagarh Comp IV, Shishamkhata I and II, Kanda I, and 23 pt. and Gaujera 23.

The crop consists of extensive grassy chaur, with scattered trees of *Semal*, *Dhak*, *Kathber*, *Ber*, *Ficus spp.*, *Shisham*, *Piaman* (*Syzygium cerasoides*) etc. and a few small patches of Sal here and there. The most common grasses are *Munj* (*Erianthus munja*), *Kans* (*Saccharum spontaneum*), *Dab* (*Desmostachya bipinnata*), *Ulla* (*Thameda arundinacea*), *Ganeria* (*Narenga porphyrocoma*), *Dolu* (*Eriainthus ravennae*), *Bichhree* (*Narandia arundinacea*), *Seru* (*Imperata cylindrica*), *Bichhla* (*Arundinella nepalensis*), *Panni* (*Vetiveria zizanioides*) etc. Bamboo is absent.

SUB GROUP 5B-NORTHERN TROPICAL DRY DECIDUOUS FORESTS:

(1) 5B/CIa-Dry Siwalik Sal Forest:

The remaining Sal forest, lying in the southern part of the TR, belongs to this type, which occupies the following areas:

This type occurs on the Middle Siwalik Sand-rock formation, which gives rise to shallow, dry and completely drained sandy soils. Humus is scanty. The ground is very broken up, generally steep, stony and rugged. Knife-edge ridges are numerous and the terrain is cut up by many *nalas*. Denudation is active and there are signs of erosion at many places.

The distribution of Sal in this type is governed chiefly by aspect and gradient. On the northern, western and irregular groups and patches of varying extent and density, grading off into badly formed single Sal trees on the steep slopes. The top canopy consists of *Sal*, *Bankuli*, *Khair*, *Sain*, *Tendu*, *Bhilawa*, *Kathbhilwa*, *Jhingan*, *Pula*,

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Kusum, Chir etc, with an under story of *Sandan, Amaltas, Aonla, Bel, Ber, Kathber, Kura, Khoda, Grewia* species; *Bauhinia* species etc. Bamboo is common. The undergrowth is scanty, mainly of *Bindu, Harsingar, Dhaula* etc. but grasses like *Guria, Baib, Kumeria, Nathlia, Bichhroo, Siru* etc, are plentiful.

The southern slopes carry an open but similar crop of a more xerophytic nature, with a very low proportion of *Sal* which usually occurs in patches or as single trees in sheltered and favorable localities. Bamboo is dense at places and grasses like *Guria, Baib, and Kueria* are dense and distributed throughout the area.

In this type, *Sal* is of poor quality varying from quality class III to IV, the average being III/IV. All age and size classes are usually represented but mature trees are generally absent. *Sal* regeneration is generally deficient and very slow growing and is difficult to obtain, except in hollows and moist places, where it is good. Forms transitional to the Moist Siwalik *Sal* (3c/c2a) are of frequent occurrence wherever the soil is deep, and moist.

(2) 5/E 9- Dry Bamboo Brakes:

Bamboo brakes occur throughout the northern dry mixed deciduous forests, usually on dry hill sides, with a good drainage but deeper soil, where bamboo often forms a dense and almost impenetrable growth to the exclusion of other spp. It is also found in the dry shiwalik *Sal* forests and on the high banks of rivers and nalas (particularly in the Palain valley) in the moist Shiwalik *Sal* forest. It is associated with the middle Shiwalik sandrock formation and to a lesser extent with the lower shiwalik nahan sandstones.

GROUP 9B- Himalyan sub-tropical pine forests:

(1) 9/CIa Shiwalik chir- pine forests:

This type occurs as small scattered patches of chir-pine occurring in groups or as single trees with a scattered deciduous trees storey. It occupies ridge tops, cool depression, upper northern slopes along the ridges or steep dry slopes and landslips inside the dry and moist shiwalik conglomerate and nahan sandstones but on very favourable situation on northern aspects it descends down to the sandrock formation. In many localities the proportion of *Chir* is gradually increasing as a result of fire protection, in some places, on or near the ridge tops, pure *Chir* crops are getting

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established, as in Tumaria and Adnala. Regeneration is coming up well in some areas, especially on fresh landslips.

Chir is usually associated with *Sal*, *Sain*, *Bankli*, *Dhuri*, *Jhingan*, *Bahera spp.*, *Amaltas*, *Sandan Bahunia spp.*, Pula etc, and with the usual undergrowth. The true type is really not represented in the TR, and most of the crops are in the transitional zones between Shiwalik Sal and Chir forests.

2.3.1. Grasslands:

The flat grassy plains sometimes quite extensive and locally termed as '*chaur*'. These charus are generally a result of man-made clearings, made in the past for cultivation and settlements subsequently abandoned. The important grasslands are Dhikala *chaur* (Boxar *chaur* which was a continuation of Dhikala *chaur* is now submerged in the reservoir), *Phulai chaur*, *Khinnanauli chaur*, *Paterpani chaur*, *Mohanpani chaur*, *Bhadhai chaur*, *Bijrani chaur*. Apart from these extensive grasslands, many other smaller ones are also found in the tiger reserve. These are of varying extent. These grasslands are characterised by rich dense growth of various medium size to tall grasses, both palatable as well as unpalatable in varying density. These are the most favoured grazing grounds of the ungulates and elephants that congregate here in large herds for grazing and naturally attracting the predator the tiger. Hog deer are also primarily found in the grasslands of Dhikala zone. The recent man-made reservoir over the Ramganga has engulfed a very large chunk of these chaurs of Boxar and Dhikala with apparent adverse ecological changes which needs extensive study.

Grassland vegetation occupies nearly 25% of the Corbett Tiger Reserve. The flat anthropogenic grasslands are dominated by *Vetiveria zizanioides*, *Saccharum benghalense*, and *Dichanthium annulatum*. Most important of these is Dhikala *chaur*, which supports a very high ungulate population. The grassy slopes are dominated by *Chrysopogon fulvus*, *Neyraudia arundinacea*, and *Heteropogon contortus*. Very steep slopes and ridge tops have *Eulaliopsis binata*, locally known as "*Bhabar*" grass.

2.3.2. Plantations:

The most common tree species planted during 1960 and 1970s is *Eucalyptus hybridus*. This is followed by teak (*Tectona grandis*), *Haplophragma adenophylla*, *Acacia catechu*, *Ailanthus excelsum*, and *Dalbergia sisso*. Bamboo (*Dendrocalamus*

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strictus), most important food for elephants which was very common in the past is now scarce causing a problem of man& animal conflict in the nearby buffer area. Most of the old plantations are in the buffer areas.

2.3.3. Vegetation:

The vegetation comprises of forest, grasslands and riparian types, which mainly include northern deciduous forest (Moist Shiwalik Sal, Moist Bhabar Dun Sal, Western Gangetic moist mixed deciduous forest and Alluvial Savannah woodland), Northern Tropical Dry Deciduous Forest (Dry Shiwalik, Northern dry mix deciduous and Khair Sissoo Forest) and Himalayan Subtropical Pine Forest.

The Corbett Tiger Reserve is part of the biotic province 07A (Gangetic plain-Upper Gangetic Plains) with a very rich floral diversity as the major portion of the reserve is confined to Bhabar tract of Shiwalik formation. There are 617 species of the flora under 410 genera 111 families of Angiosperms (Monocot-132, Dicots-462), 1 Gymnosperm and 22 Fern and fern allies.

There are more than 110 tree species in the forest. Notably 73% of the forest cover comprises of Sal (*Shorea robusta*) forests. A frequent associate of Sal is Haldu (*Adina cordifolia*). The predominant species in the higher ridges is Bakli (*Anoguissus latifolia*) and other associates include Khetwa (*Piliostigma malabaricum*), Gurial (*Bauhinia rausinosa*), Dhauri (*Lagesteomia parviflora*), Amaltas (*Cassia fistula*), Bhilawa (*Semecarpus anacardium*), Amla (*Phyllanthus emblica*), Papri, Kumbhi, Mahua (*Madhuca indica*), Rohini (*Mallotus philipensis*) and Jamun (*Eugenia jumbolana*). Chir (*Pinus roxburgii*) the only conifer is confined to some of the highest ridges around Sultan. The river valley, high banks and islands are dominated by *Delbergia sissoo*.

Among the shrubs (51spp), *Clerodendron* spp, *Helicterios issorea* are predominant, while climbers like *Miletta auriculata*, *Porana paniculata*, *Vallaris solanacea*, *Phamera vahlii* are commonly found.

Invasive weeds like *Lantana camara* are profusely growing, thus inhibiting the regeneration of Sal and other herbaceous plants. Extensive growth of *Cannabis sativa* is also found in the grassland.

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2.4. Wild Fauna, Habitats and Tropic Niches:

Corbett Tiger Reserve is popularly known as the 'land of Roar, Trumpet and Song'. This is because of the tiger, elephant and bird populations which find a home here. Corbett Tiger Reserve harbours extensive variety of fauna owing to the rich and diverse habitats and prey base. As per the Zoological Survey of India's "Fauna of Corbett Tiger Reserve" a sum total of 1013 species of fauna have been documented here. These include 49 species of mammals, 685 species of birds, 39 reptilian species, 10 amphibians and 36 species of Pisces amongst vertebrates and 10 species of Nematodes, 11 species of Centipedes, 21 species of termites, 19 species of bugs, 37 species of dragon and damselflies, 34 species of hoppers and crickets, 6 species of mayflies and 10 species of beetles and 36 species of butterflies.

Current status of Faunal Diversity of Corbett Tiger Reserve is as follows:

Sl.No.	Class	Number of			
		Order	Family	Genera	Species
1.	Mammalia	9	21	43	49
2	Aves	18	75	294	685
3	Reptilia	3	13	31	39
4	Amphibia	1	3	9	10
5	Pisces	3	8	22	36
6	Nematoda	7	8	10	10
7	Chilopoda (Scolopendromorpha)	1	1	4	11
8	Isoptera(Termites)	1	3	8	21
9	Hemiptera (Bugs)	1	6	16	19
10	Odonata (Dragon & Damsel Flies)	1	8	25	37
11	Orthoptera	1	4	32	34
12	Ephemeroptera (May flies)	1	4	4	6
13	Dermaptera (Ear wigs)	1	3	5	10
14	Coleoptera (Beetles)	1	1	10	10
15	Lepidoptera (Butterflies)	1	8	25	36
	Total	50	166	538	1013

1. Threatened Fauna:

Based on IUCN Red List (2004), a total of 648 species of the Indian fauna has been documented as threatened, of which 248 are globally threatened (Critical 44, 109 Endangered and 195 Vulnerable). The Corbett Tiger Reserve has 40 such species among which 4 are critically endangered, 10 are endangered and 26 are vulnerable.

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List of Critical, Endangered and Vulnerable Species of Corbett Tiger Reserve

Mammals

1. *Panthera tigris* (Vulnerable)
2. *Elephas maximus* (Vulnerable)

Birds

3. *Gyps bengalensis* (Critical)
4. *Gyps indicus* (Critical)
5. *Gyps tenuirostris* (Critical)
6. *Vanellus gregarious* (Critical)
7. *Leptoptilos dubius* (Endangered)
8. *Falco cherrug* (Endangered)
9. *Houbaropsis bengalensis* (Endangered)
10. *Pelecanus philippensis* (Vulnerable)
11. *Leptoptilos javanicus* (Vulnerable)
12. *Marmaronetta angustirostris* (Vulnerable)
13. *Haliaeetus leucoryphus* (Vulnerable)
14. *Aquila clanga* (Vulnerable)
15. *Aquila heliaca* (Vulnerable)
16. *Grus antigone* (Vulnerable)
17. *Gallinago nemoricola* (Vulnerable)
18. *Rynchops albicollis* (Vulnerable)
19. *Aceros nipalensis* (Vulnerable)
20. *Sexicola insignis* (Vulnerable)
21. *Prinia cinereocapilla* (Vulnerable)
22. *Chaetornis striatus* (Vulnerable)
23. *Ploceus megarhynchus* (Vulnerable)

Reptiles

24. *Gavialis gangeticus* (Vulnerable)
25. *Crocodylus palustris* (Vulnerable)
26. *Melanochelys tricarinata* (Vulnerable)

Frog and Toads

27. *Paa minica* (Vulnerable)

Fishes

28. *Raiamas bola* (Endangered)
 29. *Tor chelynoides* (Endangered)
 30. *Tor putitora* (Endangered)
 31. *Tor tor* (Endangered)
 32. *Botia lohachata* (Endangered)
 33. *Nemachilus montanus* (Endangered)
 34. *Barilius vagara* (Vulnerable)
 35. *Labeo dero* (Vulnerable)
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36. *Puntius chola* (Vulnerable)
 37. *Puntius conchoni* (Vulnerable)
 38. *Garra gotyla gotyla* (Vulnerable)
 39. *Mystus vittatus* (Vulnerable)
 40. *Bagarius bagarius* (Vulnerable)
-

Several endangered species such as Muggers, Gharial, Leopard Cat, Goral and Mahseer etc., have a significant presence in the Reserve. The Corbett Tiger Reserve along with Rajaji National Park represents the Northwestern limits of Tiger and Elephant distribution in the Indian sub-continent. Corbett Tiger Reserve is a prime habitat for Tigers and its prey, which includes four kinds of deers, viz., Sambar, Spotted deer, Hog deer and Barking deer. Along with these Wild Boar, Sloth Bear, Jackal, Yellow Throated Marten and Smooth Indian Otter are also found in good numbers in the Corbett Tiger Reserve.

Leopards are found mostly in the hilly and fringe areas of the Tiger Reserve. Some nocturnal smaller cats found here are Leopard Cat, Jungle Cat, Rusty Spotted Cat and Fishing Cat. Sloth Bear is found in the lower regions of the Tiger Reserve while the Himalayan Black Bear is seen in the higher hills only. Also seen on the rocky hillsides is Goral or Goat antelopes. Monkeys and Langurs are well distributed throughout the Tiger Reserve and warning the whole jungle with alarm calls from tree top perches, when they see either Tiger or Leopard.

The rich avifaunal diversity represents 5% of the world's avifauna, 45% of the Indian Avifauna and 49 species of the diurnal raptors. The avifaunal diversity is at its peak during winter.

1.1. Mammals:

Corbett Tiger Reserve is abundantly populated by herbivores like Spotted Deer, Sambhar, Barking Deer, and to a lesser extent Hog Deer. The prey base of the tiger is further enriched by wild boar (*Sus scrofa*), Langoor (*Presbytis entellus*) and Porcupines (*Hystrix indica*). Goral (*Nemorhaedus goral*) is also found in steeper slopes. Besides tiger (*Panthera tigris tigris*) the other important predator is the Panther (*Panthera pardus*). Smaller carnivores are represented by Leopard cat (*Felis bengalensis*) Jungle cat (*Felis chaus*), Rusty Spotted Cat (*Prionailurus rubiginosa*) and Jackals (*Canis aureus*). The faunal diversity is also enriched by Sloth bear (*Melursus ursinus*) and hundreds of elephants. Black Naped Hare (*Lepus nigricollis*) and Porcupine (*Hystrix indica*) are common rodents besides rats. Otter (*Lutrogale perspicillata*) is the only aquatic mammal found in the rivers of the Tiger Reserve.

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The Asian elephant (*Elephas maximus*) is widely spread in the Tiger Reserve right from November to June. During rainy season they migrate to other forests areas. Of late, these herds of elephants have frequenting the south- eastern tracts of the Tiger Reserve (Jamunagar, Malani, Bijrani forests) which were not being visited before. Quite a few herds have been found to stay in these tracts right through the rainy season. This new phenomenon is apparently a result of ecological changes, which have taken place chiefly as a result of cessation of forestry operations after the commencement of the Project Tiger.

1.2. Reptiles:

Indian Crocodile i.e. Mugger (*Crocodilus palustris*) are found in the river Ramganga. Gharials (*Gavialis gangeticus*) are also found in abundance in Ramganga River. The Gharial population of Corbett Tiger Reserve assumes special significance as this species, which is listed as Critically Endangered in the IUCN Red Data Book, makes the river Ramganga flowing inside the Tiger Reserve home as the third largest breeding population of the Gharial in Northern India (other populations are found in the National Chambal WLS and Katarniyaghat WLS). This is of special significance as this population has adapted the congenial environment of a reservoir.

Other terrestrial reptiles are represented by various species of snakes. Important species are King Cobra (*Ophiophagus hannah*), Common Krait (*Bungarus caeruleus*), Cobra (*Naja naja*), Russel viper (*Vipera russelli*) and Python (*Python molorus*). Important lizard found are monitor lizard (*Varanus bengalensis*), and Corbett Tiger reserve is also endowed with few species of fresh water turtle.

1.3. Birds:

Corbett is very rich in avifauna. Approximately 550 species belonging to 294 genera and 75 families are found here, of which four species are Critical, three endangered, fourteen vulnerable and nineteen near threatened. Common birds are peacock, jungle fowl, partridges, kaleej, parakeets, laughing thrushes, orioles, kingfishers, drongo, doves, wood peckers, fly catchers, owls, eagles etc.. The artificially built reservoir has started attracting lots of ducks, teals, cormorants etc. The Checklist of Birds has been appended as **Annexure-2/2**.

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1.4. Pisces:

The river Ramganga sustains a large variety of fishes. The Mahaseer (*Tor spp*) is the main species found throughout the length of the rivers. The other mentionable species are the - Kalabasu (*Labeo calabasu*), chilwa (*Oxygaster bacaila*), Chaal (*Barilus spp*), Gunthala (*Gara spp*), *Puntius spp.*, Lanchi (*Wallago spp*), Gadiyal (*Nemacheilus spp.*), Sori (*Channa spp.*), Gaidi (*Mastacembelus armatus*), Kawwa (*Xenentodon cancila*) and Goonch (*Bagarius bagarius*).

2.4.1. Trophic Niches:

Study of feeding behaviour is one of the most important issues of wildlife management. Habitat improvement, cover manipulation and various techniques of the ecosystem development primarily need the data pertaining to food and feeding habitat of any specific species.

The Tiger Reserve management should collaborate with the WII to prepare reference slides of faecal matters of certain animals and analyze them for correlating with the feeding behaviour recorded from "Field observation". Thus composition of food preference and its required quantum etc. can be established in case of a particular species.

2.5. Major conspicuous changes in habitat since inception:

It is a matter of scientific study & research as to what changes took place in its landscape since its establishment as a Protected Area in 1936. Efforts should be made to collaborate with reputed research institutes to carry out such study and advice accordingly.

The major changes were in the form of:

- a. Submergence of nearly 80 Sq.km. of verdant Sal and miscellaneous forests due to the construction of Kalagarh Dam on river Ramganga;
- b. The occasional change of course of river Ramganga due to flood, heavy siltation of Phulei grassland due to unprecedented flood of year 2010;
- c. Large tracts of grassland have been infested with of obnoxious weeds. More than 25% of the Corbett Tiger Reserve forest cover has been covered by lantana;

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- d. Partial disappearance of **Patera grass** (*Typha elephantenia*) from Paterpani and Dhikala grassland ;
- e. Local extinction of Barasingha or Swamp deer and Wild dog.
- f. Re- introduction of Gharial in Ramganga River.
- g. Absence of Sal regeneration in some areas.
- h. Hog deer population has decreased.
- i. Uniformity in under-story composition of crop has increased.
- j. Elephant sighting has increased.
- k. Sighting of Tiger has increased.
- l. Some chauras have got submerged in water; Buxar Chaur is one of them.
- m. Phulei chaur has been submerged and subsequently devoid of grass due to heavy rains of 2010 and 2011.

Chapter-3

Status of Tiger & Co-predators

3.1. Distribution:

The tiger is the spirit of the Indian jungle. Even its distant roar, or an alarm call from some animal announcing its presence, charges the whole atmosphere. Acute sensitivity, secretiveness and the ability to surprise, untiring perseverance, agility in attack, tenacity to follow and hold and strength to overpower are the qualities necessary in a successful predator. The Tiger possesses them all in extraordinary measure. The Tiger has a wider ecological tolerance than the other big cats.

The forest cover of Uttarakhand is 24,536 km², comprising 46% of the geographic area of the State. According to the 'Tigers, Co-Predators and Prey in India' Report-2008 released by the WII, about 1901 km² forest area has been occupied by Tigers. Uttarakhand has Tiger Conservation Priority I &II area in the tune of 13,000 km². There are 178 (161 to195) tigers occupied in the above mentioned area as reported by the above mentioned study report by the NTCA and WII. Uttarakhand has a single major population of tigers constituted by the Corbett Tiger Reserve and its surrounding forests of Lansdowne, Haldwani, north-western Nainital and lower elevation area of Ranikhet comprising a occupied area of 1524 Sq. km. with an estimated population of 164 (151-178). The landscape is characterized by having the ability of sustaining high density tiger populations- the *Corbett National Park having 19.6 tigers per 100 km²*. (Tigers, Co-Predators and Prey in India-2008 Report of WII & NTCA). Later the report on 'Tigers, Co-Predators and Prey in India-2010', further emphasized that the *Corbett Population Block (having an area of 2287 Sq. Km) has the highest tiger density in the world (9.4 tigers/100 Sq. Km. at the landscape scale)*.

Thus, with good management and protection, the tiger reserve can serve an important role for tiger conservation in the entire landscape. The high density of tiger without sustainable dispersal will certainly cause havoc to the tiger population. The dispersal capability of the tiger is best described by Smith (1993) that males dispersed about three times farther than females. Most females were philopatric, settling next to their mothers. Age of dispersal vary from 19 months to 28 months. Dispersal is male-biased in mammals and usually the dispersing sex has a higher mortality rate than the philopatric sex.

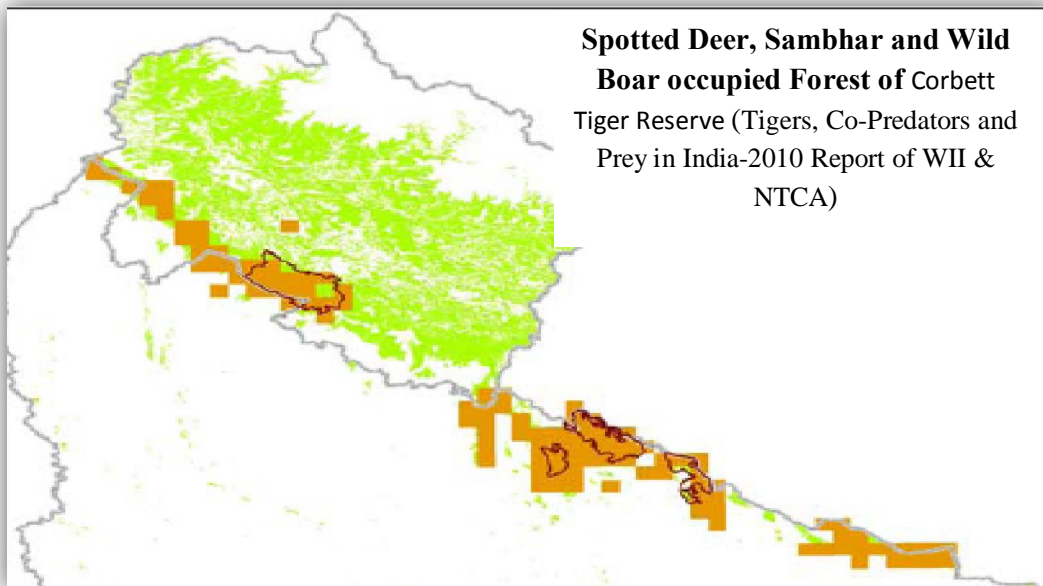
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3.2. Abundance status:

As mentioned in the WII/NTCA report on Tigers, Co-Predators and Prey in India-2008, the Corbett National Park in the Tiger Reserve is endowed with 19.6 tigers per 100 Sq.km., which is certainly the highest density among all Tiger Reserves of India. The report on Tigers, Co-Predators and Prey in India-2010, further reiterated that the Corbett Population Block (having an area of 2287 Sq. Km) has the highest tiger density in the world (9.4 tigers/100 Sq. Km. at the landscape scale). The 2008 and 2010 report has been given in **Annexure-3/1**.

Apart from the All India Tiger Estimation Exercise which is done after a gap of 4 years, annual tiger monitoring exercise known as Phase-IV exercise is also been undertaken at the Tiger Reserve level. The Annual monitoring report of 2011-12 has also estimated a stable population of Tigers in Corbett Tiger Reserve

Since occupancy of a forest patch by tigers is negatively proportional to human disturbance indices & positively correlated with prey availability and expanse of



undisturbed core, all these positive attributes manifests in the healthy population of the Tiger.

3.3. Prey- Predator Relationship:

The carrying capacity of tigers in a given area is primarily determined by the availability of prey base. In Corbett National Park it is about 19-20 tigers per hundred square kilometres. A tiger requires a deer size mammal approximately once a week,

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which means that it consumes almost 50 such animals in a year. To maintain a stable prey population in a long run the consumption should broadly corresponds to the rate at which the prey population grows. The reason for this is closely linked to the need for biological sustainability of both tigers and their prey. For the prey population to sustain itself, the off take of prey (predation rate) cannot exceed the prey's reproduction rate. The prey population typically grows at about 10 percent, and in equilibrium this "excess" is consumed by predators. The main prey species of tiger and co-predators are Sambhar, Spotted Deer, Hog Deer, Wild Boar, Barking Deer and Porcupine etc. The grasslands of the core area support a thriving population of Spotted Deer, while large forest patches are ideal habitat for Sambhar and Barking Deer. Some areas with in Corbett have shown a visible rise in prey population mainly due to the efforts made by the management for habitat amelioration.

3.4. Assessment of threats:

The threats to wild animal in general & tiger in particular are as follows:-

3.4.1. Poaching:

Such a high density of tigers does attract poachers, but due to effective patrolling, intelligence gathering, prompt action and better coordination with other enforcement agencies and stakeholders, the Tiger Reserve has largely remained safe from organized poaching.

3.4.2. Fragmentation of habitat:

Though the core area is compact, temporary fragmentation is a possibility taking into account of the destruction of about 17 Sq.Km. of grassland in the Dhikala Range induced by heavy rains. Apart from this, there is also a strong possibility of alienating wildlife from the area which are heavily covered by lantana. Grasslands degraded by unpalatable weeds act as a barrier between the patches of forests.

3.4.3. Quality of Corridors:

The southern and northern boundary has the problem of unavailability of undisturbed corridor. The eastern boundary is highly disturbed due to mushrooming of resorts, hotels and general human habitations. The Sunderkhal habitation put a serious danger for animals particularly Tigers. On the southern boundary, the forest road puts

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hindrance for safe passage of animals to adjoining areas of Amangarh in Uttar Pradesh. The Kalagarh Irrigation colony also blocks free movement of wildlife.

3.4.4. Human-wildlife conflict:

The southern part of Core area is sensitive towards human-wildlife conflict. There is constant threat of retaliatory killing of tigers which may arise due to loss of cattle due to depredation by tigers. Straying of tigers during rains, crop raiding by elephants, wild boars, deer and nilgai causes immense pressure on management to tackle the human-wildlife conflict. Though ex-gratia for human loss and injury is being disbursed promptly, lack of adequate funds delayed the payment of ex-gratia for loss of cattle earlier. Considering the paucity of funds for prompt distribution in such cases, a new corpus fund has been created by the Government of Uttarakhand along with increasing the ex gratia relief to a great extent. The Corpus fund is kept at the disposal of DFO/DCF and has largely addressed this problem. is proving to be of great help in prompt payment in such cases. The Tiger Reserve authority should continue the present practice of maintaining good relationship with villagers for keeping the tigers safe from retaliatory killings. The Tiger Conservation Foundation along with funding from CAMPA can play a proactive role to contain the severity of human-wildlife conflict. The status of human and animal casualty along with damage to crops by wild animals and corresponding disbursement of ex-gratia has been given as **Annexure-3/3**.

3.4.5. Pressure from tourism activity:

Approximately 2 lakh tourists visit the Tiger Reserve every year. Tourism activity can have its adverse effect on the peace and tranquillity of the wild animals and though only a small part of the core area is open to the tourists, heavy regulation has to be ensured to promote responsible tourism rather than commercial tourism. There are five tourist zones in Corbett Tiger Reserve, including four spread across the core zone of Corbett Tiger Reserve. The Dhikala zone lies in the core area of the Corbett Tiger Reserve. It is the most cherished tourist destination of the Corbett Tiger Reserve. Details about the tourism activity have been discussed in the Chapter-11.

3.4.6. Presence of Gujjars:

There are Gujjar settlements inside the Sonanadi Wildlife Sanctuary area which was recently notified as the part of the core of the Tiger Reserve. Presence of Gujjars along with their cattle is a potential danger for the life of the wildlife including tiger.

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Delay in their translocation to Hardwar Division has caused the increase in their number of families from 181 in 2003 to about 241. Settlement of the Gujjars outside the Core Critical tiger habitat is a priority for management.

3.4.7. Diseases:

Though there was no report regarding death of tigers due to diseases, out break of diseases afflicted to herbivores may cause havoc to the food security for the tigers. Regular vaccination is to be carried out for the cattle belongs to the Gujjars.

3.4.8. Invasion of habitat by obnoxious weeds:

Many part of PA is invaded by many invasive weeds like *Parthenium*, *Sida*, *Lantana*, *Ageratum*, *Solanum*, *Cannabis*, *Chrysanthemum*, *Cassia tora*, *Van Tulsi* etc. These weeds are suppressing the growth of indigenous plant community including palatable grass and subsequently have an adverse effect on the animal community and overall composition of the ecosystem.

3.4.9. Power lines:

Power lines running through the core area to Dhikala and Paterpani are a potential danger to elephants. Stray incidents of electrocution of elephants were reported in the distant past. Adequate measures like regular inspection of the electric poles, lopping of dangling branches, covering the pole with barbed wire, etc. are the measures which proved successful in keeping the elephants safe from electrocution.

3.4.10. Local and temporary migration induced by water scarcity:

Although there are substantial water sources in the tiger reserve, sometimes in the pinch period, elephants and other herbivores may intrude into the adjoining villages for water, where they either come in conflict with the humans or face a threat of poaching.

3.4.11. Illicit fishing:

The Kalagarh Reservoir and Ramganga River is vulnerable for illicit fishing. As the rivers are famous for Mahaseer fish, it has been a challenge to conserve this fish. Though there were not much illicit fishing reported from the area, but the extensive water course is a potential rout for poachers to sneak in to the reserve. Regular patrolling and cooperation from the Eco-development Committees (EDCs) protect the water bodies from such illicit activities.

Chapter-4

History of Past Management & Present Practices

4.1. Conservation History:

From time immemorial the forests along the feet of the hills, to which alone any fiscal value pertained, as well as those within the hills, were considered to be the property of the ruling powers and as such formed a source of revenue to the state. Densley in 1881 wrote that the valley of the *Patli Dun* itself and portions of Palain Valley were occupied in not very distant period by villages and those dependent on the neighbouring forests for their requirements. There were also evidences of a few old canals near Boxar and an old well near Dhikala. The British took possession of this area between 1815 and 1820. In Garwhal as in Kumaon the contract system remained in force and in 1839, one Padam Singh had the lease-right of collecting the forest and pasturage dues of the *Patli Dun* for 20 years for a fixed annual rental of Rs. 2750.00. In 1853 Padam Singh's rights were purchased for Rs. 15000.00 and the forests were taken under direct management of Govt. and transferred from Bijnor to Garhwal District.

In 1854 Captain Reid took over the management and remained in charge until 1858. Reid attempted little in way of conservancy but commenced felling operations on a large scale. He erected a saw mill at *Boxar* but it could not work owing to a defect in the slope of the canal that was to provide the motive power. Up to 1858, forest management received little attention. The contractors did as they pleased as collection of large revenue was the only objective and the tenet of improvement of the forests for future was often altogether lost sight of. Before it was realized what was taking place, all accessible areas had been reduced to the verge of ruin. Thus the forests of the *South Patli Dun*, over their more accessible portions, were stripped by successive heavy felling of their sound timber and it was only by 1894, after 30 years of strict and careful protection, that they had recovered themselves from the effects of these excessive felling followed by frequent fires.

In 1858 the forests came under Major Ramsay, who took the first step towards systematic conservancy. In 1861-62, cultivation in the *Patli Dun* was stopped by assigning lands to the people in the *Bhabar*. The cattle stations were removed from the reserved forests. In the meanwhile roads were opened up and the forests, especially those of Garhwal, were made accessible from all sides. At the same time a regular

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system of working was instituted in certain forests, the remaining ones being closed, and it was made compulsory that all trees should be selected and marked. The Sawmill at *Boxar* was transferred to Roorkee. Colonel Baugh acted as Conservator under Ramsay and an establishment was entertained to prevent the felling of timber without license, to protect the forests from fire, to cut down climbers and to mark trees for felling.

The management of the forests was transferred to the Forest Department in 1868. In 1879 all the forests from the Dabka River (in Ramnagar Division) to the Ganga were constituted reserves under the Forest Act. In 1868 only two forest divisions were created viz. Garhwal from The Ganga to the Kothirau and Kumaon from Kothirau to the Sharda River. A third division was formed in 1879, with the leased forests of Tehri-Garhwal in the Bhagirathi valley and the sub-montane forests between Ganga and the Khoh river. Management of these forests through Working Plans started in 1879.

When the lease of the Bhagirathi forest came to an end in 1885-86, the three divisions were reconstituted in 1890. After the changes the Ganges division consisted of forests between the Ganga and the Ramganga and Palain Rivers; the Garhwal Division up to the Dabka River and the Kumaon Division from Dabka to the Sharda. Though the Kalagarh block on the west of the Ramnagar formed part of the Garhwal Division, it was transferred to the Ganges division in 1900. In 1911 the names of these divisions were changed to Lansdown, Ramnagar and Haldwani respectively. In 1918, the Kalagarh division was formed consisting of parts of the old Ramnagar and Lansdowne divisions.

Most of the forest areas of present Core-Critical Tiger Habitat were managed by Working Plans. The available information about old working plans has been listed as follows.

Sl. No.	Author of WP	Period for which made	Period for which actually followed	Working Plans
1	E.P. Densey	1881-82 to 1892-93	1881-82 to 1894-95	W.P for North Patli Dun
2	Not Known	1887 onwards	1887-88 to 1894-95	W.P for South Patli Dun
3	F. Beadon Bryant	1888-89 to 1894-95	1888-89 to 1894-95	W.P for Palain forests
4	-do-	1895-96 to 1915-16	1895-96 to 1915-16	W.P for Garhwal Div.

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5	-do-	1895-96 to 1915-16	1895-96 to 1920-21	W.P for Ganges Div.
6	S.H.Howard	1916-17 to 1935-36	1916-17 to 1920-21	W.P for Ramnagar Div.
7	C.G. Trefor	1921-22 to 1925-26	1921-22 to 1926-27	W.Scheme for Kalagarh Div.
8	F.K.Makins	1927-28 to 1936-37	1927-28 to 1935-36	W.P for Kalagarh Div.
9	Not Known	1930-31 onwards	1930-31 to 1935-36	Khair scheme for Dhara Range.
10	Not known	1932-33 onwards	1932-33 to 1935-36	Khair scheme for Sonanadi Range
11	B.D.Pant	1936-37 to 1950-51	1936-37 to 1950-51	W.P for Kalagarh Div.
12	C.M Johri	1939-40 to 1950-51	1939-40 to 1950-51	WP for East Mandal Block
13	G.M Hopkins	1951-52 to 1954-55	1951-52 to 1954-55	Interim scheme for Kalagarh Div.
14	S.S Srivastava	1655-56 to 1969-70	1955-56 to 1969-70	WP for Kalagarh Div.
15	V.B Singh	1957-58 to 1961-62	1957-58	Clear felling scheme for submergence area of Ramganga project
16	C.S. Saundal	1962-63 to 1967-68	1962-63 to 1967-68	-do-
17	U.S. Bora	1968-69 to 1969-70	1968-69 to 1969-70	-do-
18	R.S Mathur	1970-71 to 1979-80	1970-71 to 1979-80	WP of kalagarh forest Div.

Management Plans

Sl. No.	Author of Management Plan	Period for which made	Period for which actually followed	Details
1	Rajiv Bhartari	1999-2000 to 2009-10	1999-2000 to 2012	Management Plan for Corbett National Park
2	Samir Sinha	2001-01 to 2009-2010	2001-01 to 2012	Management Plan for Sonanadi Wildlife Sanctuary

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Prior to the creation of *Hailey National Park* this forest area was a shooting block under Kalagarh Forest Division. The grassy plains along river Ramganga and its tributaries were full of big and small game and *Shikar* parties were organized regularly. In May, 1934 Sir Malcolm Hailey Governor United Provinces suggested creation of a National Park by legislative authority with the object of game preservation. When shooting and hunting had been prohibited by executive orders, a Game Sanctuary was created on 10th October 1934 in an area of 200 square miles. Hailey asked that a bill should be drafted to provide something more permanent. The bill for the creation of Kruger National Park was taken as a model.

The Legislative Council passed the United Province National Park Bill on February 25, 1935. The Governor decided that the Park, be named *Hailey National Park*. The rules under Section 10 of the Act were issued on 23rd April 1936 and came into force on 8th August 1936. The initial Area of Hailey National Park was 125 Sq. Miles. The boundaries were revised on 8th July 1940 to provide a more accurate description without changing the NP area. F.W. Champion was in-charge of the Park from May 1937 to March 1940 as Divisional Forest Officer, Kalagarh Forest Division. Along with Sir Malcolm Hailey and Jim Corbett, he played an important role in laying the foundations of the National Park. The original Park consisted of parts of Dhara and South Patli Dun ranges of Kalagarh Forest Division and Malani Range of Ramnagar Division. Because of a large area of the Park being included in the submergence area of Ramganga Dam, the boundaries of National Park were revised in 1966 to include a further area of 196.84 Sq. Km. bringing the total area of the park to 520.59 sq. km. out of which an area of 384.94 sq. km. was under Kalagarh Forest Division and the rest with Ramnagar Forest Division.

Even after the creation of a National Park regular forestry operations were carried out in the forest as per the working plan prescriptions. Until 1955-56, the Park was managed by the territorial DFO, but in 1956-57 its administrative control was transferred to the newly formed Game Preservation Circle and later to the Chief Wildlife Warden. All the works continued to be executed through territorial DFO, though the funds came from the budget of the wildlife organisation, except for the maintenance of roads and paths, which were the responsibility of the DFO. Under S.S. Srivastava's plan, all the prescriptions were applicable to the forests lying within the Corbett National Park, but it was emphasized that disturbance should not be caused to

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the wild animals. Again it was also suggested that petty felling, except for ordinary departmental works, may not be carried out. However this suggestion was hardly followed. In the early seventies it was realized that tiger population in the country has gone down to dangerously low level, which threatened the survival of the flagship species. As a result of which the prestigious post-independence conservation programme "Project Tiger" was launched on 1st April 1973. Corbett was one of the nine tiger reserves that were initially selected for inclusion under Project Tiger.

Before the inclusion of the National Park in Project Tiger and some years after that, majority of the area of National Park was under the territorial jurisdiction of Kalagarh Forest Division and wildlife tourism as well as shooting permits for the adjoining shooting blocks were managed by the Wildlife Warden who was under direct administrative control of Chief Wildlife Warden, Uttar Pradesh. In 1976 the territorial jurisdiction was handed over to the Field Director, Project Tiger Ramnagar but the tourism in the National Park continued to be controlled by the Wildlife Warden. Finally in 1980 the National Park was placed completely under control of the Field Director.

The following important works/activities were carried out under different management plans before the Field Director was given the administrative control of the National Park.

- Ramganga Dam Project started during Srivastava's Plan period. Clear felling were done in three parts ó firstly in 1957-58, then in 1962-63 and finally in 1967-68.
- Gregarious flowering of bamboo started in 1952 in Pakhrau block continued till 1962, gradually spreading through the entire division.
- Alignment and construction of Saddle dam ó Paterpani road and Hathikund ó Kandikhhal road started in 1969-70.
- Dhikala-Paterpani road was constructed in 1956-57 as also the hutment dormitory.
- Kandru-Chaur-Paterpani road constructed in 1960-61.
- Gaujpani-Jamunagwar and Dhangarhi-Sultan motor roads were constructed.
- Maidaban-Lohachaur road was constructed in 1963-64.

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Subsequently many a changes were ushered on the Tiger Reserve, which would destine to influence the habitat and consequently bring about major changes in the management practices.

- Declaration of Tiger Reserve in 1973
- Increase of the Buffer area in 1991
- Creation of Ramganga Reservoir.
- Relocation of three villages from the southern boundary (Dhara, Jhirna & Kothirau)
- Local extinction of Barasingha or Swamp deer and Wild dog.
- Re- introduction of Gharial in Ramganga River.
- Partial evacuation of human settlement from Kalagarh.
- Confirmation from WII that Corbett Tiger Reserve is a major source population of Tigers in Northern India and Critical Tiger habitat and also as a Level 1 tiger Conservation Unit by *Wikramanayake et al 1998*.
- Deployment of Ex-army personnel and 200 local youths under 'Tiger Protection Force' and 'Operation Lord', respectively to help local staff in their day-to-day protection measures.

4.2. Habitat Management:

Ever-since the scientific management of TR came into being, there was emphasis on the holistic management of wild animals and their habitat. It basically included the creation and maintenance of grassland & its annual management, plantation, construction of water holes for lean period. Of late there has been an attempt to make use of the whole eco-system of Tiger Reserve to create favourable conditions for the further enrichment of wild animals specially Tiger. The prevailing practice since many years is the eradication & control of lantana followed by plantation of palatable grass.

The objective for habitat management is to ensure protection from fire, availability of water and fodder to the wild animals and replace exotic species with native species.

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Problems:

Owing to strict protection and complete ban on tree felling, canopy density in forest areas has increased. Open areas and grassland became vulnerable to colonization by woody vegetation. Grasslands showed degradation due to invasion of weeds including lantana. Non-availability of adequate fund pushed the habitat restoration work to low priority, while protection measures being the dominant activity.

Gregarious flowering and lack of cultural operations has led to the near disappearance of bamboo, which is favorite fodder for elephants.

Exotic weeds such as *Lantana*, *Parthenium*, *Ipomea* etc have invaded vast tract of Corbett Tiger Reserve. About 49 species of exotic weeds has been identified, but no proper study or mapping has been carried out so far other than for Lantana.

Siltation due to soil erosion is gradually filling up deep pools in Ramganga River which are favoured habitat for both Gharials and muggers. Sona Nadi Sanctuary, once famous for Hathi Kund (deep water filled gorges where elephant can be drowned) has no such kund visible now due to heavy siltation.

4.2.1. Grassland Management:

(i) Weed Eradication:

Obnoxious weeds like *Lantana*, *Parthenium*, *Ageratum*, *Cassia tora*, etc., were removed periodically. However, in the absence of a comprehensive strategy for weed management, the eradication process has not yielded desired result so far.

(ii) Fire Protection:

Forests become prone to fire in two phases- March óApril and May- June, the later stage being the most devastating. Strict Fire Protection measures are taken during these months with deployment of experienced and dedicated staffs. Fire Management operations were carried out according to an approved Fire Plan. The broad outline of the fire management operations are-

1. To reduce fire hazards by removing dry grass and uprooted fallen trees, maintain a network of Fire lines and mobilizing public support and participation for prevention of accidental fire.
2. To detect and control accidental fires.
3. To document its effects on biodiversity.

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(iii) Fire as a management tool:

Control fire has been employed as a management tool for the following purposes.

1. Control burning of grassland checks the invasion of woody plants by destroying the seeds and also the growth of weeds. As the tendency of the grassland is to attain the next stage of riparian succession, fire stops the advancement of grassland to attain the shape of a high forest. Fire also induces growth of new flush of grass which becomes the food reserve of the herbivores.
2. Fire is also employed to burn inflammable loads along the roads and on the fire line to keep safe the adjoining forest.

4.2.2. Water Management:

The main objective is to ensure availability of water to wild animals by means of -

1. **Construction of earthen tanks** – To provide permanent solution for water supply in water deficient area, a network of small tanks were created.
2. **Hand pumps** – To provide safe drinking water to camping staff and safe and properly maintain water supply to animals, very few number of hand pumps were erected at ecologically and strategically important places.
3. **De-siltation of natural ponds and waterholes** – The Natural ponds and other water bodies were de-silted for steady supply of water even in the driest months.

4.2.3. Grazing:

There are 181 Gujjar families waiting for resettlement at the core area (Sonanadi Sanctuary). The grazing pressure of cattle owned by Gujjars is a matter of serious concern. Details regarding regulations on grazing have been discussed in Chapter-7.

4.3. Protection & Intelligence gathering:

4.3.1. Protection:

The Corbett Tiger Reserve has been fighting to protect itself from the following detrimental factors.

- 1) Poaching.
- 2) Forest Fire.
- 3) Retaliatory killings due to extreme cases of human-wildlife conflict.

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- 4) Invasive weeds.
- 5) Lopping & sometimes illicit felling (Particularly in the southern boundary).
- 6) Non-biodegradable waste generated from tourists.
- 7) Disease.

The core area of Corbett National Tiger Reserve remains safe from lopping and illicit felling since it is free from any habitation and the entry points has been blocked by strict patrolling and surveillance. The villages at the southern boundary of Tiger Reserve at times pose challenge against intrusion into the reserve which has been tackled by active vigilant staff as well as from cooperation of the Eco-development Committees.

Though regular eradication of weeds including lantana is the norm but paucity of fund fails to take care of the prospective rich habitats of the reserve. Lantana eradication programme has shown some good results by adding new patches of grass land to the Tiger Reserve.

The incidence of poaching is under control & this has been made possible by virtue of strict patrol & day-night watch by senior functionaries of department. A system of beat level patrolling, long distance patrolling and surprise checking of forest guard chowkis and anti-poaching chowkis keep the reserve safe from any kind of poaching. The Tiger Reserve administration has designed a protection protocol in the form of a 'security plan' which has been followed diligently by the staff.

The large scale poaching of tuskers in the year 2000-2001 was a wake up call for the Tiger Reserve. With the active cooperation of the Government of India, additional temporary force was sanctioned to protect the flagship animals of the Tiger Reserve- tiger and elephant. When the Tiger Reserve was reeling under serious deficiency of field staff, this was a more than welcome gesture by the central government. The Government of India met the entire expenditure and the system works pretty good for the protection of tigers and other animals. Under 'Operation Lordø' about 200 local youths are engaged for patrolling in the sensitive areas. Similarly, 60 ex-service men are deployed to augment the protection force.

The paradox is that there are 181 Gujjars are still residing in the Sonanadi Sanctuary area which is the part of the core area of the Corbett Tiger Reserve. Some Gujjars are also residing in the buffer area of the Corbett Tiger Reserve. So it is

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imperative to keep safe the herbivore wildlife from the diseases carried by cattle of Gujjars and villagers.

Therefore it has been a practice to running health care programme in the vicinity of Tiger Reserve with the help of team of veterinary Doctors from the Government Veterinary Hospital & adjoining GBPUAT, Pantnagar (U.S.Nagar, Uttarakhand) to inoculate the cattle against common diseases like foot and mouth disease, Haemorrhagic Septicaemia and Black Quarter etc. The veterinary doctor of Corbett Tiger Reserve also actively participates in domestic animal welfare activities of the fringe villages.

4.3.2. Intelligence Gathering:

As far as intelligence gathering is concerned it had no mention in the former management plans. Since it is now recognized as an integral part of wildlife protection, of late the Corbett Tiger Reserve administration is working on to formulate a road map to strengthen the intelligence network. This needs specialized training which has been generally lacking so far. The Corbett Wildlife Training Centre, Kalagarh is working in this area.

However, close cooperation and sharing information about the possible movement of professional poachers by Wildlife Crime Control Bureau, Corbett antipoaching SOG, Special Task Force of UP Police and concerned public have been found to be beneficial in keeping the flagship animals safe from poaching. The Corbett Tiger Reserve administration is also taking the help of Eco-Development Committees to gather local intelligence about any movement of offenders and prospective poachers. Apart from the above sources, the 260 personnel drawn from fringe villages to strengthen wildlife protection are also a potential tool for gathering information about offenders, wandering gangs and possible intrusion by the poachers.

4.4. Tourism & Interpretation:

Tourism in Corbett is doing well ever since the activity became an integral part of management. The purpose of this activity was to make the general public aware about the importance of conservation of flora & fauna. The overall tourism activity has largely remained unchanged over the times barring certain steps taken to streamline the tourist movement and introducing the system of online bookings to facilitate the tourists and bring transparency in the booking system.. However, that is now changing and there is greater understanding and awareness of the role of interpretation. The details about the

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tourism and interpretation have been discussed in Chapter -11 (Ecotourism and Interpretation).

4.5. Research and Monitoring:

Research in the Corbett National Tiger Reserve has been largely low key. Though several studies have been done, they did not translate into fruitful field level action. Following is the list of research works carried out by the Wildlife Institute of India, Zoological Survey of India, Kumaun University, Pantnagar Agriculture university & some NGO's .

S.N.	Topic of Research	Name of researcher	Name of institute
1	Grey headed fishing eagle	Rishad Noroji	WII, Dehradun
2	Ecological impact of prescribed burning & fire risk assessment.	Sonali Ghosh	WII, Dehradun
3	Sample collection of fishes	I.J. Singh	WII, Dehradun
4	Elephant corridor	Anil Kumar singh	WTI
5	Tarai Arc Tiger conservation landscape	Dr S.P. Goyal	WII, Dehradun
6	Otter & fishes	Ashgar Nawab	WII, Dehradun
7	Man-Tiger conflict	Sarad Kumar	Wild life Society of India
8	Vulture Survey	Vibhu Prakash	BNHS
9	Golden Mahaseer fish survey	Vidhyadhar Atkorey	WII, Dehradun
10	Prediction of forest height and biomass in dry and moist deciduous forest of Uttaranchal state using the Geo science Laser Altimeter system	Sunil kumar	Colorado State University
11	Mapping of National Park & wildlife sanctuaries	Amit Kumar Srivastava Ather Noor Arun Kumar	WII, Dehradun
12	Collection of classified animal in reserved area	Arun Kumar	Zoological Survey of India
13	Ecological research in Corbett National Park (Wood Pecker)	Raman Kumar Gazala Shahabuddin	Council for Society Development New Delhi, Centre for Wildlife Studies, Bangalore.
14	Impact of human induced disturbance of Flora biodiversity with in and in surrounding areas of CNP	Ku. Ruchira Bist	Kumaun University

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15	Survey of Crocodile	Subir Mariyo Chauhin	Crocodile Conservation Alliance Dehradun
16	Lantana Eradication	Prof. C.R. Babu	Center for Environmental Management of Degraded Eco-systems
17	Anti poaching activities and monitoring the elephant population	A.Christy Williams	WWF Nepal programme

Other than the above studies/researches the following long and short-term studies on different subject have also been carried out in Corbett Tiger Reserve.

1. Remote Sensing:

Shri Shivaji Chawan and Dr. Anjana Pant two diploma trainees from IIRS carried out their thesis studies on *Habitat Suitability Analysis* with Emphasis on Prey Base in CNP in 1995 by making use of remote sensing GIS techniques. They tried to map the vegetation cover, carryout the digital classification of the data and habitat management prescriptions to improve the wildlife habitat.

Another study was carried out by IIRS between 16.04.98 to 28.04.98 as part of the field work of the UN sponsored CSSTE-AP. The study was carried out by 6 trainees from Usbekistan, Phillippine, Myanmar, Mangolia, Cambodia and Sri Lanka under the supervision of Dr. M.C. Porwal. The study covered the following aspects.

1. Digital and visual mapping of Corbett National Park showing habitat conditions using IRS- IC/ID data.
2. Creation of GIS data base of National Park covering following aspects - Vegetation type, topography, base information. Compartment/block boundaries (to be provided by forest department).
3. Forest fire risk analysis in Corbett National Park area using GIS.

2. Plant Survey:

A group of M.Sc. botany students from Delhi University carried out a field study in October 1995 in the abandoned village sites of Dhara, Jhirna and Kothirau. The study was carried out under the guidance of Prof. C.R. Babu. Dept. of Botany, Delhi

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University and Chairman of Species Survival Commission, Indian Subcontinent Plants Specialist Group. Many new grass species and sub species variants were discovered during this field study.

A preliminary survey was carried out for Phyto-diversity Assessment of Corbett Tiger Reserve by a multi disciplinary team from NBRI. The survey was carried out between 4.11.97 to 9.11.97. Scientist tried to study, collect and assess the vegetation and biodiversity of Corbett Tiger Reserve mainly in the Central Southern parts of Corbett National Park. A follow up survey was planned for October, 98 but could not materialize.

A Project was initiated by Dr. Girish Kumar for mapping area affected by Lantana weed in Corbett National Park. The project could not be completed. A vegetation map of Corbett National Park was prepared by Forest Survey of India. This project was taken on a pilot study basis and information from both Remote Sensing and Ground Survey was used.

3. Eradication of Lantana:

Professor Dr. C. R. Babu and a team of scientists of the Centre of Excellence Programme of MoEF, Government of India, has studied and made recommendations about the management of lantana cover in the Tiger Reserve. Based upon the study, the lantana removal operation has been carried out to restore the degraded habitat.

4. Fire Ecology:

A study was carried out by Ms Sonali Ghosh from the Wildlife Institute of India on the fire ecology of Corbett National Park. Another study was carried out by IIRS on fire risk analysis during 1998.

5. Tourism:

One of the recommendations of the Research and Monitoring Workshop held at Kalagarh in April 1994 was to study the impact of tourism on habitat and wildlife. The Wildlife Institute of India imitated a three-year study on Impact Assessment of Tourism in Corbett National Park in March 1996.

6. Research on breeding population of Gharial:

A research project on the breeding behaviour of Gharial Crocodile is going on since 2008. Gharial being the rarest members of its order, the species was recently

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upgraded from 'Endangered' to 'Critically endangered'. The research was started on the concept that Gharial Crocodile population in Ramganga River might be in danger because of the creation of a large lake as part of a hydro-electric cum irrigation dam at Kalagarh across the Ramganga river. Shri Subir Chowfin is working on the breeding behaviour of this magnificent reptile. According to his studies the Corbett population is over hundred individuals. This is an important contribution to the global population of Gharial adults. In addition to the above facts, the uniqueness of this population is that the gharials of the Corbett Tiger Reserve are breeding in a lake like environment.

7. Ornithology:

Shri Rishad Naoroji a researcher on raptors continued his independent field observations on the Lesser Grey headed fishing eagle *Ichthyophagas ichpay-* and other raptors of CNP. Samples of fish taken from Ramganga were sent for chemical analysis so that the level of pesticides contamination could be measured.

4.6. Relocation of Villages:

As such there are no permanent settlement/villages inside the Core Critical area of Corbett National Tiger Reserve. However, 181 Gujjar families are camping inside the Sonanadi Sanctuary part of the Core area. The relocation of Gujjars has been cleared by the MoEF, Government of India, the designated land (160 Ha. reserve forest land at Sabhalgarh Compartment No. 8 of Chiriyapur Range in Haridwar has been handed over and the process is likely to be completed very soon.

4.7. Administration & Organization:

The Administration & Organizational setup of Corbett Tiger Reserve is as follows. The Corbett Tiger Reserve is headed by the Field Director. The Deputy Director and the DFO, Kalagarh are DCF level officers who report to the Director. The Director directly reports to Chief Wild Life Warden & is responsible for the overall affairs of the Tiger reserve

4.7.1. The administrative structure and organisation of Corbett Tiger Reserve:

1. Field Director
2. Deputy Director
3. DFO, Kalagarh

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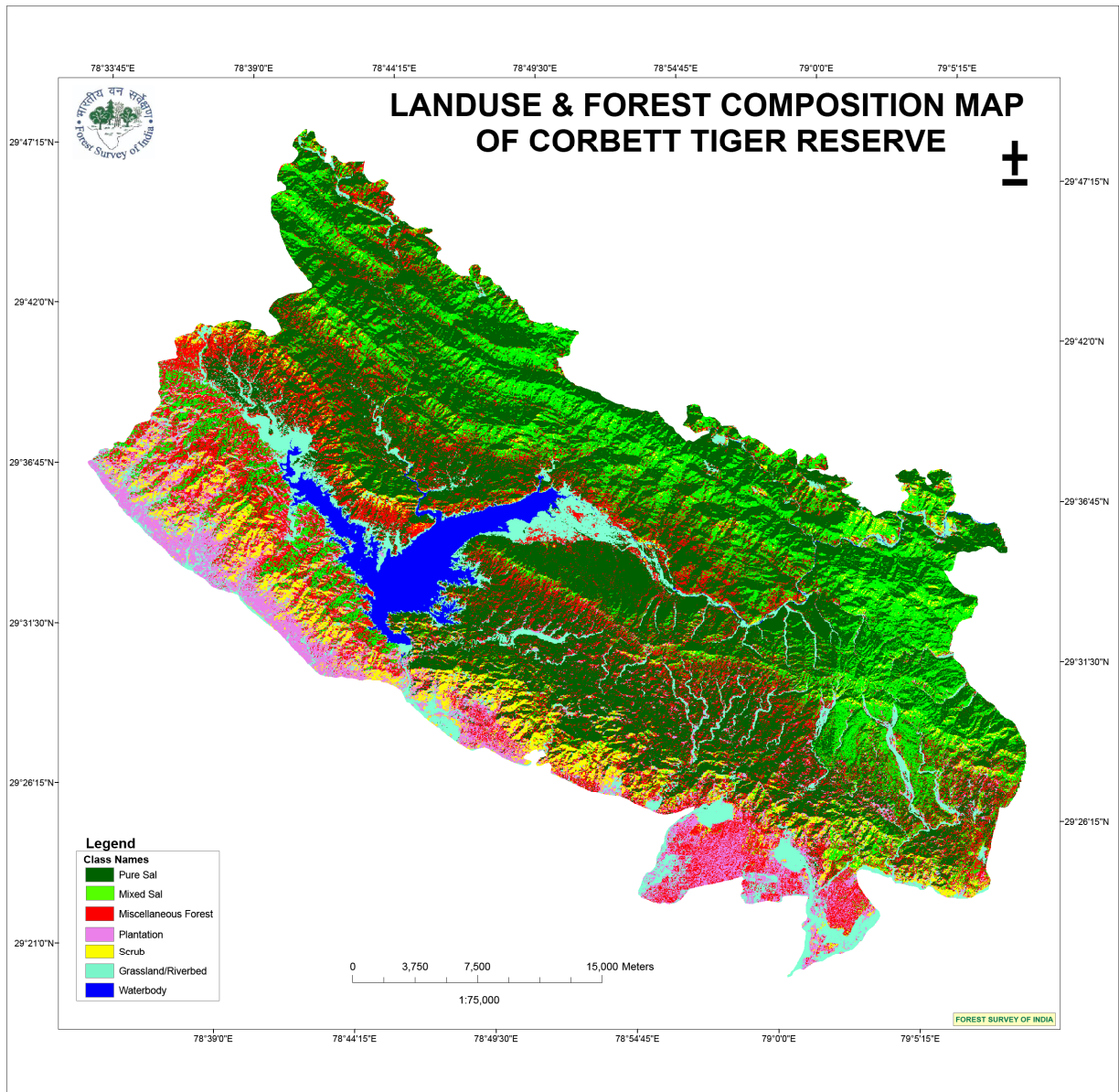
4. Director, Corbett Wildlife Training Centre
5. Sub Divisional Officer, Kalagarh
6. Sub Divisional Officer, Bijrani
7. Sub Divisional Officer, Sonanadi
8. Sub Divisional Officer, Adnala
9. Range Officer, Bijrani, Sarpduli, Dhikala, Kalagarh, Jhirna, Dhela, Research, Mohan, Palen, Maidaban, Ratuadhab and Sonanadi

Note: Detail of the organisation has been discussed in Chapter-13.

Chapter-5

Land use patterns & Conservation-Management Issues

5.1. Land Use Classification:



The core area of Corbett Tiger Reserve have the following types of land uses :

Ecotourism:

About 163 sq. km. of core area has been designated for the use of tourists. The detail of the tourism zones has been discussed in the Chapter-11.

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Kalagarh Colony:

A total of 23521 acres or 9518.61 ha forest land was sanctioned to Uttar Pradesh Irrigation Department for the Ramganga Hydroelectric Project and setting up a residential colony for their staff, vide letter of CF, Western Circle, No.-903/13-11, dated 22-08-1966, for. Out of the total sanctioned land the UP Irrigation Department received 22234.81 acres or 8998.15 ha. As per the conditions of the land transfer order, after the completion of dam construction, the excess land had to be returned to Forest Department. In pursuance to this Honorable High Court, Allahabad, Lucknow bench in its order dated 04-08-1999, directed handing over the surplus land to forest department, after keeping minimum essential land required for upkeep or running of the dam establishment and removal of all encroachments in the forest land by the irrigation department and handed over back to forest department ". The Honourable Supreme Court vide its order in December, 2013 has ordered vacation of certain portions of the Kalagarh colony.

The status of land use at Kalagarh is as follows:

Sl. No.	Land use	Total area received by Irrigation Department	Minimum area required by the department	Surplus land to be returned to Corbett Tiger Reserve	Area handed over till Jan. 2011	Balance land to be handed over to the Corbett Tiger Reserve
1	Dam and submerged area	8652.17 Ha.	8500.79 Ha.	151.38 Ha.	151.38 Ha.	-
2	Kalagarh Colony	345.98 Ha.	147.54	198.44 Ha.	193.125 Ha.	5.315 Ha.
3	Total	8998.15 Ha.	8648.33 Ha.	349.82 Ha.	344.505 Ha.	5.315 Ha.

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Status of transfer of Buildings:

S. No.	Location	Total Buildings to be handed over to forest deptt. by irrigation deptt, U.P.	Buildings Transferred upto 30-07-2012	Remaining Buildings to be transferred by irrigation deptt, U.P.
1-	New colony	153	129	24
2-	Central Colony	652	479	173
	Total	805	608	197

(i) Cases of encroachment (Evacuation) pending at various courts :

In pursuance of interim order date 04-08-1999 of Honourable High Court, Allahabad; Lucknow bench, the joint team of Forest department and Irrigation department identified a total of 865 encroachments in Kalagarh colony. Irrigation Department filed eviction cases against them under UP public premises act-1972 in the court of SDM, Kotdwar. Besides the above cases, the CEC, in its report dated 30-04-2004 also recommended evacuation of encroachments in the Irrigation colony and made DM and SSP, Pauri personally responsible for the task. One affidavit has also been filed in the Honble Supreme Court (I.A. 1157) regarding the above purpose.

Following is the latest situation of those cases:

Sl. No.	Details	No. of cases filed
1	No. of Cases filed in the court of SDM, Kotdwar, by Executive Engineer, CMD, Kalagarh	818
2	Cases disposed by the said court.	796
3	Cases pending as on 31-07-12	22
Sl. No.	Details	
1	No. of cases ó evacuated (during August 2005)	177
2	No. of cases under appeal in the court of Distt Judge, Pauri.	135
3	Stay application in honourable High Court, Nainital.	1

Against evacuation orders of 796 cases, Irrigation Department U.P. has evacuated 177 cases so far. Irrigation department, U.P. has not taken action against 619 cases against which evacuation orders have been passed.

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Sustained effort should be taken by the District Administration, Pauri to free the area from encroachment and hand over the land to Corbett Tiger Reserve. The Irrigation Department is also expected to handover the remaining land and buildings to Corbett Tiger Reserve.

The Hon. Supreme Court has also issued directions in December 2013 regarding removal of encroachments as well as return of excess land in Kalagarh to the Corbett Tiger Reserve to be developed as wildlife habitat. The onus of this has been placed primarily on the district and police administration of Pauri District.

The Hon. Apex Court's orders have to be complied with in letter and spirit by all concerned. without any delay.

(ii) Habitat Restoration works:

Corbett Tiger Reserve has done habitat restoration works in various stages in the area, which was transferred to it by the Irrigation Department. After removal of invasive species like lantana & others, plantation and grass planting has been done in the area. Approx 180 hac. area has been restored till now.

5.2. Socio-economic Profile of villages:

Gujjars & Their Historical Background:-

Gujjars are nomadic Muslim folks who are also referred as Jammuwala Gujjars, cattle rearing being their principal occupation. They migrated from their ancestral villages from Jammu & Kashmir to the foot hills of Himalayan mountain ranges. According to various sources, they came to Himachal Pradesh as part of the dowry of the King of Sirmour, who married a princess of Jammu nearly 300 yrs. ago. From Himachal, they gradually entered western Uttar Pradesh and continue to remain here since then.

Gujjars traditionally construct huts using poles and grasses from the forests. These are called *deras*. Each family keeps a herd of 15 to 20 buffaloes near their *deras*. Traditionally, Gujjars used to migrate to upper Himalayas during the summer season, returning again in the winter. But of late, most of them have preferred permanent settlement throughout the year, thereby giving no respite to forests. The rapid increase in the human and livestock population of the Gujjaras coupled with near cessation of their seasonal migration is cause for severe stress on the habitat of Tiger and its prey.

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The rise in human and cattle populations along with the influences of altered life style has seen the Gujjars being trapped in a vicious circle, whereby the rapidly declining resource productivity and lack of options has led to over use and abuse leading to accelerated degradation of the habitat and the prevalent Gujjar life style has essentially become unsustainable. Since they are not getting basic human amenities like, education, health, electricity, safe drinking water, etc, the rehabilitation of Gujjars have become need of the hour.

5.2.1. Gujjar settlements of the core area:

Apart from the Kalagarh colony, the core area is free from permanent human habitation. About 181 Gujjar families are residing in the Sona Nadi Sanctuary area which was incorporated as part of core area of the Corbett Tiger Reserve. Since the Gujjars needs to vacate the core area, the Government of India cleared the 160 Ha. of forest land for their resettlement at Sawalgarh Compartment No. 8A of Chiriyapur Range of Hardwar Forest Division. The relocation process has been fast tracked and is expected to be completed soon. The relevant notification and order of Government of India with reference to translocation of Gujjars has been given as **Annexure-5/1**.

Gujjar Families in core area:

Name of Division	Name of Range	Gujjars Families (2001-02)	Gujjars Families (July 2010)
Kalagarh Tiger Reserve, Lansdowne	Palain	26	28
	Adnala	31	53
	Madavan	16	29
	Sonanadi	80	111
	Mandal	5	-
Ramnagar Tiger Reserve, Ramnagar	Kalagarh	23	35
Total		181	256

5.3. Resource Dependence of Villages:

As such there are no permanent settlements in the form of villages inside the Core area. However the Gujjars depend upon the forest for fodder. They also need poles

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and grass for their shelter. Since they are nomadic in nature, the pressure on forest shifts accordingly. However, the huge number of cattle competes with wild animals for water and fodder.

5.3.1. Resource Dependence:

Tourism:

Tourism is one aspect, which has been evolving very rapidly in this landscape. Though Corbett is the first National Park of the Asian mainland, large-scale tourism is something new to the area. Till the eighties tourists used to stay in the guesthouses of the forest department. Private tourist lodges started getting established in the late eighties on the periphery of the reserve especially in village Dhikuli. In the nineties, more entrepreneurs joined the fray and today the outskirts of Corbett has many private properties. This boom in tourism has skyrocketed the land prices. The resorts that have come up are also a source of employment to the locals both at the construction phase and in their day-to-day operations. The rise in land prices has brought in lots of money to the rural economy from the sale of land holdings. This has both positive and negative impacts on the rural social-economic fabric but definitely the dependence of villagers on tourism has increased considerably.

5.4. Human Wildlife Conflict:

In comparison to the buffer area, the core zone remains relatively safe from this human-wildlife conflict. A sizeable stretch of the core area shares boundary with Uttar Pradesh. There were regular occasions of straying of tigers into the adjoining villages of Uttar Pradesh resulting in cattle lifting. Damage of crops by deer, nilgai and wild boar is a frequent problem in these villages. Human beings are also occasionally injured or lose their lives either by elephants, tigers or leopards.

5.5. Assessment of Inputs of Line Agencies/Other Departments:

Many other government departments are active in the human settlements around Corbett Tiger Reserve and are providing basic services to the population. Yet, the services and schemes are the same as practiced in other parts of the state and no site specific schemes are operational by any of the departments. Police and revenue departments occasionally help in the mitigation of human-wildlife conflict issues. The after effects of human-wildlife conflicts are considered as the sole responsibility of the Corbett Tiger Reserve administration and other departments maintain a calculated

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distance. Tourism around the TR remains uncontrolled as no guidelines exist for the construction of lodges and land use was being changed easily without taking into account the concerns of Corbett Tiger Reserve. However, the Government of Uttarakhand has recently issued an order to ban the landuse change within 2 kms of the boundary of Corbett Tiger Reserve. NGO's do have a presence in the area and they try to support the TR in its conservation efforts. The prominent NGO's working in the area include WWF, the Corbett Foundation, WTI, Mahasheer Conservancy and Rainbow Friends of Nature. Regular interaction with various line agencies is necessary as mandated by the NTCA. The Corbett Tiger Reserve administration cannot work in isolation, because help is necessary from different departments during the time of natural disaster and to maintain law and order during the time of intense human-wildlife conflicts.

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Part B: The Proposed Management

Chapter-6

Vision, Goal, Objectives and problems

6.1. Vision:

The tiger reserve aspires to maintain a healthy and viable source population of the tiger at optimal density along with the entire associated organisms, their habitat and the Ecosystem services provided by the landscape, in vibrant partnership with local people, inculcating in them the sense of pride and belongingness towards Corbett Tiger Reserve and the adjoining tiger landscape.

6.2. Management Goal:

The Corbett Tiger Reserve will be managed as a repository of natural process and wild flora and fauna of the Shivalik-Terai for posterity. In the process it will protect & conserve the tiger and associated species and their habitat from all threats, natural or otherwise.

To ensure long term conservation of wild flora and fauna as well as the Shivalik Terai landscape by employing world-class scientific conservation and protection strategies with active involvement of local communities so as to maintain its position as a premier ecotourism destination focusing on nature education and interpretation.

6.3. Management objectives:

The following are the management objectives of Corbett Tiger Reserve:

1. To ensure long term conservation of a genetically viable and healthy population of Wild Tigers, which will also act as a source population for the larger Corbett landscape.
2. To protect and conserve a genetically viable population of Asian Elephants with a balanced sex ratio.
3. To accomplish a robust regime for protection and management of endangered wild flora and fauna with active partnership of local inhabitants living in the proximity of the Tiger Reserve

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4. To restore & rejuvenate wild habitats which have been degraded by various known and unknown factors.
5. To maintain productivity of the grasslands to optimum levels.
6. Address the special needs for long term management of Hog deer population and habitat through quality research and consequent implementation of prescriptions.
7. To facilitate long term and short term research programmes to support better understanding of natural processes and human impacts, by coordinating with various National and International Institutes. The programme should lead to logical conclusions at the field level with regard to conservation issues.
8. To promote a vibrant management set up to instil confidence and a sense of pride and ownership in its staff & enhance better bonding with higher level of functionaries.
9. To ensure capacity building of the frontline staff for effective wildlife law enforcement..
10. To maintain such essential infrastructures like 6 forest rest houses, forest roads, culverts, fire lines, chowkis, watch towers, elephant sheds, residential & non-residential buildings, Corbett Wildlife (Training), Kalagarh Centre, barriers and such other structures which are essential for strengthening protection, managing tourism and welfare of the field staff.
11. To ensure that no ecologically unsustainable land use activities operate within the jurisdiction of Tiger Reserve.
12. To maintain good relationship with local communities, including by strengthening Eco Development Committees (EDCs) along the border of the core zone
13. Maintain a close and effective working relationship with neighbouring forest divisions including Bijnore forest Division of U.P and to work closely with police & civil administration and other government agencies for effective coordination.
14. Proactive mitigation of Human-wildlife conflicts including timely and effective efforts to mitigate losses and to prevent revenge killings of tiger and other wild animals.

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6.4. Problems in achieving objectives:

The following are the limiting factors, which have a bearing on the impact of management practices.

1. Sudden increase in the human imprints in the areas adjacent to the Tiger Reserve and other associated commercial activities in the area.
2. Increase in Human Wildlife Conflict in adjacent Human dominated Landscape.
3. The delay in budgetary allocation leading to delay in essential works and procurement of basic requirements.
4. Inadequacy of budget leads to unavailability of motor boats, tractors and even vehicles for Range Officers and limited resources for maintenance and operational use of the same.
5. Vast area under cover of lantana and other obnoxious and non palatable weeds.
6. High resource dependency of adjoining population on the forests.
7. Rampant, unplanned mushrooming of tourism infrastructure around the Tiger Reserve and ever increasing pressures have further compounded the conservation concerns around the tiger reserve. Pollution, including noise, light and sound and solid waste management are already significant challenges in the area. Lack of effective regulations by the revenue authority on un-authorized constructions has already pushed the scant land and water resources along the boundary of the reserve in to the brink of disaster.
8. The high cattle population of Gujjars also poses danger of outbreak of serious contagious diseases among the wild ungulates. They are also causing damage to the precious water resources during the pinch period for the wild animals.
9. Lack of a sustained research programme on various aspects of wildlife management and ecology inhibits critical decision making at times.
10. Ageing frontline staff who are not fit for the tough field duties.
11. Lack of adequate staff in the frontline.
12. Lack of quality infrastructure facilities for staff & their families.

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13. Limited opportunities of exposures to good practices in other renowned tiger reserves for lower and higher level functionaries.

Limited institutional capacity to respond to the growing threat of organised wildlife criminals targeting the Corbett landscape.

6.5. Strength-weakness-opportunities-limitations (SWOT) Analyses:

6.5.1. Strength:

Uttarakhand is famous for the Himalayas as well as its forest cover. The total forest area of Uttarakhand is 64.79% of the geographical area of the State. Uttarakhand has six National Parks, seven sanctuaries, three Conservation Reserves and one Biosphere Reserve. In comparison to the prescription of National Forest Policy of 1988, where the percentage of protected areas should be 4% of the geographical area of India, in Uttarakhand, the percentage of Protected Areas is approximately 14% of the State's geographical area.

Corbett Tiger Reserve, Nanda Devi National Park, Rajaji National Park, Valley of Flowers National Park and Gangotri National Park are world famous protected areas of Uttarakhand.

The state of Uttarakhand has rich cultural heritage of conservation and protection of wildlife, which is evident in the fact that Corbett Tiger Reserve has the highest tiger density in the country as per WII-NTCA assessment. Uttarakhand is also famous for its rich population of Elephants, Snow Leopards, Himalayan black bears, Gharials, Mugger and a large number of resident as well as migratory birds. It is also famous for faunal diversity, the epitome of which is the UNESCO World Heritage site of Valley of Flowers. Uttarakhand is also endowed with diversified aquatic ecosystems represented by Ganga, Yamuna, Ramganga, and many other important rivers, lakes, reservoirs and marshy lands.

Corbett Tiger Reserve is committed to its topmost priority for protection and conservation of tiger and its habitat. It has an effective 'Protection Plan' where different levels and different intensity of patrolling are carried out throughout the reserve. During Monsoons when the roads are badly damaged Long distance foot patrolling is undertaken by the staff and is popularly known as 'Operation Monsoon'. During this period large tract of vulnerable areas are regularly scanned to ward off any kind of

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possibility of intrusion that may lead to poaching of wildlife in general and tiger in particular.

Apart from regular staff, 200 daily wagers and 60 ex-military personnel have also been deployed on protection duty. Since they are from the adjoining villages, they help the Tiger Reserve to get cooperation from the villagers as well as in collecting intelligence about movement of suspected persons. These 260 persons are put into regular patrolling along the sensitive boundary of the Tiger Reserve.

Corbett Tiger Reserve has a robust round the clock wireless network, which is used for protection of tiger and its habitat. It has strategically placed anti-poaching chowkis and forest guard chowkis to protect the tiger reserve.

The most sensitive part of Corbett Tiger Reserve is its southern boundary. NTCA has supported Corbett Tiger Reserve to install a 24x7 electronic surveillance system (e-eye) to scan nearly 400 sq. km area of the highly vulnerable southern boundary of Corbett Tiger Reserve. Nine towers have been set up under this project. Visible as well as Infra Red cameras have also been installed under this scheme which can be monitored through internet from anywhere in the world by authorized officers. It is proposed to set up another 5 towers to cover other vulnerable areas as well. This system will help the management to strengthen the protection measure of the Tiger Reserve.

Corbett Tiger Reserve is annually visited by considerable number of tourists. The tourist activity is allowed in 19.85% of the core area (163.21 sq. km. of 821. 99 sq.km) as against the suggested norm of 20% by the 'Tourism Guideline' given by NTCA.

The most outstanding achievement of Corbett may be its high population density of tigers. It is also evident from the fact that the adjoining forest divisions also have considerable number of tigers.

Corbett Wildlife Training Centre-Kalagarh:

One of the most important strengths of Corbett Tiger Reserve lies in the fact that the tiger reserve has a rare distinction of having a dedicated Wildlife Training Centre at Kalagarh, which imparts trainings to forest guards and other forest officers. Its unique distinction lies in the fact that the centre provides class room as well as field opportunities for learning, thus strengthening the wildlife management skill of the

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trainees. This centre has been providing regular inputs to staff from Corbett Tiger Reserve and neighbouring divisions, including in UP on essential elements of wildlife management including on conflict management, anti poaching etc. Similar training opportunities are made available to staff and other stakeholders from Uttarakhand and beyond from time to time. As such, the growth of this training centre is a vital and essential part of the management of Corbett Tiger Reserve. NTCA has also underscored the importance of this unique training facility and offered all support in its growth and development.

The State Government has recently taken a decision to develop the Corbett Wildlife Training Centre as a 'Centre for Excellence'.

Special Tiger Protection Force:

The Corbett Tiger Reserve is in the process of constituting a Special Tiger Protection Force. Thirty percent of these at the forest guard level will be recruited from local Gujjars, which besides generating employment opportunities will also considerably strengthen protection of tigers and its habitat. A tripartite MoU in this regards has been signed among NTCA, Govt. of UK and Corbett Tiger Reserve and the process of constituting this force is under progress. This force is likely to give a real boost to protection activities of the Tiger Reserve.

Tiger Conservation Foundation for Corbett Tiger Reserve:

The Tiger Conservation Foundation has been constituted in Corbett Tiger Reserve under section 38(X) of the Wildlife Protection Act, 1972 as amended up to 2006.

The aim of the Foundation is to facilitate and support the management for conservation of tiger and biodiversity and, to take initiatives in the eco-development of people in such development process.

The tiger foundation works on following objectives:

- (a) to facilitate ecological, economic, social and cultural development of the tiger reserve.
- (b) to promote eco-tourism with the involvement of local stake-holder communities and provide support to safeguard the natural environment in the tiger reserve.

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- (c) to facilitate creation of and/or maintenance of such assets as may be necessary for fulfilling the above said objectives.
- (d) to solicit technical, financial, social, legal and other support required for the activities of the foundation for achieving the above said objectives.
- (e) to augment and mobilize financial resources including recycling of entry and such other fees received, in the tiger reserve to foster stake-holder development and ecotourism.
- (f) to support research, environmental education and training in the above related fields.

Tourism:

There is a marked improvement in the tourist facilities in terms of refurbishment of forest rest houses, canteen, drinking water facility, on-line booking of morning and day excursion and forest rest houses, registration of vehicles for visits in Corbett Tiger Reserve, restriction of entry of private vehicles, improvement of Corbett museum, Dhangarhi museum, library and establishment of a mini Corbett Information Centre at Dhikala and improvement of upkeep of the camp elephants, etc. Annually the tiger reserve attracts nearly two lakh visitors which generates lots of good will for the reserve as well as generates nearly seven crore rupees as revenue. Apart from regular tourists, lots of school children, students from higher education institutes, trainees of All India Services and Central services, etc., also visit the tiger reserve on a regular basis.

The other noteworthy positive factors are:

- The biggest positive in the landscape is that the local human population despite facing the effects of Human Wildlife Conflict is still supportive to the cause of conservation
- Corbett is an important driver of local economy and is a major contributor to the livelihood of the local villagers
- Most of the villages already have functional EDCs.
- Presence of local and international NGOs in the landscape

6.5.2. Weakness:

The Tiger Reserve has several weaknesses, which need to be improved upon. The lack of regular recruitment at the field level has led to an ageing frontline staff

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whose average age is over 50 years. Lack of proper promotions and some basic incentives like nutrition allowance, good quality uniform, drinking water, lighting and transport facility tend to demoralize the frontline staff who often work in very difficult and challenging circumstances. Sometimes, delay in availability of budget also causes delays in payments to daily wage staff employed in protection and other critical duties. There is serious inadequacy in the field of research and development activity in Corbett Tiger Reserve. Though Corbett Tiger Reserve offers vast opportunity for research on various aspects of ecology and natural resource management, there has been limited work carried out in this direction. Corbett Tiger Reserve should harness the expertise of Wildlife Institute of India, the Garhwal and Kumaon Universities, GBPUA&T, Pantnagar etc., for furthering research on various subjects, whose prescriptions will be invaluable for the management of the reserve. This will also help strengthen a sense of ownership and pride amongst local students who get an opportunity to carry out research on various aspects of Corbett Tiger Reserve.

Intelligence gathering and coordination amongst various institutional units remains one of the weakest links in the intricate chain of protection strategy. This requires specialized staff and equipment. Identification of the willing and capable staff and grooming them in this specialized job is necessary.

Some other inadequacies are:

- Presence of a large encroachment (Sunderkhal) on the eastern boundary hampering free movement of wildlife from Corbett Tiger Reserve to Koshi river.
- Tourism flourishing on the boundary but not very inclusive of the local people who are not getting the commensurate benefits.

6.5.3. Opportunity:

The greatest opportunity for Corbett Tiger Reserve lies in the fact that geographically it is a compact area and connected with very high potential habitats of Ramnagar, Tarai West, and Lansdowne Forest Divisions. The other divisions of the Corbett Landscape like Haldwani, Tarai Central and Tarai East have the immense potential to be developed as prime tiger habitat of Uttarakhand. The recently constituted Nandhaur Wildlife Sanctuary will enhance the quality of tiger population in the landscape. The Rajaji National Park with its vibrant population of elephant and massive

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potential for tiger is a great opportunity to enhance the quality of gene pool of tigers and elephants.

Given the unique reputation of Corbett Tiger Reserve regarding the rich biodiversity and accessibility to New Delhi, various nationally and internationally sponsored conservation programmes can be implemented simultaneously. That will disseminate the knowledge about various intricate & complex issues of nature. The Staff & officers posted here can be front runners in conservation programme if they are given proper exposures & facilities to pursue various extracurricular activities like photography, bird watching, flora identification etc. They can emerge as experts and thus serve & play a long innings in the Tiger Reserve which ultimately will be good for the conservation efforts in this part of Uttarakhand in particular and country in general. An excellent opportunity is also available to further the cause of conservation of the tiger by facilitating and supporting eco-development of people residing in the buffer area.

The other noteworthy opportunities are as follows.

- People who already have attachment with the forest and wildlife can be easily motivated for the cause of conservation.
- Rate of literacy among the villagers is high and hence it is easier to convey the conservation message to them
- .With an established network of EDC, community participation in eco-tourism and environmental awareness programme can be ensured.
- Local NGOø can be easily roped in to assist the departmental initiatives
- Eco-tourism opportunities are present aplenty which can be directed for the benefit of local villagers.
- The market for tourism is well developed.
- Corbettø brand name can be used for the promotion of tourism.

6.5.4. Limitations:

Limitation & threats are quite obvious for the richest tiger density landscape of the Country. The limiting factors are described in the sub-chapter 6.4. Apart from that the Tiger Reserve administration routinely faces challenges and due to the vigil of staff any ulterior motives of outsider is being thwarted. Poaching continues to be a big threat here as is in all the PAs of the country & means have to be devised to fight it

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systematically. Yet another threat is the ever increasing pressure of tourist activity which has a great limiting factor, and often shifts the focus from core forestry to appeasement of tourists. The peculiarity of the Kalagarh colony which lies in the core zone of the tiger reserve needs special attention. This has been described in detail in Chapter- 5.

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Chapter-7

Management strategies

7.1. Delineation of Critical Tiger Habitat and Inviolate Areas:

The best practice of a tiger conservation programme would be to let the breeding tiger population remain undisturbed from anthropogenic influences and ensure adequate shelter and sustainable supply of food.

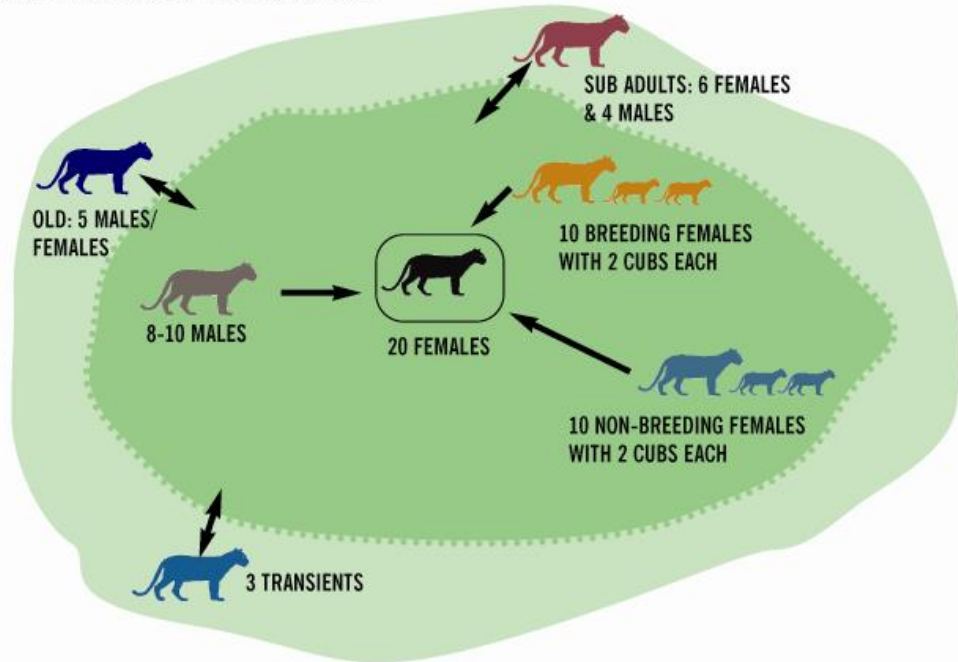
Tiger is a territorial animal, which advertises its presence in an area and maintains a territory. It is a well-known fact that partial overlaps of resident male territories in an area do occur. However, a higher degree of overlapping increases risks of lethal internecine combats. Several female territories do overlaps within the territory of a male tiger. The tiger land tenure dynamics ensures presence of prime adults in a habitat, which act as source population, where young adults from nearby forest areas periodically replace old tigers.

Tiger being an umbrella species, this will also ensure viable populations of other wild animals (co-predators, prey) and forest, thereby ensuring the ecological viability of the entire habitat. Therefore, buffer areas with forest connectivity are necessary for healthy tiger dynamics, since such areas foster sub-adults, young adults, transients and old members of the population. The young adults replace the resident ageing males and females from the source population area.

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TIGER LAND TENURE DYNAMICS

Minimum Population of tigers in breeding age needed for a viable population of (80-100 tigers) which require an inviolate space of 800-1000 square kilometers



Simulation Results for Viable Tiger Population (designed by WII)

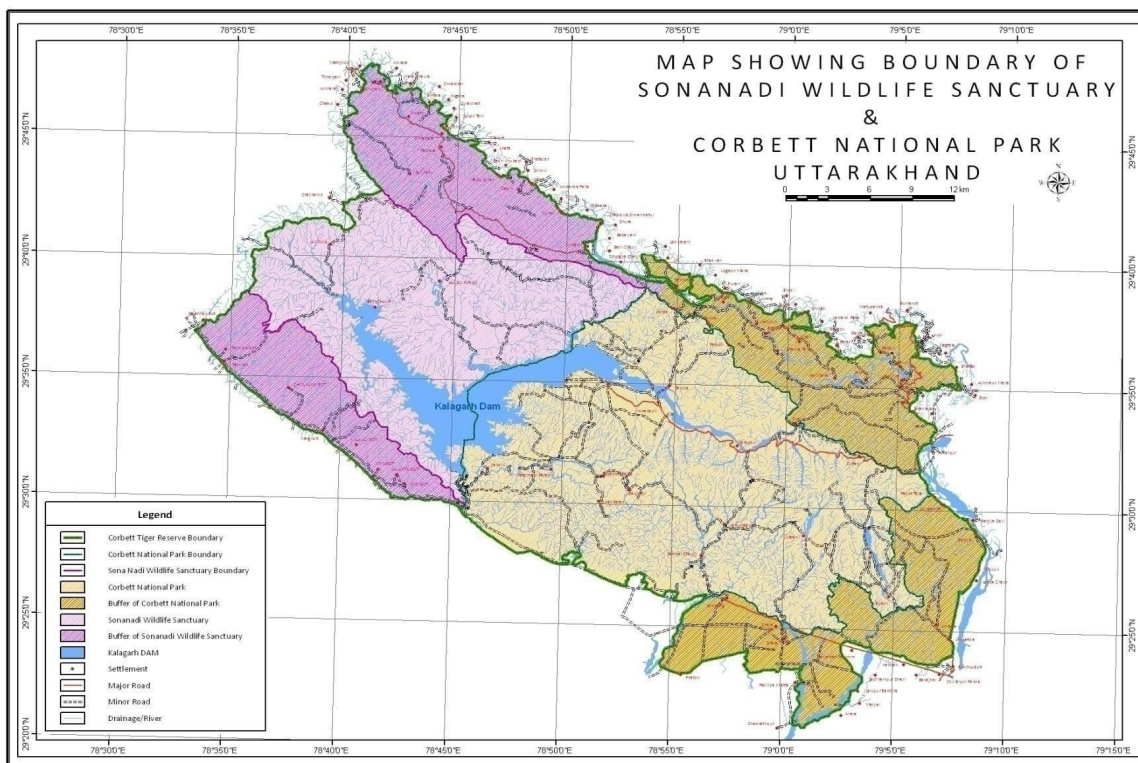
During the all India tiger status monitoring exercise jointly taken up by NTCA along with State Forest Department and the Wildlife Institute of India, Corbett Tiger Reserve was extensively surveyed with a systematic sampling protocol. The effort resulted in the mapping of tiger occupancy and relative abundance, prey abundance indices, anthropogenic pressure indices and habitat quality. A team of researchers of Wildlife Institute of India estimated absolute abundance of tigers and prey by double sampling in a stratified sample of different tiger sign abundance. Relationship between indices and absolute abundance were evaluated and calibrated for predicting tiger densities. The results of this exercise show an estimated vibrant density of 19.6 tigers per 100 sq.km. to be present in the 521.99 sq.km. of Corbett National Park which is the part of the core area of the Corbett Tiger Reserve (Ref: Status of tigers, co-predators & prey in India-2008.)

According to the report 'Status of Tigers, Co-predators and Prey in India-2010' prepared by NTCA and WII, the Corbett population block (which is larger than Corbett Tiger Reserve) has the highest tiger density in the world (9.4 tigers/100 sq.km at the

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landscape scale) and serves as a source for the entire landscape extending from Kalesar in Haryana to Pilibhit Forest Division in Uttar Pradesh.

Map showing the core area of Corbett Tiger Reserve, constituted by the Corbett National Park and the Sonanadi Wildlife Sanctuary.



This research has demonstrated that tiger occupancy of forests were dependent on availability of wild prey and low human impact on the habitat. Tiger densities declined with increase in human use of the forests. Good source populations of tigers were found in areas devoid of human settlements and least human impact. Thus, to ensure perpetuation of the above goals it is essential to have an inviolate area for a minimum viable source population of tigers. A minimum of two such populations should be ensured in each bioregion so as to preserve the unique behavioural, ecological and genetic adaptations of the tiger.

The Wildlife (Protection) Act, 1972 (amendment in 2006) mandates that the core tiger habitat should remain inviolate and it is the duty of the state Government to declare the core tiger habitat as 'Critical Tiger Habitat'. In pursuance of the above requirement the Government of Uttarakhand through a notification (no. 6774/x-2-2007-19(27)/2002

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dated 24th December, 2007), declared the core area of the Corbett Tiger Reserve as the ‘**Core Critical Tiger Habitat**’. The expansion of the core area is 821.99 km². This area comprises of the Corbett National Park and the Sonanadi Wildlife Sanctuary. According to the ‘Status of Tiger, Co-predators and prey in India-2008’, the tiger density in the Corbett National park (520.82 Sq. Km) is about 19.6 tigers per 100 sq. Km and the 2010 report emphasized a density of 9.4 tigers per 100 Sq. Km. in the Corbett Block (2287 Sq. Km.) - which is highest in the world.

Area statement of Core Area:

1.	Corbett National Park	520.82 Sq. Km.
2.	Sonanadi Wildlife Sanctuary	301.17 Sq. Km.
3.	Total core area of Corbett Tiger Reserve	821.99 Sq. Km.

The core zone of Corbett Tiger Reserve is not entirely free from anthropogenic pressure. The Sonanadi Sanctuary part of the core is still not free from 181 nomadic gujjar families. Apart from that about 86.5 sq. km of core area is under control of Irrigation Department of UP, which manages the hydro-electric project at Kalagarh. This land was made available in 1966 (vide letter no 903/13-11 dated 23-08-1966 of CF Western Circle, Nainital). Large numbers of people are still residing in the area. Many unauthorized people are also residing in these colonies. The Allahabad High Court, and CEC had ordered for eviction of the encroached land and buildings by the user agency and handover of the same to Corbett Tiger Reserve. Partial implementation of the Hon'ble High Court's order has been carried out. About 6 ha. of land and 197 dwelling units are yet to be handed over by the Irrigation Department. A recent order of the Supreme Court of India in December 2013 has also asked for these lands to be vacated from illegal occupants and handed over to Corbett Tiger Reserve.

The core zone also has tourist accessible areas. About 20 percent of the core zone is open for tourists. Dhikala, Bijrani, Jhirna, and Durgadevi are the four places where tourists can have morning excursion as well as avail the facility of night stay. The Dhikala, Bijrani and Jhirna tourist zones lie in the Corbett National Park while the Sonanadi zone forms part of the Sonanadi Wildlife Sanctuary which together form a part of core critical zone of the tiger reserve. Dhikala being the prime tourist destination of Corbett Tiger Reserve is hugely popular with visitors and it is always going to be a

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huge challenge to further limit access or close this complex for tourists. Similar is the case with other tourist zones also.

Progressive closure may be the right approach; where in the initial step would be to reduce the overnight stay over an extended period of time while day visits may be continued by adopting suitable practices to regulate and minimize impacts. Efforts should be made to encourage group tourism (as per the prevailing Canter ride facility) for day excursions. It is also necessary to address the dependency of livelihood of thousands of people who depends on the tourism based on Corbett Tiger Reserve. Ecotourism should be the central theme for managing the burgeoning inflow of tourists, where involvement of local stakeholders as well as promoting tourism in the buffer areas should be encouraged.

Carrying Capacity of tigers:

The optimum Carrying capacity of Tigers based on the prey density has been calculated using predictive equation of Hayward et. al. (2007).

$$y = -2.158 + 0.377x$$

y = log of predicted predator density

x = log of Preferred prey biomass

Prey	Weight	Density
Chital	49	53.5
Sambar	200	7.97
Barking Deer	17	1.86
	Prey Biomass (kg)/sqkm	4247

$$\text{Log (Predator density)} = -2.158 + 0.377 * \text{Log(Prey biomass)}$$

$$\text{Predicted tiger density} = \mathbf{16.2 \text{ tiger/100sq km}}$$

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7.2. Zone & theme approaches to management strategies:

The multifarious peculiarity which translates into diverse bio-geographic terrain, rich biodiversity, multifarious problems related to habitat management and ecotourism, mushrooming of resorts and hotels, constant threat to wildlife, ever increasing incidences of Human-Wildlife Conflict, restriction of corridors, presence of Gujjars in the core area, biotic influence of khatta of buffer area & encroached village (Sunderkhal) of the adjoining Forest Division and high expectation from authorities, demands highest standard of management.

Since it is impossible to design a standard management practice to be implemented throughout the landscape, it would be practical to adopt zone and theme approach of management. Sometimes a combination of approaches is best suited taking into account of the overflowing requirements of management.

Under this approach, several specific objectives and problems relevant to an identified part of the PA can be recognised as a 'management zone'. This management zone would have its own measures and strategies. Furthermore, several objectives and different problems, created by a combination of factors, can be tackled by a 'theme strategy' under which measures can be prescribed for the entire area.

7.2.1. Zone Plan:

A zone is an area of specific management category distinguishable on account of its objective. Separate zones need to be created because management objectives of one zone may not be compatible with the objectives of other zone. And hence the zone plans. The following zones are being proposed:

1. Unique Tiger Nursery Zone
2. Hog Deer Management Zone
3. Voluntary Relocation Zone
4. Eco-tourism and Interpretation Zone
5. Submergence Zone

7.2.1.1 Unique Tiger Nursery Zone:

The entire Core Zone of the Corbett Tiger Reserve, barring the areas included under the Voluntray Relocation Zone is identified as a unique tiger nursery and is to be conserved as such. This is the most valuable source area for tiger populations in the entire landscape and is to be carefully nurtured as such. The key principle for

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management of areas in this zone is to ensure continued high prey productivity through focused protection efforts, preventing depression of tiger densities through strong anti-poaching initiatives and to ensure low human disturbance in such areas. Generally speaking, any habitat management activities as have been in practice for such areas, especially for maintenance of chauras, will be continued but there will be no efforts to create new chauras that may artificially inflate tiger densities. All attempts will be directed towards fostering tiger population vis-à-vis the carrying capacity of the habitat. The existing carrying capacity for the tiger will be the key basis for habitat interventions in this zone. This zone will be in general a "No Go area" for any such activity which is incompatible with the aims of tiger conservation.

Promoting the process of populating promising tiger habitats in the landscape with the reproductive surplus from the areas under this zone by habitat connectivity with other nearby areas will be critical to the effective management of this zone.

Regulated tourism will be carried out in this zone as per NTCA guidelines.

7.2.1.2 Voluntary Relocation Zone:

This zone includes all such areas within the Core Zone of Corbett Tiger Reserve, which are currently occupied by Gujjars. Such Gujjars living within this zone have been identified and provided options for voluntary relocation outside the Tiger Reserve, which they have accepted. A total of 157 families have been allotted land in Sabalgarh block of Haridwar Forest Division.

The voluntary relocation will be carried out in accordance with the minimum standards laid down for this by the NTCA and will be completed within a period of five years. Necessary funding support for the same will be sought from NTCA.

This zone will stand merged with the Unique Tiger Nursery Zone once all current residents of this zone have voluntarily moved out to other areas.

7.2.1.3 Hog Deer Management Zone:

The Hog Deer (*Axis porcinus*), is one of the four deer species found in Corbett Tiger Reserve. Large herds reportedly roamed the area till the late sixties. However, after the construction of the Kalagarh dam, large tracts of grasslands were submerged and this has sounded the death knell for the species in the region. A deer species largely

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sympatric with the Spotted deer or chital, very few Hog deer, perhaps numbering less than a hundred survive in the Tiger Reserve today.

A discussion with scientists from WII and field staff indicates following reasons for decline in Hog Deer Population in the Tiger Reserve.

- a. Hog Deer is a open grassland species and as a result, naturally prone to higher degrees of predation. Their fawns are particularly prone to predation by smaller predators like Jackals.
- b. Hog Deer are specialist feeders and hence consume specific grasses and shoots. Very less is known about the status of such specialist grasses in CTR, which might be acting as a limiting factor. Further even for these limited resources they face competition from other deer species which are more in number and more general in feeding habits.
- c. Since a very small number for Hog Deer are left, there is a serious threat of increasing inbreeding among the survivor groups. The inbreeding depression further makes them more susceptible for disease outbreaks in the population.

Hence there is a pressing need to make sincere efforts to take urgent steps for conservation of Hog deers. Like the example of revival of the hard ground Barasingha in Kanha National Park, it will be in the fitness of things to launch a similar exercise for the revival of the Hog Deer in Corbett. Towards this, the following is proposed:

- Collection and compilation of past knowledge including distribution and other attributes of Hog Deer in Corbett Tiger Reserve.
- Collection and compilation of anecdotal evidence along with other scientific information on causes of Hog Deer decline in Corbett Tiger Reserve. Proposed treatment model for in-situ restoration of Hog Deer populations keeping in mind local ground realities.
- Detailed, long term prescriptions for grassland management in Corbett Tiger Reserve especially Dhikala.
- Epidemeological studies on disease prevalence in Hog Deer population.

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7.2.1.4. Eco-tourism and Interpretation Zone:

This is one of the most sensitive zones of Corbett Tiger Reserve. There are presently five Ecotourism zones available for tourists, of which certain areas of four ecotourism zones fall in the core area of Corbett Tiger Reserve. Dhikala is the most famous among them, followed by Bijrani and Jhirna. The others tourist zones are Sonanadi and Durgadevi. The Durgadevi tourist zone lies in the buffer area. The famous Haldupadav FRH lies in the Sonanadi tourist zone. The Dhikala, Bijrani and Jhirna Ecotourism zones are part of the Corbett National Park.

A new Tourism Zone, Dhela Ecotourism Zone has been opened for visitors in the Buffer Zone since 1st December 2014.

Management of eco-tourism in the core area of Corbett Tiger Reserve needs meticulous planning and consisting monitoring to keep safe the wildlife from adverse anthropogenic effects. **The subject has dealt in detail in Chapter-11.**

7.2.1.3. Submergence Zone:

In the event of flood in Ramganaga River, huge amount of non-biodegradable debris is deposited on the grasslands of Phulei, Dhikala, Sherbhuji and Lidkhalia. These hazardous materials should be collected and systematically disposed off annually during the winter season. More importantly, the drawdown has very significant ecological impacts which need to be regularly documented and analysed.

Strategy: A study is prescribed to be undertaken to ascertain the movement of all kinds of wildlife in the event of submergence of the grassland. Since Phulei grassland was submerged in 2010 flood and heavy sand deposits virtually destroyed the grassland, a separate study should be carried out for restoration of the habitat of the terrestrial as well as aquatic fauna dependent on the area in question. Change in composition of grasslands post such prolonged submergence is also a key aspect to be studied in detail.

Corbett Tiger Reserve should initiate a MoU with the Irrigation Department regarding planned release of water from the Kalagarh reservoir so as to minimize threats to the fragile ecology of the region.

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7.2.2. Theme plan:

There are certain areas, which are governed by multiple objectives and influenced by more than one factors. Entities like grassland, water resources, habitat of different animals, forest fire, maintenance of roads, wooden culverts, forest rest houses, chowkis and staff quarters etc. are overlapping and cannot be managed exclusively. The following themes have been identified in the Tiger Reserve for planning, which would be discussed in the forthcoming chapters.

1. Habitat Management
2. Conservation of water bodies
3. Soil & water conservation
4. Fire protection
5. Strengthening wildlife law enforcement
6. Human Resource Development programme
7. Maintenance of infrastructure
8. The Outreach programme
9. Conflict Management

7.2.2.1. Habitat Management:

Corbett Tiger Reserve is one of the richest tiger habitats of India. It has the unique distinction of having highest density of tiger. Despite of this fact of abundance, the reserve is not free from some limiting factors like the invasion of obnoxious weeds, scarcity of water during the pinch period and degradation of grassland. Much of its grassland is vulnerable to forest fire and some parts are subject to submergence during the monsoon. The total area of the grasslands in Corbett Tiger Reserve is about 20% of the whole area.

The peculiarity of the Core Critical area of Corbett Tiger Reserve needs specialised habitat management with focus on the specific requirements of key species of the wild. For habitat management, there has to be an adequate level of understanding of the requirements of the targeted species as well as of the local limiting factors for the same. Traditionally habitat management have been generally confined to creation of water holes, protection against forest fire and attempts at removal of weeds as and when resources were available for the same. The quantum of operation is largely dependent on availability of financial resources which often remain unpredictable.

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Kalagarh Division was widely known for its *Bamboo*. Gregarious flowering and lack of cultural operations has led to a situation where this very important species for elephants needs special care for proper rehabilitation. Exotic weeds such as *Lantana camara* and *Parthenium* have invaded several areas and restrict the growth of native palatable species.

Erosion along the slopes is showing the increasing trend. This is especially true for the Southern side where width of *raus* has been increasing and newer gullies are formed every year.

The continued presence of Gujjars inside the core area and lack of adequate control on their activities has also contributed to the decline in habitat availability and quality.

Strategy for future management:

For the Core, any habitat manipulation must be carried out after a very, very careful evaluation of need objectives, outputs and outcomes and must be accompanied by a regular monitoring and evaluation protocol. The exercise has to be done in the manner of wielding a surgeon's scalpel, which if done wisely can give new life but if applied carelessly can also kill. The emphasis will be on habitat amelioration and not habitat development.

While existing practices for maintenance of chauras may continue, it is reemphasised that the creation of any new chauras in the core should not be encouraged.

It is important to reemphasise here that no large scale manipulation is to be permitted as this has serious implications on altering carrying capacity of herbivores & subsequently carnivores. Carrying capacity will be the guiding principle for such amelioration and creation of new meadows, placement of salt licks etc. are to be avoided unless specifically prescribed in particular cases. We must be guided by the axiom that **öNature is the best teacherö**.

The following strategies can be considered :

i. Setting up a monitoring regime for habitat conditions:

A study of the major vegetation attributes both structural and functional can be carried out by obtaining and analysing satellite imagery data on a periodic basis to study and establish benchmark information on habitat conditions. The wildlife applications of

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such study subsequent recommended method of study are enumerated in brief as follows:

Vegetation attribute	Wildlife Application	Study methods
Density	Correlation to animal populations, Forage Mgmt, Regeneration of desired species.	Quadrats, Belt transect, PCQ, Plotless, and Nearest Individual Method.
Frequency	Relative abundance of desired species, Forage quality, Succession trends.	Point intercept Quadrats Line intercept.
Canopy Cover	Thermal, escape, resting, roosting and other cover requirements	Point and line intercepts, Ocular estimation, Densitometer
Foliage Cover (Leaf Area Index)	Correlation with insect abundance	Line intercept Cross wire sighting.
Ground Cover	Interpret communities & impact assessments.	Point intercept Grid-quadrat frame.
Production	Forage quality, Forage quantity, Suitability, season of use, Phenology.	Clipping & weighing Forage volume estimation. Double sampling.
Species Composition	Forage quality & Species diversity	Species enumeration, Releve' method
Structure	Potential habitat Nesting/resting sites, other cover requirements	Bisects, Life form study

Activity 1: Establish study plots in each habitat type using Stratified Random Sampling Techniques and monitor succession changes in the same.

Activity 2: Mapping of the extent of Lantana and other exotic weeds should be done. The infestation of weeds in the core area is an important attribute that needs to be studied in some detail. Present information is at best sketchy and of low reliability.

Activity 3: The impacts of Gujjar habitations on the habitat should be regularly monitored. This can be done by placing of vegetative sampling quadrats around *deras* and in non-Gujjar areas and to monitor quality of habitat around *deras* and in non-Gujjar areas of similar attributes. Once the Gujjars opt for voluntary relocation, the revival of the habitat should also be carefully monitored.

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Activity 4: The width of *raus* and streams should be monitored annually. The width of these sots will be recorded at fixed locations twice a year during April and October.

ii. Management of the available natural habitat to meet the requirements or targeted species:

Activity- 1:

As the reported number of Gujjars residing inside the core area (Sonanadi Sanctuary) is 181 families, under no circumstances the number should be increased by clandestine entry of outsiders into the area. A systematic and full proof inventory should be prepared to monitor their number identity and their location. The process of relocating these Gujjars to Sabalgarh Compartment number 8A of Chiriyapur Range of Haridwar Forest Division is underway and will hopefully be completed soon.

Periodic enumeration of the cattle has to be done to disallow dogs, goats, sheep and cows to be reared by the Gujjars. A depredation record has to be maintained to monitor loss of cattle due to tigers and any sudden increase of incidents of the cattle lifting should be taken up very seriously to save tiger from the possible retaliatory killings by the Gujjars. All the cattle should be vaccinated against infectious diseases, which are potential danger for the wild ungulates.

Activity- 2:

Until the relocation of the Gujjars in the designated area grazing free zones has to be maintained to save the wild ungulates from contagious diseases as well as ensuring availability of food and water for the wild animals. This can be done with active support of Gujjar headmen locally called *Numberdar*.

The Gujjars are showing rapid increase in both human and cattle populations. They are also not averse to try and sneak their cattle inside the CTR especially during peak summer. They should be shifted to other areas pending rehabilitation.

The following areas should be strictly prohibited from grazing:

1. Mandalti Block
2. Adnala Block Compt. 7-18
3. Tumeria Block
4. Lal Darwaza Block Comptt. 1-3,6-12.
5. Chiplighatti Block-except Comptt. 8,9 &10 (Gujjars from Comptt.13 to be-shifted)
6. Bailanala Block Comptt. 1 -10,

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7. Gaujera Block -
8. Motasal Comptt. 1-3, 7-9.

It has to be ensured that during seasonal migrations, Gujjars will not be allowed to travel with their cattle along Halduparao- Vatanvasa and Halduparao-Semalparao-Chokhamb. The areas available for grazing of Gujjar cattle may be utilised on a rotational basis.

These directions will become superfluous, once the Gujjar have voluntarily relocated from the Sonanadi Wildlife Sanctuary.

Activity- 3:

Strict rules & regulations have to be enforced for lopping by Gujjars and other communities. The following trees should be protected against lopping by Gujjars and villagers.

- Sal (*Shorea robusta*).
- Semal (*Bombax ceiba*).
- Tun (*Cedrela toona*).
- Kusum (*Schleichera oleosay*).
- Sandan (*Ougeinia dalbergioides*).
- Shisham (*Dalbergia sissoo*).
- Bijasal (*Pterocarpus marsupium*).
- Amaltas (*Cassia fistula*).
- Khair (*Acacia catechu*).
- Sain (*Terminalia tomentosa*).
- Bahera (*Terminalia belerica*).
- Harra (*Terminalia chebuta*).
- Bakli (*Anogeissus latifolia*).
- Jamun (*Sygygium cuminii*).
- Dhauri (*Lagerstroemia parviflora*).
- Haldu (*Adina cordifolia*).
- Tendu (*Diospyros tomentosa*).
- Bhillour (*Trewia nudiflora*).

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- Rohini (*Mallotus philippinensis*).
- Bargad (*Ficus bengalensis*).
- Pilkhan (*Ficus infectoria*).
- Pipal (*Ficus religiosa*).
- Khabar (*Ficus cordifolia*).
- Genthii (*Boehmeria rugulosa*).
- Chir (*Pinus roxburghii*).
- Bans (*Dendrocalamus strictus*).

Activity- 4:

Very limited planting activities may be taken up to meet needs of wildlife. Under no circumstances exotic species are to be taken up for planting in any area. Habitat enrichment plantation of species such as bamboo, ficus, narkul, patera etc., should be taken up in patches. Plantation of canes should be taken up in suitable areas.

No cultural operations involving bamboo should be carried out in the Core Zone.

Activity- 5: Management of Grassland:

Plant communities evolve from low diversity to complex systems, in a process called succession. Communities at an early stage of succession which in this case is dominated by grasses, may require management intervention in order to ensure the survival of the typical wildlife. Many a times the management requires encouraging rapid succession when there is instance of degradation due to over use by the ungulates and elephants. Apart from triggering the factors for succession, the management requires to restore the diversity and productivity of a degraded grassland by means of active protection from over grazing, fire & eradication of weeds.

The core area is endowed with extensive grasslands. These grasslands are characterized by high diversity of grass species and healthy presence of prey and predators. These grasslands form early *seral* stage in the forest succession and are governed by various factors such as flood, fire, invasion of weeds and woody plants. These grasslands are locally known as òChaurö.

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Following is the list of various types of grass found in the Corbett Tiger Reserve:

S.No.	Botanical Name	Local Name
1.	<i>Apluda mutica</i>	Chhari
2.	<i>Veteveria zizanioides</i>	Khus
3.	<i>Cymbopogon martini</i>	Marchi grass
4.	<i>Chloris barbata</i>	Firke
5.	<i>Chrysopogan fulvus</i>	Godia
6.	<i>Desmostachys bipinnata</i>	Daab
7.	<i>Bothrichloa pertusa</i>	Doob
8.	<i>Heterogon contortus</i>	Kumeria
9.	<i>Eulaliopsis binate</i>	Bhabhar
10.	<i>Saccharum spontaneum</i>	Kauns
11.	<i>Thysanilaena marxima</i>	Oons
12.	<i>Saccharum munja</i>	Mooni
13.	<i>Capil pidium spp</i>	Chunar
14.	<i>Imperata cylindrical</i>	Sirou
15.	<i>Phragmitis Karka</i>	Narkul
16.	<i>Eragrostis ciliaris</i>	Chriya chuna
17.	<i>Sporobolus indicus</i>	Chriya dana
18.	<i>Sorghum halepense</i>	Vanchari
19.	<i>Dichantuium annulatum</i>	Nalli
20.	<i>Neyraudia arundinacea</i>	Naltura

Most grasslands of Corbett are representing various stages of succession influenced by different regimes of fire and flood. Grasslands having moderate to good moisture retention capacity show the indications of invasion of woodland and proliferation of weed.

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Although tropical grasslands have been studied by several authors (Yadav and Singh, 1977; Kotwal and Pandey, 1981; Lehmkuhl, 1989; Rodgers, 1990), very little ecological information exists on the grasslands of Bhabar region. Such information is crucial for the conservation of wildlife in the protected areas (Panwar, 1986; Rahmani, 1992; Rodgers and Sawarkar, 1988). The Chauris of Corbett Tiger Reserve (CTR) are known for high concentration of wild herbivores and thus the Tiger. Wildlife tourism in the Tiger Reserve is also dependent on the animal sightings in these grasslands. But care should be taken not to create/develop grasslands for promoting sightings by the tourists.

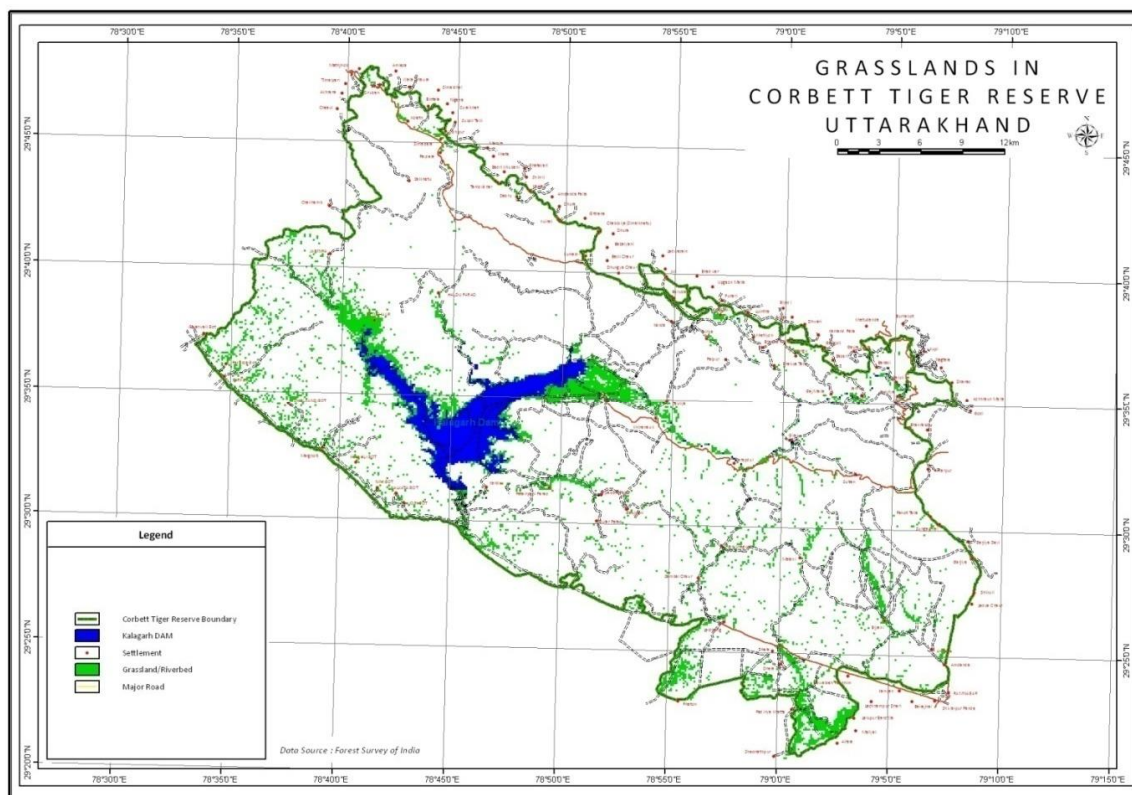
All grasslands have to be monitored regularly so as to maintain their productivity. Respective annual plan of operation for grassland management has to be prepared by the Deputy Director/ DFO, Ramnagar Tiger Reserve Division and DFO, Kalagarh Forest Division of Corbett Tiger Reserve. The list of grass lands has been given in the **Annexure-7/1**.

The grass lands should be managed with the following objectives:

1. To maintain the grass land for sustained supply of fodder to the ungulates, elephants and habitat for Hog Deer and numerous birds.
2. To arrest the natural process of succession towards woodland.
3. To ensure a sustained prey base for the predator like Tiger-the flagship of Corbett Tiger Reserve.

However, creation of new grasslands should not be taken up without specific scientific studies as this can artificially inflate prey and consequently predator numbers in a given location in the immediate but with long term adverse implications including increased intraspecific aggression and human-wildlife conflict.

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System of assessment:

The management plan strongly prescribed to evolve a system of assessment and monitoring of the vegetation as a basis for manipulating it in tune with management objectives. This involves qualitative process such as floristic inventory, community description and photo-documentation, as well as quantification of factors such as vegetation cover. Therefore, it has been necessary to (1) assess habitat quality for large herbivores, and (2) quantify the proportion of Grasses, forbs and weeds in areas under influence of fire and flood in order to manage the grassland habitat effectively. Such information can be portrayed on a vegetation map.

A short survey conducted by Wildlife Institute of India (*Ecological observations on the grasslands of Corbett Tiger Reserve, India*) observed that the relative frequency of grasses was highest in intensively burnt Dhikala Chaur and lowest, in Low-lying wet alluvium found in the Phulei Chaur.

5(i). Rotational burning of grassland:

Apart from the manipulation of water supplies, fire is an important manipulative tool, especially in grassland management. Conversely, prevention of unwanted fire is a

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vital part of habitat management, as is the control of weeds. By all means grass land should be protected from uncontrolled fire.

The grasslands should be divided into various patches depending upon the expanse of the area. Rotational burning should be resorted to so that every patch can be burn once in three years. Burning of the grassland should be taken up in the late winter or early summer depending upon the amplitude of weed infestation and presence of coarse annual unpalatable grass. Adequate protection measure has to be taken against uncontrolled fire. Each *chaur* should be treated individually. The Sub-Divisional Officers are required to submit detail report about the weed control of each of the *chaur* based upon which the advance planning has to be done for using fire to manage the grassland. Extreme care has to be taken to restrict fire to the designated spots only. Adequate staff has to be employed for the purpose who also comb the area to ascertain that no juvenile animal are left in the area. Regime moisture and direction and velocity of wind have to be considered before resorting to burning the grassland. A strip of substantive width has to be cleared along the boundary of the designated area to save the adjoining plot from accidental fire.

2. Similarly in some areas (i.e. in 50% areas) grass lands should not be burnt rather it should be cut & results should be compared with the burnt area by continuing this process for next 5 years.

3. A scientific study should be made for this period in both the areas whether it has helped improve the habitat of animals, particularly hog deer & grassland dependant birds resulting into increase in their population.

4. Repeated burning of grasses over the period of time has its risk of deterioration. Grasses can become hard & fleshier and as such lost its palatability for herbivores. In that situation, nutritious endemic grass has to be planted by removing the coarse varieties. At least 100 ha. of area should be taken up every year for the next five years & results should be analyzed & observed in the succeeding five years.

5(ii). Protection from grazing:

Grassland should be protected from overgrazing by the buffalos owned by Gujjars who are residing in the core area (Earlier Sona Nadi Wildlife Sanctuary). Similarly grazing by ungulates in vulnerable grasslands can be discouraged by manipulating the water source, so that the grassland in question can have adequate time

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to rejuvenate. Later this area can be opened for grazing by closing other potential grassland from heavy grazing. A thorough survey has to be carried out to ascertain the target areas and an action plan has to be prepared for the purpose.

5(iii). Removal of woody plants:

Woody plants like Dalbergia, Zizyphus, Bombax, Terminalia belerica, Aonla etc., are commonly seen growing inside the grassland. This is an indication of the favourable factors that leads the grassland to the next sere stage which is not desirable for grassland. Manual uprooting of such regenerations has to be taken up by the Tiger Reserve managers. However, due care has to be taken to spare such trees like bahera (*Terminalia belerica*) which are generally used by Spotted deer and Sambhar to remove the dead skin of their antlers by rubbing with the stem of the plant. Moreover some tree cover should be allowed as animals very often require shade during the peak summer season. How many trees have to be retained for the above purpose has to be decided by a study based upon peculiarity of each grassland. There cannot be a single strategy for all the *chours* of the reserve.

5(iv). To maintain healthy combination of annual and perennial grass species:

Effort should be made to maintain a combination of palatable species of grass of annual and perennial variety to cater special need for different animals. A judicious combination of annual and perennial species should be grown by introducing local varieties of grass. Adequate inventory and research works should be carried out to monitor the health of the grassland.

5(v). Plantation of Patera Grass:

Planting of Patera grass (*Typha elephantina*) can also be tried in paterpani & phultal block of Kalagarh & Bijrani Ranges. Initially 10 ha. each should be taken up for plantation for the next 5 years. Depending on the performance of its growth pattern, other moist areas could be considered for taking up of such plantations. This will help in restoration of habitat in these areas.

5 (vi). Grass nursery:

In order to improve the quality of grasslands of Corbett Tiger Reserve, constant effort has to be made to maintain the existing nurseries of Dhela, Dhikala and Halduparao. Palatable and nutritious local grasses along with nitrogen fixing fodder

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species should be raised in those nurseries and the planting stock should be used to replenish the area which has been subjected to eradication of Lantana. Efforts should be made that every range should have a grass nursery so that lantana infested areas in each type of forests is stocked with palatable grasses and nitrogen fixing fodder species.

5 (vii). Removal of Lantana:

More than 25% of the area of Corbett Tiger Reserve is under thickets of weeds, the dominant being lantana. Given the consistent efforts were being made to keep certain areas free from lantana and other weeds, in order to increase the food base for the herbivores, the result is far from satisfactory. The fact is that complete eradication of weed is very difficult and economically not feasible over large areas. Lantana and other weeds (Example- *Cassia tora*, *Eupatorium odoratum*, *Cannabis sativa*, etc) have very effective mechanisms for seed dispersal and often re-grow vigorously from root cuttings. Lantana competes for resources and reduces the productivity of pastures and forests. Lantana is also allelopathic and can release chemicals into the surrounding soil, which prevent germination of valuable species.

The lantana thickets along the tree line near the grassland provide suitable cover to tiger to ambush / stalk the prey and rest during daytime. During most of the time tiger was seen resting / feeding on kill in lantana thickets. It seems in absence of good shrubby layer of indigenous plants, lantana is providing a very good cover to tiger, the main predator of the Tiger Reserve. It also provides cover for lesser animals and birds.

In Corbett Tiger Reserve, it has been reported that tiger used to leave the area that was cleared off from lantana. So while eradicating lantana some pockets may be left near the edge of the grassland till some good shrubby layers of indigenous species replace lantana and cover the area in question. Lantana eradication can be successful only if it is not limited to “removal” but taken to its logical next step of “replacement” by appropriate local species.

5 (viii). Strategy for removal of Lantana:

Lantana control and eradication programme is a must for the very survival of various key habitats in Corbett Tiger Reserve. For some years, attempt has been made to control lantana by applying a technique developed by Professor Dr. C.R. Babu of the *Centre of Excellence programme of MoEF, Government of India*.

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The lantana thicket has to be uprooted and dried while stacking the portion of root in an upside down position. The technique prescribed to burn the dried stem and the area has to be planted by grass clumps or through broadcasting of seed by making balls mixed with fertile soil and cow dung (50:50). Mopping up operation has to be carried out for three years.

There should be minimum disturbance to the soil while uprooting lantana, otherwise it will provide suitable ground to regenerate lantana by germination of seeds lying in the ground, which remain viable for very long time. The treated area may be suitably re-vegetated by palatable indigenous grass, or encouraging naturally occurring seedlings, which will help to replace lantana in the longer term.

The area for lantana eradication should be identified and demarcated in advance. Care should be taken to create vast stretch of eradication area which has to be developed into grassland to meet the growing demand of the herbivores. At the same time the objective of the operation should be to create suitable condition in the mixed forest to encourage regeneration of valuable species of plants, which hitherto remain neglected, and eventually leading to degradation of the quality of the forests. Grasslands should be given top priority for eradication of lantana and other unpalatable weeds every year. Before commencement of work, the density of lantana/weeds should be ascertained and a Site Specific Plan (SSP) should be prepared by the concerned Range Officer under the guidance of the respective SDOs. Funds will be released for the SSPs after examination by the Deputy Director and DFO Kalagarh and due approval of the Director, Corbett Tiger Reserve. The uprooting will be carried out prior to the flowering. The mopping up operation should be carried out for 3-4 years depending on the regeneration of the lantana and/or weeds like *Cassia tora* etc.

The present practice of two years maintenance followed by uprooting of lantana in the first year should be increased to five years. Three years is inadequate to free the area from lantana and restock the area into grassland. An annual target of 1500 to 1800 hectares has been envisaged in this Tiger Conservation plan. Detail record should be maintained and data should be uploaded to form GIS maps. The SSPs will be prepared according to the trend shown by the GIS maps.

The record of removal of lantana/weed will be maintained in the following format along with the compartment history.

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Sl. No.	Particular of the Area				Area in Ha.	Years of Working (Mention the year wise work on area in Ha. and corresponding expenditure)				
	Range	Block	Compt	GPS		1 st Yr	2 nd Yr	3 rd Yr	4 th Yr	5 th Yr

Note: Report on management of lantana based on a study by the Centre of Excellence programme of MoEF, Government of India.

Report No. 1

Professor Dr. C. R. Babu and a team of scientists of the Centre of Excellence Programme of MoEF visited different sites in Corbett Tiger Reserve where Lantana was removed by cut rootstock method. The sites evaluated includes: (i) Laldhang (both the Centre of Excellence Programme site and CTR's sites), ii) Dhela, iii) Kothi Rao, iv) Jhirna, v) Hathidangar, vi) Dhikala, vii) Sambar Road and viii) Sarpdhuli. Some of the sites managed by CTR are ecologically restored after eradication and others are not restored. The topography of the sites varies considerably. For example, some sites are located in shallow flat valleys and a few sites represent the lower slopes of hillocks.

Following the discussion with the field officers, following observations were made-

Observations:

1. There was no regeneration from the clumps removed by cut rootstock method in any of the sites examined.
2. In the plots managed by the Centre of Excellence Programme, no saplings of Lantana or other weeds were observed except in some portion of Jhirna where some Pogostomon and Sida were noted.
3. In Laldhang few young clumps of Lantana (1 to 2 plants in 10X10 square meters) were observed and these were probably derived from the seeds washed out from the slopes of the hills which are infested with Lantana. In one of the sites of CTR located along the road sides, invasion of Sida was observed.
4. In Kothirao area where Lantana was removed by CTR very few clumps of Lantana were observed which are probably derived from the defecated seeds by generalist birds. The area was heavily infested with weeds such as Sida and Cassia tora.
5. Both Laldhang and Kothirao sites are shallow valleys surrounded by low lying hills.

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6. *Jhirna site is also a shallow valley surrounded by hills covered by dense forest. A part of the valley (about 200 acres) managed by the Centre of Excellence Programme was free from Lantana clumps and secondary invasion except in a few pockets where Sida and Pogostomon were observed. Lantana was not removed from the remaining 200-300 acres of the valley. Lantana invasion has been spreading to new areas from this site. Besides Lantana, Sida and Cassia also invaded the area. To make Jhirna plot as a model plot and to develop it into a grassland habitat that support a rich wildlife, it is necessary to eradicate Lantana and other weeds from the remaining 200 to 300 acres.*
7. *In Dhela village areas where Lantana is being removed by CTR using cut rootstock method, no secondary invasion has been observed so far.*
8. *In Hathidangar, Lantana was cleared from several hectares. In these areas native grasses were established. These sites are largely free from Lantana except for a very few scattered young plants of Lantana growing under perching trees such as Eucalyptus. These saplings of Lantana originated from the seeds defecated by generalist birds such as common miner which are present in large numbers in the adjacent areas from where Lantana was not removed. A stretch of 1km long and 40 meter width around the plot is still infested with Lantana and this must be removed.*
9. *It was also observed that tractor used to mow down the clumps before removal by cut rootstock method. This was done to make the removal of clumps by individual workers easier. But this method has one major disadvantage- some rooted prostrate branches left out have developed into new clumps. The grasslands developed after removal of Lantana is used by thousands of herbivores besides 2000 livestock of the Gujjar village.*
10. *Dhikala area plots managed by the Centre of Excellence Programme were devoid of Lantana and even Artemisia and Pogostomon etc. But in the areas managed by CTR there was infestation of Lantana, Pogostomon and also Artemisia. The massive reinvasion of Lantana is due to seeds defecated by generalist birds from Lantana infested sites periphery to the eradicated sites. Further, Cordia-a widely used perching tree by generalist birds is most abundant in the area. These weeds also established in the grassland located close to the forest.*

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11. *In Sambar road areas where Lantana was removed by CTR from the lower portions of the slope of a hillock, there was regeneration of Lantana from the seeds washed out from upper slopes and these seeds germinated in absence of grass cover and developed into full clumps. The other sites in this area were devoid of Lantana but Pogostomon has invaded due to lack of restoration either to woodland or to grassland.*
12. *In Sarpduli area Lantana was removed from the lower slopes and within a year gregarious growth of young plants derived from seeds covered the habitat. The seeds were washed from the upper slopes and deposited on the lower slopes and germinated in the absence of restoration of the site either into a woodland or grassland. It was also observed that the Lantana clumps were removed in June and kept without burning till December. This resulted in the dispersal of the seeds from these clumps by water currents during monsoon season. It was also noticed that some of the branches from large clumps were chopped and left there on the ground. These chopped stems were rooted and developed into adult plants.*
13. *A critical evaluation of the sites where Lantana clumps were burnt suggests that no seedlings of Lantana and other weeds were observed.*
14. *It is often argued that Lantana provides a cover for Tiger. This may not always true. This is evident by the fact that a Tiger waited outside the Lantana clumps to capture its prey. In fact Lantana clumps may be hindrance to Tiger for capturing its prey.*

Recommendations:

1. *Tractor mowing on Lantana clumps and uprooting of clumps by JCB should be avoided for the removal of Lantana.*
2. *After uprooting of the clumps, the clumps should be kept upside down at the same site from where it was removed, dried and burnt. In other words collecting different clumps and piling them at one place for drying and burning should not be carried out as in situ burning (at the same site from where clump is removed) prevents germination of Lantana and other weed seeds.*
3. *In planning eradication of Lantana, the topography and gradients of the site should be taken into account. For example, for Lantana infested on the slopes across the gradient, planning of eradication should be done in a way that the Lantana on the upper portion of hills and slopes should be removed first before removing the*

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Lantana located on the lower/flat areas contiguous with the hill slopes. This prevents washing of the seeds from upper portions and hilltops to the lower portions. The reinvasion of *Lantana* in the lower slopes of Sambar road is due to washing out of the seeds from the upper slopes. To prevent further invasion of *Lantana* from the upper slopes, ***Lantana clumps on the upper slopes and hills should be removed immediately.*** A similar situation exists in the Sarpduli area where *Lantana* was removed from the lower slopes of the hills before removal of *Lantana* from the upper slopes. This resulted in the reinvasion of areas located in the lower portion from where *Lantana* was removed. In this area also *Lantana* should be removed from the upper slopes and hilltops.

4. *Another major source of reinvasion of Lantana in eradicated plots is the defecated seeds dispersed by generalist birds perching on the trees. To prevent this reinvasion of Lantana, clumps of Lantana that exist along the periphery of the eradication plot, should be removed. In another words in planning the Lantana eradication in a given area, Lantana should be removed from the entire areas in one go but not in small pockets to prevent the dispersal of seeds by perching birds. For example the CTR has successfully removed Lantana from the vast tracts of Hathi-dangar area and successfully established grassland used by thousands of herbivores. Only about 1km long and 40 meter wide stretch which is infested with Lantana is left out. To prevent the reinvasion of the successfully eradicated plot, Lantana from this stretch should be removed.*
5. *It is difficult to determine the size of the plot for eradication of Lantana until the home ranges of generalist birds that feed on Lantana and disperse the seeds are known. A study is being carried out by the Centre of Excellence Programme to define the optimal size/area which should be taken as a unit for Lantana eradication programme.*
6. *It was also observed that wild boars contribute to the disturbance of top soil and thus exposing the buried stratified seeds to the sunlight resulting in germination of Lantana at these sites. This can be prevented if the habitat is restored after removal of Lantana either into a forest ecosystem or grassland.*

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7. *It may be noted that the Lantana clumps present in the peripheral areas of the site from where Lantana was removed should be given priority in the Lantana eradication programme.*
8. *About 200 acres of Jhirna plot is still infested with Lantana and other weeds. The Centre of Excellence Programme is planning to remove the Lantana and other weeds from this area and restore it to grassland during the next year to make it a model plot for successful eradication of Lantana and converting it into a productive ecosystem supporting rich wildlife.*
9. *Continuous monitoring of eradicated plots for three years is a must for successful eradication of Lantana and other weeds. Therefore in any scheme of Lantana eradication a small part of the grant must be allocated for monitoring and removal of saplings from already eradicated sites besides earmarking larger budget for eradicating Lantana on a large scale.*
10. *There is a problem of secondary invasion by annual weeds such as Cassia tora, Sida, Ocimum and even Tephrosia. These weeds can be managed very easily by chopping stems just after flowering or before fruits are ripened. The best season is in the month of September. There are some perennial weeds such as Pogostomon benghalensis. These have to be uprooted and burnt before flowering and fruiting.*
11. *Restoration of Lantana eradicated sites is not effective due to lack of adequate seeds for grassland development. To make the grass seeds available in large quantities for restoration work, collection of seeds of perennial grasses and legumes should be initiated. In forest areas where Lantana was removed, it would be ideal to restore these sites to woodlands rather grasslands.*
12. *The vulnerability to forest fire of existing grasslands will be low as the significant amount of biomass was already consumed by herbivores and in old burnt plot a part of the biomass is decomposed. Burning such grasslands will have minimal effect on the prevention of weed seeds to germinate and on the control of weed growth. In fact burning with low inflammable material may stimulate proliferation of subterranean meristems of perennial weeds.*
13. *Grassland of Bijrani at water hole and surrounding islands in the stream beds and flood plains of streams, are marshy grasslands and harbour moisture loving grasses such as Eragrostis elegans, Cyperus species, Fymbristylis and other*

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grasses. Such grasslands may develop on the presently submerged sites in Dhikala after receding flood waters. These grasslands represent one of the seral stages in ecological succession of grassland communities and are maintained by periodic floods. These types of seral grassland communities cannot thrive on elevated areas where moisture is less and flood waters never enter.

Report No.2

Prof C. R. Babu and a team of scientists from the Centre of Excellence Programme at University of Delhi visited the Corbett Tiger Reserve and carried out detailed surveys of the Dhikala grasslands and came out with the several critical observations.

Observations:

- 1. About 90% of the grasslands were submerged and the water from the reservoir has still not yet receded. The 10% of the grasslands were not flooded as these are located at a slightly higher elevation. These grasslands include grass cover developed after one year, two year and more than two years of burning. Almost all of these three types of grasslands are infested with weeds such as Artemisia vulgaris, Helicteres isora, Cannabis sativa, Pogostomon, a few clumps of Lantana etc. There is no difference in the density of the weeds among different grasslands subjected to different fire regimes although more number of plants species were observed in the grasslands which were subjected to fire regime more than two years ago. The grasslands adjacent to the forest were invaded by some forest species and the grass species are almost on the verge of extinction giving rise to the woodlands.*
- 2. Because of the seepage of the subsoil water from the reservoir, the moisture content of the soil is very high in some places and sedges characteristic of marshy lands have emerged. Because of the high soil moisture many weed seeds and seeds of grasses have germinated and rootstocks of perennial weeds have sprouted.*
- 3. Due to submergence of most of the grasslands, the herbivore population particularly elephants and members of deer family entirely depend upon these elevated grasslands. As a result of this intense herbivore pressure, these grasslands are highly degraded. Most of the grass clumps were grazed and some were uprooted by wild boars. On the grazed clumps, new shoots are emerging out almost mimicking the grasslands after burning. Some of the grass seedlings have sprouted in the open*

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gaps between the open clumps. In other words intensive grazing has substituted fire in sprouting the old clumps without disturbing the germination of grass seedlings in the open gaps.

- 4. It is not only the composition but also structure and physiognomy of the grasslands has changed due to the extremely high levels of subsoil moisture. For example Imperata cylindrica has been eliminated in several patches since it prefers well drained soils. Tall grasses like Themeda, Cymbopogon, Sacharum have been dwarfed because of acute grazing pressure. Most of the grasses like Apluda, Bothriochloa and Dicanthium have disappeared because of browsing pressure.*
- 5. After the flood water recedes and when the new grasslands emerge, most herbivores would migrate to these regions and thereby automatically reduce the pressure on the present area.*
- 6. However, in the absence of any receding of the reservoir water, the high soil moisture levels coupled with intense herbivore pressure will endanger the existing grasslands - due the increased survival of weeds and saplings of woody species, and failure of regeneration of grasslands. Burning of this patch in coming months (even controlled cold-burn) will lead to perishing of emerging seedlings and new shoots, and grass seedlings in gaps would also be lost; the net result would be total loss of grasslands, leading to further depletion of the wildlife. At this stage no fire should be permitted as its role is taken over by grazing as is evidenced by emergence of new shoots from clumps and seedlings in the gaps.*

Recommendations:

The existing grasslands in Dhikala are in a highly fragile phase and subject to intense herbivore pressure. If the herbivore pressure continues at the present rate, and if the water level in the reservoir does not recede, the famous grasslands of Dhikala, which are the pride of Corbett Tiger Reserve, will be endangered. To prevent the loss of this habitat used by rich wildlife, the following action points may be implemented.

- (i) The Kalagarh Dam authorities should be requested to release the water so that the new grasslands could emerge after the water recedes and the subsoil water level decreases. This will result in regaining lost habitat for the wildlife in the absence of which, the grasslands and the dependent wildlife are endangered.*

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- (ii) *All the weeds should be uprooted from the existing grasslands. The saplings of woody species that have invaded the grassland should also be uprooted. And immediately after removal, broadcasting of grasses may be carried out to prevent the migration of woodland species.*
- (iii) *Broadcasting of seeds of palatable species of grasses, particularly of species like *Apluda*, *Bothriochloa*, *Dicanthium*, *Sporobolus* and *Eragrostis* must be taken up in areas where weeds and seedlings have been uprooted from, and also in gaps which have come up due intense herbivore pressure.*
- (iv) *No burning of grassland should be carried out as it would destroy the newly sprouted shoots from old clumps and emerging grass seedlings in gaps. This burning would also result in loss of soil moisture and organic matter. It may also stimulate the germination of seeds of weeds and promote proliferation of shoots from dormant and potential root-stocks. The best option available to management at this point is to avoid any burning.*
- (v) *Long term studies are needed for evolving appropriate strategies for management of grasslands of Dhikala in particular and grasslands of Corbett Tiger Reserve in general.*

5 (ix). Management of grasslands through removal of unpalatable vegetation:

Management of weeds remains to be a great challenge to maintain the quality of the grassland as well as the under storey of mixed as well as pure sal forest. Weeds reduce the availability of palatable species thus abandoned by prey species and consequently tigers and co-predators. Some of the most common weeds found in the tiger reserve are, *Lantana camara*, *Eupatorium adenophorum*, *Adhatoda vasica*, *Cassia tora*, *Artemisia nilagirica*, *Artemisia paeruviflora*, *Pogostemon benghalense*, *Polygonum barbatum*, *Cannabis sativa*, *Rumex dentatus*, *Solanum nigrum*, etc.

Various authors (Bell and Oliver.1982; Debroy, 1986; Dhungel and O'Gara, 1991; Rodgers, 1986) have recommended intensive burning of wet grasslands but experience in low lying grasslands of Corbett has shown that burning followed by seasonal inundation promotes the growth of several annual weeds including *Cannabis sativa*. In such areas planting of certain species of local grasses e.g., *Phragmites karka*, *Arundo donax* Linn and *Pseudosorghum fasciculare* (Roxb.) may prove to be useful as they are typical species of low lying moist areas and preferred by elephants.

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Complete eradication of weeds in the protected areas is expensive and the consequent benefit for the improvement of wildlife habitat is high. But given the resource crunch facing by the department, alternate methods should be explored to address the problem. It is recommended that patches of weeds which occurs along the prime habitat should be retained to give shelter to ungulates during hot summer as well as for stacking by tiger. Following are the Strategies for management of weeds.

Strategies:

- Encourage the growth of non-weed species.
- Most weeds love light. Other plants eventually shade out the weeds and replace them, but this may take a long time. Examination of the ground cover will show woody plant seedling and saplings (e.g. Mallotus, Trema, Ehretia). Removing weeds from around these plants speeds up natural succession resulting in a more diverse flora. Care should be taken to retain weed competitors when large patches of weed are cleared. In forestry operations one should leave trees of the desired species as seed source for the future.
- Manual removal of the weeds: Manual removal of the weeds before the onset of flowering is a time tested operation. Experience suggests that three years of intensive weeding is required to end the dominance of the weeds. Broadcasting of grass seed may be taken up for faster colonization of grass. Woody weeds (e.g. *Lantana*, *Eupatorium*, *Sida*, *Cassia tora* etc.) must be uprooted to avoid denser growth from root coppice. These activities should be taken up during monsoon when the soil is moist and soft. Extracted material should be collected and left for decomposition.

Weeds growing on the degraded slops should not be removed as these areas often join the flat productive zones to the hilly areas. Wild animals use these patches as corridor to move from one place to another. Sometimes such cover is used by tigers and leopards to stalk their prey. It is better to leave such areas as nothing can grow except the early colonizers (in this case the weeds).

5(x). Post eradication plantation:

Selected species should be planted soon after the eradication and before the weed has time to re-establish itself. If highly palatable species are to be planted, they

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should have to be protected from wild ungulates and elephants. Good alluvial soils can often support a tall and dense grass growth of species like *Arundo donax*. *Arundo* can out-compete *Lantana* within three years, if the grass rhizomes are planted on a 1 m x 1 m spacing immediately after eradication. In case of hygrophilous weed infested grassland (for example Phulei Chaur), the weeds can be controlled by planting tall perennial grasses like *Narkul*.

Extensive applied research work should be carried out by reputed institutes to identify the cause of weed infestation, so that the limiting factors can be managed to keep forest healthy.

7.2.2.2. Conservation of water bodies:

Despite sufficient annual rainfall about 1200 mm, the natural water available during pinch period in the core area is very low and is sporadically available in soil beds and in few water pools, like Phultal, Nakatal etc. The main reason for low water availability is the poor water holding capacity of sandy soil of the area. The experience gained over the past years clearly suggests that water commands a host of direct and indirect influences on wildlife, and its configurations play an important role in the distribution patterns of wild animals especially the Elephants, Sambar, Cheetal, Wild boar, and Nilgai in the Tiger Reserve. Developing or closing water sources has the potential to regulate the dependency of the herbivores on the habitat. Thus over exploitation of any area can be regulated and further degradation can be arrested by providing recovery time for the habitat in question.

Development of water sources for wildlife constitutes a very important conservation tool, which offers flexibility to manage the habitat, particularly grasslands.

Objectives: For the management of the drinking water resources, it is useful to know how water sources are distributed and whether or not they dry up. With this information on a map it will be easier to a) identify seasonal gaps in water availability, and b) to decide where the provision of additional water sources might be needed.

The precise objectives of a water survey and the degree of detail of information sought should be clarified before designing the survey.

Mapping usually begins with a survey to locate the perennial sources, accessible to wildlife. If these are inadequate for wildlife needs, a survey of the non-perennial sources will be necessary to provide a basis for a water development plan. Ultimately,

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all water sources may be located and classified by type and seasonal availability. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO.*).

Following are some of the Strategies to manage the water sources of Corbett Tiger reserve.

Strategy for future management:

Activity-1: Survey for Perennial Sources:

Regular survey should be done in the reserve area for natural and artificial water sources of seasonal and perennial nature. Local staff usually knows the existing perennial sources of water. After enquiry, locate them on a map superimposed by 5 km x 5 km grids. Lightly shade all squares containing perennial water. Since, as a rule of thumb, a water dependent species should have no further than 2.5 km to walk to water, any grid square without a perennial sources represents a "gap". A decision then has to be made whether additional water should be made available. If the answer is yes, a survey for non-perennial sources should be made. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO.*).

Activity-2: Survey for Non-perennial Source:

In practice, preliminary information about non-perennial sources can be taken down along with perennial sources. However, it is necessary to find out how long these sources sustain in the dry season. This study should ascertain the average value taking in to account several dry seasons. To do this choose one or more non-perennial sources in each respective "gap" grid for inspection at regular intervals, commencing with the post-monsoon period. Inspection intervals should be shortened prior to the final drying up. Relate the duration of water to the total rainfall in that year and compare this with high and low annual totals, as seen in records for the area. Ideally, one should repeat the survey in several subsequent years, examining permanence of water in relation to variations in annual rainfall.

At the end of the survey, one is able to tell for what period in an average year, no water is available in a specific grid cell and it is for that period that additional supplies need to be provided. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO.*).

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Activity- 3: Classification:

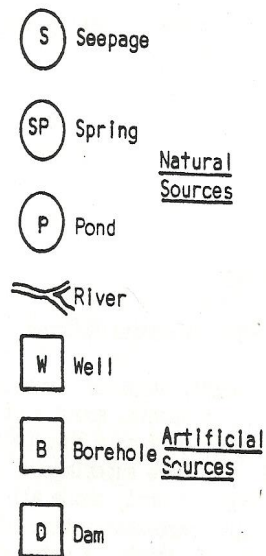
In the long term it may be useful to produce a comprehensive record of water sources according to permanence, type and access.

- Permanence: Periods during which the source normally contains water, e.g. July to September; July to December; July to March; July to June (perennial).
- Type:
 1. Natural sources i.e. river, lake, pond, spring, seepage, etc.
 2. Artificial sources i.e. check dam, reservoirs, well, borehole with tank, artificially deepened seepage, etc.
- Access: Times and reasons of difficult access, e.g. steepness, competition from livestock, disturbance by noise and traffic, lack of cover, etc. Mention should be made that access is difficult for some species, but not for others. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO.*).

Activity-4: Mapping:

- Design symbols for permanence, type and access.
- Enter these on a map in any appropriate combination. For instance natural sources available during the pinch period, artificial sources to be serviced during the pinch period, water sources with a high degree of disturbance, etc.

Through this methodology, the general distribution and types of water sources with an indication of availability can be accessed at a glance and prove beneficial for the management of the water sources. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO*).

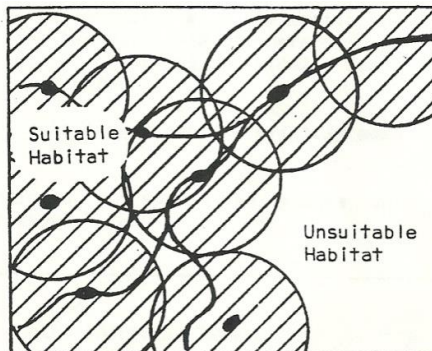


Above symbols may be colour-coded to indicate permanence
e.g. Green = July-September
Blue = July-December
Yellow = July-March
Red = July-June

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Activity-5: Habitat Analysis Based On Water Resources:

A useful refinement shows the availability of water for a particular species or group of species. Some species may move several kilometers away from the nearest water source, while others stay within a few hundred meters. If the maximum range from water is 2 km for the species under consideration, draw circles with the appropriate radius around each source. The space outside the circles represents unsuitable habitat for that species. (Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO.).



Activity-6: Precautions while developing supplementary water sources:

- A gap in water supply is not in itself sufficient reason to establish an additional water source. Clear objective must be established.
- An unreliable supplementary supply is worse than no supply.
- Providing access to natural water sources is preferable to construction of artificial ones.
- A large number of small and widely scattered sources are better than a few large sources, which may lead to over-concentration of animals around them.
- A water source per every 25 sq. km is adequate for most protection areas. Animals would thus have a maximum distance of 2.5 km to travel for water.
- All water bodies should be regularly checked for pathogens which can cause epidemics among animals. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO.*)

Activity- 7 Constraints:

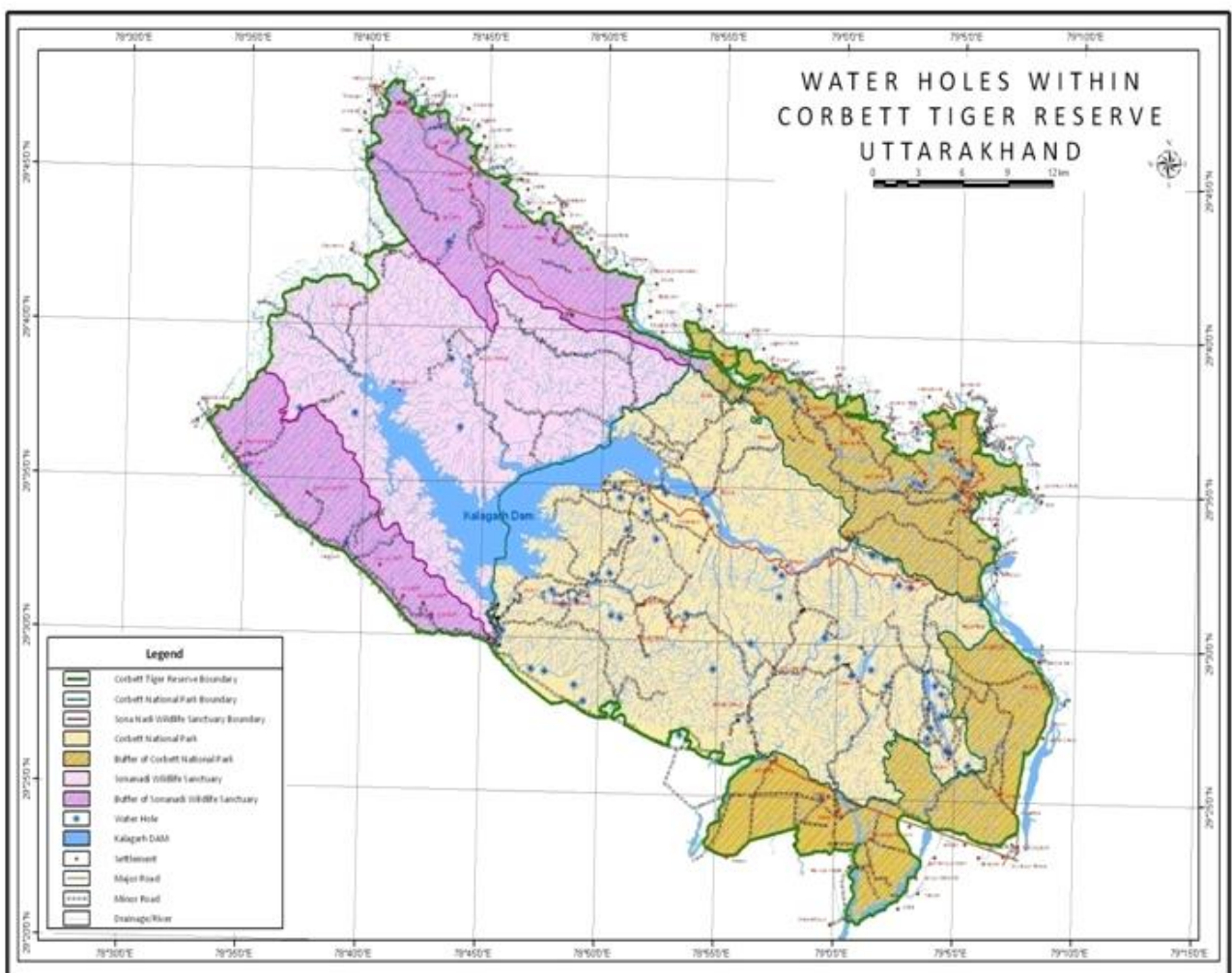
In certain conditions, developing new water sources may involve some risk. For instance:

- Withdrawal of water, particularly ground water, may alter natural processes of water cycling and lead to significant changes in ecosystems.

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- Water sources in the southern boundary of the core area may bring domestic stock into contact with wildlife, increasing the chance of disease transmission.
- Excessive water development in arid zones can raise animal populations to levels incompatible with food availability, leading to habitat degradation.
- Endemic and rare plant species may be adversely affected, therefore avoid water development in areas where these are present.

Water development might trigger erosion on steep lands and fragile soils. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller.,WII & FAO*).



Activity-8: Guidelines for choosing a Site:

Selection of site for the development of the water hole is one of the most important decision to be taken by the management. Endeavour should be made to ensure the following steps-

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- Sites should be chosen near habitat edges (ecotones) where species from different habitats congregate.
- The site should have shade trees and tall shrub or grass escape cover nearby.
- Such sites will be avoided which are likely to be disturbed frequently, e.g. by livestock, tourists or traffic.
- Waterholes should look natural. It should be given an irregular shape and slightly sloping edges. Locally available stone can be used.
- For the benefit of tourists, who are allowed to observe wildlife from a vehicle track, the site should be laid far enough away to prevent speeding vehicles from scaring the animals (25 m).
- For timid species, earth bank should be built between the track and water hole to shield animals from approaching vehicles. Tourists can view animals by peeping over the top of the bank. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller., WII & FAO*).

Activity-9: Providing Access to Natural Water Sources:

Where additional water is needed, it is often easier and cheaper to facilitate access to natural sources, like, a high ground water table, a spring emerging from a sheer rock face, or a source which is normally occupied by livestock, than to install a totally artificial water supply.

Activity-10: Collection of information:

Further information about the types of wildlife species utilising a particular habitat, has to be collected. Compartment data thus collected has to be shown in a Range level map. Such water-maps provide very important insights into the current status of the water distribution and the requirement of artificial water sources vis-a-vis the species using the target area. On the basis of these surveys and water-maps, the feasibility and suitability of the engineering structure for artificial water facility has to be decided for construction.

1. Attracting the wild animals to the otherwise less utilised habitats by creating artificial water sources.

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2. In the southern boundary where the core area is very near to human habitation, wild animals should be discouraged from using the water sources. By doing so human-wildlife conflicts will be reduced and the chance of transmission of infectious diseases from the livestock.
3. Attracting wild animals close to the observation set ups, thus facilitating easy sighting, monitoring and research etc.
4. Facilitating special water bodies for tiger especially at most favoured habitats during summer season.
5. Natural vegetation has to be maintained near waterholes which often preferred by Tiger and other carnivores to predate upon the herbivores that happen to visit such water holes.
6. Since animals prefer natural clean water, it would be a good practice to create a series of small dugout pits of the size of 10ft. X 6 ft. with a depth of 4-5 ft. along the dried nullah, streams, etc. Small earthen bunds, ponds and hand pumps can be created based upon the result of the survey.
7. *Over enthusiasm to create water holes without studying the requirement of the habitat as well as the target animals should be avoided.* This may prove counterproductive in future. Other methods to protect the water bodies are - small nullahs should be protected by providing check dams, gulli plugging by live plants & hedges, construction of wire woven/live hedge/rubble stone spurs to divert the flow of water in rivers & nullahs.

Activity-11: Management of water holes:

Following measures has to be taken for managing the existing waterholes.

1. Location of water holes should be depicted clearly in the beat map.
2. Regular cleaning should be ensured.
3. Feeder channels, underground pipes should be maintained regularly.
4. Care should be taken to replenish water in the dry season.
5. The embankment should be developed in such a manner that the animal should get adequate cover while approaching the waterhole.

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6. The water sample should be sending for pathological examination in the month of November and April.
7. PIP should be laid down to monitor the number and type of wildlife using the water source.
8. If possible, camera traps can be placed to monitor tigers.
9. Jungle trails leading to the waterhole should be checked for snares, gin traps, poison baits etc.
10. Care must be taken to avoid removal of any cover species close to the water hole.
11. Tourists vehicles should not be allowed to disturb wild animals particularly the tigers at the waterholes.

The list of waterholes has been given in the **Annexure-2/1**.

7.2.2.3. Soil & water conservation:

This programme forms an important component of any Forest management plan. It has been observed that a large number of tracks are being eroded every year. A limited level of this activity would be useful to protect the habitat. The following areas should be taken up for the soil and water conservation works.

1. All major *nala (Sot)* of the Tiger Reserve.
2. All road side banks susceptible to erosion.
3. In the vicinity of staff quarters and important buildings.
4. All small river banks flowing across the Tiger Reserve.
5. Any area prone to erosion.

Following activities are prescribed for the above purpose.

Activity: Mechanical measures for soil and water conservation:

1. Construction of Gabion spurs
2. Construction of Gabion stabilizers
3. Construction of retaining walls
4. Construction of Graded bunds

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Before commencement of work, SSP should be prepared by the concerned Range Officer under the guidance of the respective SDOs. Fund will be released for the SSPs after due examination by the Deputy Director and DFO kalagarh and due approval of the Director, Corbett Tiger Reserve.

7.2.2.4. Fire Protection:

Corbett Tiger Reserve is highly vulnerable for forest fire. It is a common knowledge that forest fire is induced by anthropogenic interferences. Sometimes it is intentional and at times accidental. The best practice to save forest from fire is the identification of causes followed by meticulous planning of prevention and remedial measures to be taken in case of forest fire breaks out. It is no denying the fact that the thorough knowledge of the field staff about the terrain is the deciding factor to contain fire.

Protection of forest from forest fire remains to be a great challenge before the tiger reserve management. It is a sacred duty and responsibility for the forest officer to prepare an annual 'comprehensive fire plan'. **The details about 'fire protection' have been discussed in the Chapter-10.**

7.2.2.5. Strengthening wildlife law enforcement

Strengthening wildlife law enforcement is the key to long term survival of tigers and other wild species in this landscape. As such, it must receive highest priority.

It is becoming all the more important as the density of tigers here is highest in the world (as mentioned in the report- Status of tigers, co-predators and prey in India-2010). Tigers in Corbett are vulnerable to hunting and retaliatory killing due to intense human-wildlife conflict. It has been a great challenge for the management to keep the tigers safe from poachers and victims of human-wildlife conflict.

To meet the security challenges, given the rich biodiversity of the area and the difficult geographical terrain which provides ample opportunity for unsolicited intrusion by trouble makers, a comprehensive security plan has been prepared and is being followed with right earnest. There should be flexibility to update/revise the security plan as and when necessitated by the Tiger Reserve management.

The security in the Corbett tiger reserve can be enhanced by dividing the areas in various zones having similar protection needs as follows:

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S.No.	Security Zone (Range wise)	Zone Incharge
1.	Kotri-Sonanadi-Western Kalagarh (Saneh to Kalagarh)	SDO Sonanadi
2.	Eastern Kalagarh ó Jhirna- Dhela	SDO Kalagarh
3.	Bijrani-Sarpduli-Mohan	SDO Bijrani
4.	Maidavan-Adnala-Palain-Duggada	SDO Adnala

Only the core area of the above ranges is included in the zone.

Management Strategies:

1. Protection here needs a special setup which will take care of security all along the 45 km. southern stretch of the Tiger Reserve adjoining the U.P. At least two Patrol vehicles, strong network of intelligence network, high morale of the staff and dedicated Range officers are some of the fundamental requirements to ensure full protection of the tiger and other wild animals.
2. Two dedicated teams such as rapid response team and rescue & rehabilitation team has to be provided in each Division. The team will be lead by a Forester or Deputy Ranger.
3. The team will liaise with the local police, public representative and other forest division officials for over all control on the activities of poachers and intruders.
4. The other team which will be known as rapid rescue and rehabilitation team will be manned by a veterinary doctor, a trained person capable of tranquilizing the animal, helpers and some other support system in the form of medicine, cloths, cages etc. A dedicated rescue vehicle with the facility of treatment to the traumatized animal has to be provided to the tiger reserve. This vehicle will remain in control under an Assistant Conservator of Forests.
5. The other important aspect will be the training programme of staff in various matters of urgency like law, biodiversity, climate change, HRD, anti-poaching.
6. Endeavour has to be made to aware local people about the importance of conservation of tiger as well to cooperate forest personnel to keep the poachers away from the tiger reserve.

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7. A number of informers, preferably at least two informers should be trained each from 37 EDCs to act as eyes and ear of the Tiger Reserve.
8. Interested villagers may be designated as Van Mitra (Friend of Forests) who will strengthen the intelligence network and establish a link between villagers and tiger reserve authorities.
9. At present about 200 local youth are employed under 'Operation Lordø' scheme of NTCA and 60 ex-army personnel are under 'Tiger Protection Force'. This force forms a quality patrolling entity of the tiger reserve as well as act as a source of goodwill from the villages of which they belong to. Continuity of their service is required in the event of deployment of additional force in the form of 'Special Tiger Protection Force' (STPF).

In order to strengthen protection, some other key measures are to be taken up on a priority:

- Conducting regular Security Audits: An internal team led by an officer not below the rank of an ACF should carry out this assessment atleast once a year. They will check preparedness of various field formations randomly.
- Deployment of adequate and well trained field level staff in key areas
- Provision of ration support to field staff
- Additional medical care/life insurance cover for field staff
- Special incentives for best performing staff including in the form of a cash awards.

7.2.2.7. The Human Resource Development Programme:

Human beings are the most precious asset of an organisation. The proper development of this resource is the main key for the effectiveness of the organisation. Human welfare programme are an important part of human resource development. The frontline staff of the Tiger Reserve is normally posted in the interior locations where basic facilities for life are difficult to arrange. The daily routine of patrols and overseeing departmental works makes the life of a field staff monotonous. He needs to be given some respite and variety in the form of recreational facilities. The families of the staff face other problems of housing, schooling, health and family welfare. The

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infrastructure maintenance and development activities of the Tiger Reserve are carried out using labourers from local villages. These villagers also lack basic housing and sanitation facilities while working inside the TR. They are thus exposed to several risks which can even lead to loss of life. The families who have lost their near and dear in human-wildlife conflict also need to be supported in some form to give a human face to the TR. Overall the task of conservation of natural resources and bio-diversity cannot be best achieved by overlooking human dignity and value of life.

To ensure human welfare in and around the Tiger Reserve, the tiger reserve administration also needs to synchronize its activities with The Tiger Conservation Foundation for CTR.

The following suggestions are made towards human resource development in Corbett Tiger Reserve

- There should be a sustained effort to fill vacancies on a regular basis. This is especially important for field level vacancies.
- There should be regular opportunities for training and skill upgradation of staff in CTR. The Corbett Wildlife Training Centre at Kalagarh can play an important role towards this. Capacity building will be vital to optimize the output of the staff as well as to ensure their safety and well being while performance of their duties in a area dominated by wild animals.
- Staff should be rotated regularly from their positions. This is desirable from various perspectives; to provide ample exposure in all kinds of work conditions and needs, to provide a level playing field for all staff to serve in difficult interior locations and to keep the general morale of the team high.
- The Tiger Reserve should develop a series of residential campuses such as at Kania, Kalagarh and Kotdwar for the families of field staff.
- Basic parameters of housing and sanitation should be fixed for staff posted at different places of the Tiger Reserve. It should be ensured that all the staff gets facilities as per the laid out parameters.
- Toilets, safe drinking water and physical safety should be compulsarily provided at all the campuses situated inside the Tiger Reserve.

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- Major campuses and range head quarters situated inside the tiger reserve should have some recreational facilities for the staff like ó Radio, indoor games like carrom, chess etc and outdoor games like volleyball.
- The staff mess should be strengthened and some support should be given through the foundation in the form of providing equipments and nutritional diet.
- For the additional manpower deployed for protection, barracks and common toilets should be constructed.
- Separate barrack huts with common toilet should be constructed at major campuses for the labourers deployed in departmental works.
- On-foot movement of labourers inside the tiger reserve should be minimized. When there is no alternative they should be at least accompanied by an armed guard.
- Some basic security protocols should be laid down both for the staff as well as the labourers and strictly adhered to. All the labourers staying in a campus should be enrolled in a register indicating their permanent address and duration of stay.
- Tiger Conservation Foundation for CTR should be roped in to help the families who have lost their family member in conflict. The tiger reserve should also consider ways and means to at least provide some temporary job to the next of the kin of the deceased.

The front line staff deployed in the core area needs special care and attention. All basic living facilities have to be provided to them. A Staff Development Plan has to be prepared with special emphasize on the management and HRD of the front line staff deployed in the core area. A registered staff welfare society has been registered to streamline all their needs including welfare of family. The details on this subject can be referred in chapter- 13 (13.4)

7.2.2.8 Maintenance of Infrastructure:

Key infrastructure such as forest roads, culverts, chowkis, anti-poaching camps, solar fencing, fire lines, forest rest houses, wireless establishments, drinking water facilities etc. have to be regularly maintained. Special care should be taken for maintenance of Fire Arms.

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7.2.2.9 The Outreach Programme:

Awareness generation, extension, capacity building etc are very vital components of wildlife management. Since buffer forests have maximum interface with villagers, the awareness and extension activities should be targeted to these areas. These activities require certain amount of specialisation and suitable mindset. The regular staff of the Tiger Reserve cannot effectively deliver on this front due to obvious reasons. Some activities identified for the outreach programme are as follows ó

- Publishing literature on vital issues relating to Corbett Tiger Reserve like ó why and how the tiger reserve is important for local people, conservation value of important species, human-wildlife conflict mitigation, maintenance of solar fencing, how villagers should conduct while going to the forest areas, role of villagers and common man in supporting conservation etc.
- Capacity building of local EDCs by providing training on communication skills, creation of co-operatives and SHGs, account keeping, income generation activities etc.
- Organising visit of EDCs and villagers to other protected areas to showcase success stories.
- Organising workshops, lectures and audio-visual shows so as to create positive atmosphere for conservation.
- Organising awareness activities in the schools and colleges of the landscape.
- Organising special programme on occasions like Wildlife Week, World Environment Day, The Earth Day, etc.
- Communication with the local people and create an atmosphere for peaceful resolution of the human-wildlife conflict.
- To work for the popularisation of local art, craft and culture and to impart training to the local youth.

The Corbett Wildlife Training Centre should be made the hub of all capacity building programmes. The training of staff for SOPs and forensic analysis can also be done there. The training centre should be strengthened to cater to the future need of the

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management of the tiger reserve. The foundation could help in strengthening of resources and assets of the training centre.

7.2.2.10 Conflict Management:

Human-wildlife conflict has been part of human existence since time immemorial. It has been depicted in cave painting and has also been finely portrayed in folk lore. During the period of Jim Corbett, Corbett and its adjoining landscape saw many man-eaters, which were immortalised by his writings. Even today the surroundings of Corbett witness many types of conflict. These conflicts are a real stumbling block for conservation and need to be dealt with very carefully to minimise their ill effects. Human-wildlife conflict normally presents itself in the form of crop damage/raiding, loss of life and property, cattle lifting and spread of fear. The main species identified with conflict are ungulates, blue bull, elephant, wild boar and large carnivores.

The intensity of conflict varies along the boundary and with season. Crop damage by wild population can be seen in almost all the areas but its intensity varies from season to season. Presently the damage is more on the northern and southern part of the reserve. Few villages have almost stopped cultivation due to continuous and heavy crop raiding. In the remaining areas large sums of money is paid as ex-gratia to the villagers to compensate for the losses.

Construction of stonewall and erection of solar electric fencing has been tried in the past to reduce human-wildlife conflict but with limited success. Solar electric fencing especially has not been successful due to lack of community participation. Other measures like digging of trenches have also not been very effective.

Keeping in view the complexity of situation and the past experiences the following measures are suggested ó

- The present practice of deployment of crop guards during the ripening period has been found to be effective and villagers were also found to be satisfied. This practice should be continued. The guards should be deployed by the respective EDCs and wages should be paid by the department through the EDC.

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- The human-wildlife conflict hot spots should be identified and special micro-plans should be prepared for these areas along with the EDCs. The emphasis should be on mitigation of conflict with active support of villagers.
- Solar fencing should be erected only if the area to be protected is a small chunk and the fencing is being maintained by the users.
- Loss of human life and property is hard to predict. Thus creation of rapid response teams seems to be the only option. Rapid Response Team should consist of a small group of well equipped and trained employees stationed at strategic locations. The three stations proposed are ó Ramnagar, Kalagarh and Kotdwar.
- These teams should compulsorily be given training in emergency healthcare, disaster management, crowd management, animal rescue, use of modern technique like camera trapping, modern communication, computers etc and tranquilisation.
- Help of local NGOs can be sought in making the villagers aware of dangers of entering in a wildlife rich area and the precautions required to be taken by the villagers.
- Many myths and misconceptions are prevalent in the local populations regarding wild animals which have no scientific base. These can also be better assuaged by the support of NGOs.
- Ex-gratia distribution mechanism should be swift and transparent.
- Some important drugs like ó anti-venom, anti-rabies etc., which are not readily available in the market should be kept in stock at identified locations. Local villagers should be given access to these drugs to win support for conservation. Foundation can be made to play a role in this.
- Prompt response to any incidence of human-wildlife conflict reduces the public anger considerably.
- Rescue Vans and truck will remain ready round the clock to meet any emergency.
- The Veterinary doctor and rescue kits should remain ready for immediate response.
- Total transparency should be maintained and seniors should be posted detail information regularly.

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7.2.3. The Control Forms:

There are thirty eight control forms prescribed for easy monitoring of the management Strategies given in Chapter-7. At the end of each financial year all the control forms are to be posted. To facilitate the posting of information, each Range should maintain registers on each set of information to be reported. These registers should be posted as and when each activity is initiated. The progress of the activity/operation should be tracked to its completion. To complete the forms for the PA, the information will need to be collated across the Range registers and consolidated information should be maintained in the head office. Respective Sub-divisional Officers should remain responsible for keeping the registers up to date.

The task will be far the easier as it would need updating the computer files progressively to the end of the financial year. Some information, as prescribed in the manual, will be shared between the PA/Range Books and the control forms.

Note: The Strategy of using the forms should not be construed to be done away with the prevailing forms used by the department for various information. The forms known as 'CP/CTR' will only used for ready reference for monitoring the management issues of the Tiger Reserve. All these CP/CTR forms will be part of 'CTR BOOK' which will be maintained at the Range, Sub-division and Field Director's office.

Chapter-8

Research, Monitoring, Training

8.1. Research priorities, projects implementation:

In order to achieve the objectives of improving the protected area management and strengthening eco-development for conservation of biodiversity, considerable effort is needed to generate the critical information needed for management. Therefore there is a need to pursue strategic & sustained research effort. Studies related with applied ecology will be given preference. Formulation of a sample design which could form a basis for several studies, selection of methods, establishment of the network of sampling units and plots, creation of a field laboratory for simple tests and networking with specialized laboratories for specific studies and analysis, creation of a herbarium and reference collection of animal parts.

The following subjects were identified for future research and monitoring works in the field of wildlife biology, wildlife management and tourism interpretation and Eco-development.

8.1.1. Wildlife Biology:

1. Elephant: Composition, age, sex and population structure of elephants; seasonal and annual movements; limits of distribution limits and the fate of juveniles in such areas.
2. Tiger: Estimation, territoriality, age, structure and mortality, prey base, study of the composition of its diet, ends of the distribution limits and the fate of young one's in such areas, relationship of the Reserve Tiger population with the adjoining areas and the Tiger in these areas; movement and migration of transients and dispersal patterns, mapping of preferred habitats of Tiger and Leopard, identification of individual Tigers; management problems at the interface.
3. Crocodile: Ecology and breeding behaviour of Gharial and Mugger Crocodiles.
4. Surveys of species and broad measure of abundance- plant diversity, reptiles, smaller mammals and small cats, revised list of flora, fauna and regular updating of checklist of residential and migratory birds.

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5. Categorization and mapping of vegetation, terrain and habitat types, evaluation of habitats and the use of habitats by different important species.
6. Forage availability, quality and quantity; carrying capacity for different herbivores.
7. Breeding biology and behavior of selected raptor species, their use as indicator species; monitoring of raptors through survey.
8. Hog deer - population structure, mortality, distribution and resource utilization; sympatric relationship with Cheetal; use of radio telemetry for such studies.
9. Bamboo - distribution, quantity, utilization pattern by people and elephants, fire protection, regeneration;
10. Biomass and productivity of different forest types; sal, moist deciduous and riverine forest; productivity in grassland and aquatic bodies.
11. Ethno botany - gene pool conservation and conservation of species of ethno botanical importance, screening of plants for the ethno botanical value, taxonomy of such plant species.
12. Extent of water pollution, especially in the Ramganga reservoir, level of DDT pesticides and other agricultural non-degradable runoff chemicals, land use practices in the Ramganga catchments, outside the Tiger Reserve, air and noise pollution, impact of pollution on wildlife and aquatic biota.
13. Biology of the fishes in the Ramganga River and its tributaries and the Ramganga reservoir, population growth, migration, breeding, effect of turbidity and silt load on breeding.
14. Detailed ecology of the fauna of the wetland, especially invertebrate fauna.

8.1.2. Wildlife Management:

1. Mapping of annual and seasonal ground water and surface water resources and use/partitioning of this between different species; analysis of water quality; parasitic load, presence of minerals.
2. Grassland ecology and Management
3. Effect of commercial plantations of *Teak*, *Eucalyptus*, and *Ailanthus* on the wildlife and determination of modalities of conversion such plantations into miscellaneous forests.

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4. Effects of vast accumulation of dead and drying timbers on forest floor.
5. Identification and evaluation of the degree of soil erosion particularly in southern parts of the Tiger Reserve; categorization according to the degree of susceptibility of soil erosion; choice of techniques available to check priority sites.
6. Study of the structural changes in the Ramganga river valley system.
7. Drawdown area (around forty square km.) of the Ramganga reservoir - study of its ecology.
8. Impact of the Ramganga reservoir on fauna, avifauna and aquatic fauna; impact on major mammals - Tiger and Elephant.
9. Weeds - extent area mapping, impact on different species, weed ecology, technique for weed eradications and their evaluation.
10. Fire - impact on grassland composition; grassland ecology; effect of cool and hot burning on forest protection and ecology; study of the extent, nature, sources and management of fires; assessment of fire protection and fire monitoring system in the Tiger Reserve.
11. Human-wildlife conflict - assessment of seasonal, annual and cumulative predation and crop depredation by wild animal in the villages located inside and around the Tiger Reserve and the agricultural fields; man eating; study of this conflict as a management problem, description of the circumstances.
12. Impact of lantana, on habitat management.

8.1.3. Tourism, Interpretation and Eco development:

1. Archival research - history of the Park/Tiger Reserve and Project Tiger and the simultaneous evaluation of the relationship between people and the natural resource; forestry operations and use of elephants in these operations; elephant distribution, ranging, habitat and use of the area; notes from old visitor's books, details from retired Mahouts.
2. Role of the Tiger Reserve in influencing water availability in the entire region; qualification and monitoring of benefits of water for irrigation, hydroelectricity, domestic and industrial use specially through the Ramganga Reservoir; comparison

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- of the catchments of Ramganga within and outside the Tiger Reserve; differing land use practices and their impact.
3. Visitors - numbers, pattern, background, nationality, class and age composition; estimation of the carrying capacity of different areas of the Tiger Reserve; private tourist resorts, distribution and tourism practices, their impact on tourism and the regional environment, their resource consumption pattern; contextual setting of Corbett Tiger Reserve in the Garhwal and Kumaon region and scope for further development.
 4. Delimitation of an eco sensitive zone of the Tiger Reserve; socio-economic profiles of villages in the Buffer zone and around the Tiger Reserve Estimation of the dependency and pressure of people on the resources of the Tiger Reserve in different areas.
 5. Gujjars- numbers, rights and permits, demand, habitation sites, seasonal movements; their demand, nature and pattern of resources utilization and impact on the Sonanadi Wildlife Sanctuary; their living conditions and market relationship; exploration for an acceptable rehabilitation package.
 6. Assessment of the rehabilitation of Dhara, Jhirna, Kothirao and Laldhang villages, description of the rehabilitation package; identification of villages that need to be further shifted and the components of a sound rehabilitation programme.
 7. Impact of tourism on the habitat and the wildlife - visitors, tourist vehicles; problem of garbage disposal; pollution and habitat degradation.
 8. Impact of fire on grassland and ecoósystem and attendant species.
 9. Regional changes in species richness & diversity.
 10. Impact of Habitat fragmentation.
 11. Wildlife crime intelligence and networking.
 12. Reasons for livestock depredation.
 13. Percentage of livestock in the food-spectrum of carnivores.
 14. Wildlife crime prevention.
 15. Landscape epidemiology studies.

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16. Linkages between sylvatic & pastoral cycles.

A system of collection of relevant information on the effects of the Tiger Reserve on local economy and communities of the surrounding villages should be developed. Such social research findings should also be developed into reports, status papers, micro-plans, and other documents resulting in the formation of effective policies for upliftment/ eco-development of local communities. Although these social projects may sound purely academic or official, and may not have any immediate obvious management significance, they would prove to be of a great value later, as the present scenario of the Tiger Reserve - people interface is passing through a critical phase.

8.1.4. Research Establishment:

Corbett Tiger Reserve lacks a proper research establishment. The Research Range at Ramnagar should be strengthened. There is an urgent need to carry out systematic and basic research related to habitat, status of herbivore and carnivore population, habitat use pattern and impact of various works being carried out in and around the protected area. There is an urgent need of full time research officer(s), and assistants. The data generated across the tiger reserve should be preserved at this repository which should be under the charge of an Assistant Conservator of Forests.

8.2. Monitoring frame work:

Constitution of Research Advisory Committee:

A Research Advisory Committee may be constituted with the following membersó

- | | | |
|---|---|------------------|
| (i) The Chief Wildlife Warden, Uttarakhand | : | Chairman |
| (ii) C.C.F. Research | : | Member |
| (iii) A representative from WII | : | Member |
| (iv) State Wildlife Health Coordinator
from Veterinary College, Pantnagar. | : | Member |
| (v) Field Director, Corbett Tiger Reserve | : | Member Secretary |
| (vi) DFOs/DDs of areas where such research
is to be carried out | : | Special Invitee |

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(vi) Any other Scientist / Forest officials,

nominated by the Chief Wildlife Warden of UK : Member/Special invitee

The Committee would have the following main activities:

- (a) To finalize the selection/identification of relevant research based studies.
- (b) To review the progress of research activities carried out for the Corbett Tiger Reserve
- (c) Provide suggestion/recommendations for improvement and smooth functioning of the research activities.

The meeting should be arranged as per the requirement, but at least once in six months. The members would be eligible to get TA/DA and other facilities, decided by the Government from time to time.

8.3. Training Needs Assessment:

Assessment of training needs is one of the basic building blocks of Human Resource Development and consequently better wildlife management. Training needs have conventionally been expressed in terms of subject matter & the course design & contents. The officers as well as field staff should be exposed to latest trends and developments achieved in different subjects related with wildlife management. Such exposure would help the field staff to carry out various management practices for effective management. Regular short-courses requires to be organized from time to time for the ground level field staff to impart technical expertise to carry out various routine works, like; population estimation, water hole management, wildlife habitat management, investigation of wildlife crime, intelligence gathering and the like. Assessment also needs to identify willing officers and field staff who want to excel in the subject of their choice. Such resourceful persons should be encouraged and recognition should be extended as when required.

Training is an integral part of any management programme. Therefore, emphasis will be laid on front line staff & functionaries. It will involve training within states & outside and may be abroad. It will cover the following aspects:

- 1) Improved wildlife management
- 2) Environmental education & interpretation.
- 3) Eco-development and planning.

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- 4) Tourism impact monitoring.
- 5) Animal estimation/census & assessment techniques.
- 6) Wildlife health monitoring training
- 7) Rescue & relief operations related to wild animals especially Tigers.
- 8) Staff motivation
- 9) Weapon training
- 10) Intelligence collection
- 11) Computer application training

8.4. Human Resource Development Plan:

Human Resource Development (HRD) in the true sense covers the whole range of developing the manpower required for effective operation of an organization. It includes amongst other things manpower planning, career development and counselling and performance assessment as well as training. Wildlife management is a specialized branch, which needs special orientation, skill and knowledge. Training makes technocrats and field staffs perfect in their profession. Exposure to good efforts done in different tiger reserves develops a feeling of motivation to achieve the goal to the same degree or sometimes higher also.

The National Forest Policy of 1988, emphasises the importance to be given to HRD in forestry sector, it advocates on following parameters-

- 1) Development of professional competence among forest staff.
- 2) Attracting talented & specialized people to the forest profession.
- 3) Enhancing the performance & status of staff.
- 4) Retaining qualified & motivated personnel in forest department, recognizing the arduous nature of duties staff have to perform in remote or and often inhospitable places.

Based on the above, a fresh approach has to be made to improve the human resource. A detail road map should be developed at the earliest to achieve the goal.

8.4.1. Manpower planning & utilization:

Future manpower requirement must be related to the role & structure of organization & be based on quantum and level of manpower required to fulfil different functions in different locations.

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8.4.2. Role Definition:

Roles are evolutionary concepts. Unlike job description, which are purely functional & duty based, role definition must be focused on different functional levels. Once role have been defined, functionaries can be selected and assigned to specific location.

8.4.3. Competence based training:

Competence based training can be effectively delivered though the creation of modules for different competencies. Each module would be based on a defined competency and evolving objectives that provide the stepping stones for competency development. Each would include training strategies material for knowledge transfer, intermediate & terminal assignments to assess training progress, problems for interactive discussion and guidelines for trainer.

8.4.4. Conducting Study tours at par-excellence sites:

- (i) Eco-development study tour for EDC members and associated staff
- (ii) Wildlife management study tour for Officers & field staff.
- (iii) International study tours.

The Corbett Wildlife Training Centre:

The Corbett Wildlife Training Centre is an important and integral part of the management of Corbett Tiger Reserve. This centre will meet the primary training and capacity building requirements of Corbett Tiger Reserve and its surround landscape.

The following can best emphasize its vital importance as a training facility, especially for the Corbett landscape:

The Training facility has a focus more on field skills rather than knowledge, as it caters to frontline staff of the forest department. As such, its unique locational advantage cannot be overemphasized. There are several field aspects of conservation, which can best be demonstrated only here, on location in Corbett Tiger Reserve.

Corbett Tiger Reserve is considered a “**role model**” for wildlife conservation, especially tiger conservation. As such it is the testing ground for a variety of new tools and techniques, which are then shared with a wider audience across the Corbett landscape.

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Corbett Tiger Reserve and the surrounding landscape is reported by the Wildlife Institute of India to hold the *highest density of wild tigers in the world*. As such, it is the ideal location to learn about recent trends in tiger population estimation using camera traps.

Corbett Tiger Reserve is a classic field situation of **tiger land tenure dynamics** at work. As such, its significance as a training ground for field managers and tiger ecologists cannot be overemphasized. The Corbett Wildlife Training Centre provides its trainees an opportunity to see and understand such field dynamics and have a hands-on experience of various tools and techniques that are vital to management of wild tiger populations. There cannot be a field lab better than Corbett for this purpose.

Human wildlife conflict is a growing challenge for conservation. The training centre also provides hands-on training in the use of modern traps to capture problem animals, as well as the use of chemical immobilisation equipment. This training is also provided to local communities, so that they can partner with the Forest Department in mitigation of such conflicts.

In recent times, the centre has been providing support to staff of the neighbouring forest divisions of Uttar Pradesh as they are trying to deal with a spate of human killings by tigers in and around Bijnore on the southern boundary of Corbett Tiger Reserve.

The centre also provides opportunities for learning how to deal with wildlife emergencies. Corbett Tiger Reserve is one of the few tiger reserves across India to have a dedicated veterinarian and a veterinary unit. With their active support, this centre also provides specialized learning opportunities for those charged with the responsibility of dealing with such emergencies.

One such recent initiative is a training programme on **snake handling and capture**, which was started because of the large number of incidents, especially during the monsoons, of snakes entering interior forest camps. Field level staff is trained in non-lethal capture of such snakes, as also various aspects of snake bite management. This training has become very popular amongst staff and is delivered just before the onset of the monsoon season.

The Training Centre also plays an important role in **strengthening the security** of Corbett Tiger Reserve. As is well known, the southern boundary of Corbett Tiger

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Reserve, between Kalagarh to Dhela is a sensitive, highly porous one, abutting agricultural fields and human habitations. As such, there is a high vulnerability of unauthorised human ingress into these areas, as also of wild animals including elephants and tigers entering human habitations and farmlands, leading to conflict. Past records also indicate this area to be a hotbed of forest and wildlife criminal activity. More recently, in December 2013, 12 poachers were arrested with two fresh tiger skins in the Amangarh forest range in Bijnore District of Uttar Pradesh, which adjoins the southern boundary of Corbett Tiger Reserve.

Trainees at the centre learn smart patrolling techniques and also carry out field exercises in such patrolling including night patrolling, lending further strength to the anti poaching operations here. The trainees also serve as a bench strength, which is called upon to render support during any exigencies such as forest fires, further emphasizing the significance of the strategic location of the centre.

The National Tiger Conservation Authority (NTCA) in collaboration with Wildlife Institute of India (WII), Zoological Society of London (ZSL) and World Wide Fund for Nature (WWF) took an initiative for establishing a **decision support system for adaptive management of protected areas**. Monitoring System for Tigers Intensive Patrolling and Ecological Status (**MSTriPES**) is a result of these joint efforts. The features of the program are;

- É User friendly Field protocols for patrolling and ecological data
- É Database with statistical linkage
- É GPS aided smart patrolling
- É GIS and statistical tool for data processing
- É Quantitative and qualitative database
- É Administration and maintenance at different administrative level.

As a specialized smart patrolling technique, **MSTriPES** is currently being implemented as a pilot project in CORBETT TIGER RESERVE. Encouraged by its success, various elements of the programme are being adopted across the state. Trainings are being regularly organised at the centre to upgrade and improve skills towards smart patrolling. The use of this smart patrolling technique must be actively encouraged in Corbett Tiger Reserve and across the landscape.

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e-Eye is a unique pilot project for strengthening field enforcement, installed at the southern boundary of Corbett Tiger Reserve, near the Corbett Wildlife Training Centre. It is fully funded by the NTCA.

The system comprises of a series of short range infra-red and long range night vision thermal camera stations, mounted on high towers located at strategic locations to cover sensitive areas. These cameras are intelligent having interface with each other and connected to a central Control Room using Wi-max and can be remotely operated by authorised personnel having a user Id and password. They have powerful zoom capabilities, can rotate at 3600, tilt and work even in adverse weather conditions. Power requirements are met using solar panels deployed at each tower location. Once installed, they hardly need any human presence at tower locations. The technology is the first of its kind anywhere in any Protected Area not just in India but perhaps the world.

The network of cameras covers an area of about 300 sq.km, detecting movements of anything over about 20 kg body weight and is thus capable of not only detecting human movements but also of wild animals. Any suspicious movement generates alerts which are then forwarded to field stations in Corbett Tiger Reserve for appropriate action. The system generates a report indicating details like what kind of alert was generated and sent to which staff/officers along with their name and mobile number which helps management to keep an eye on the follow up actions.

The e-Eye system is unique and as such a very important training tool. The centre has played host to a wide range of PA managers from India and abroad who have come here to understand this modern system and replicate this in their respective areas.

The spread of this system must be increased and it must be actively used to complement other traditional methods of wildlife law enforcement in the region.

Knowledge-Sharing Partnerships

One of the key aspects of the Vision for the Centre is to enhance its status from just a physical space where training programmes for Forest Department staff are conducted to a knowledge-exchange and dissemination hub, with significant high-level events on topics related to wildlife and conservation. The Wildlife Institute of India (WII), which is a premier institution in the field of wildlife research and training in the region is already supporting various initiatives at this centre. Field-based conservation organizations such as WWF India, WTI, WPSI etc. can play a key role in strengthening

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this aspect of the Centre, given their broad-based experience of working across several key issues across the conservation and environment speCorbett Tiger Reserveum. These organizations can also offer valuable international exposure and expertise to the Centre.

The **National Tiger Conservation Authority (NTCA)** provides technical guidance and support to the centre in its various activities.

Upgradation as a “Centre of Excellence”

It is envisioned to upgrade this facility into a '*Centre of Excellence*' for Wildlife Training for field functionaries in North India. The Govt. of Uttarakhand has already taken a decision in this regard. To achieve this objective, substantial improvement has to be brought about mainly in two aspects.

- a. Improvement of infrastructure facilities and
- b. Developing good quality training modules, training material and other content for the trainees and identifying quality trainers to deliver such training.

The Centre currently offers a basket of training options for diverse target groups. How ever, there is constant need to update and upgrade such training modules along with support material, to keep ahead of emerging challenges in this sector. Also, given that the centre is located within a world renowned Protected Area, there is every opportunity to keep the trainings field oriented so that trainees not only enrich themselves with ðclassroom knowledgeö but also learn ðpractical hands óon skillsö that prepares them better to deal with real life challenges in their day to day work.

To meet the requirement various training modules would be developed to train the forest staff on wildlife management issues which includes, human-wildlife conflict, rescue and rehabilitation, patrolling and law enforcement, legal aspects, wildlife crime, illegal wildlife trade, use of modern techniques, habitat management, veterinary interventions, community engagement, tourism and disaster management. The main emphasis would be on human-wildlife conflict, Smart Patrolling, law enforcement, legal issues related to wildlife crime control and veterinary interventions in Wildlife.

Training Faculty Development:

It has been decided that the centre will work with a very lean team of in-house trainers who will be supported by a large panel of subject matter specialists drawn from diverse fields. Thus, trainers at the centre include serving and retired forest officials,

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experts from the Army, Police, Paramilitary, Media professionals, lawyers, scientists and academics including from the social sciences discipline. This enables the centre to draw very diverse talents and not be limited to a small in-house team. Also, most faculty here are field level experts who enjoy taking the trainees outside the classroom to share real hands-on experiences in the field, which is the USP of this centre and cannot be replicated elsewhere.

This approach also helps in reducing the footprint of the centre's activities.

To achieve its objectives, the Centre envisions cooperation with other organizations like Wildlife Institute of India, Forest Survey of India, Indian Veterinary Research Institute etc. and Non-profit organizations like WWF-India, to design and develop high-quality training modules at the Centre. This training material will be designed in sync with the existing training curriculum for Forest Department staff. This cooperation will also cover other key areas such as availability of quality resource persons for conducting training programmes.

However, at every step along this process, due care will be taken to minimize the footprint of the activities of the centre, given its location at the boundary of Corbett Tiger Reserve. Thus, facilities are established only for a small number of trainees to reside in house. Spillovers, if any that may be necessitated over the short term will be accommodated at other forest campuses such as Morghatti away from Kalagarh.

The centre has recently received approval for a grant from JICA, the Japan International Cooperation Agency, for the modernization and upgradation of its existing infrastructure. The National Tiger Conservation Authority has also identified the Corbett Wildlife Training Centre as one of the very few such centres available across the country close to a tiger reserve which can impart training in dealing with the human-wildlife interface with hands on experience in the field. It has offered all necessary support/grant for the its upgradation and conduct of trainings, especially those dealing with implementation of various Standard Operating Procedures issued by it.

8.4.5. Basic facilities for the staff:

Adequate facilities should be given to the staff given to the arduous nature of their work. This small gesture will certainly multiply their sense of dedication to their duty. Following is the indicative list of equipments and services which should be given

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to the front line staff. The annual budget for these articles should be reflected in the APO and the State Plan.

1. Facility for safe drinking water
2. Composite Solar Units including lights, lanterns, mobile chargers etc. in the chowkis
3. Torches
4. Wireless handset with extra battery and charger
5. Basic utensils and furniture
6. Medical kit
7. Two pairs of walking shoes
8. Two pairs of good quality uniforms
9. Winter Jackets
10. GPS
11. Digital Camera
12. Mobile Phone
13. Motor Cycle etc.
14. Solar fencing around camps

Detail on Welfare of Staff has been discussed in the para 13.4 of Chapter-13.

Note: Detail HRD plan has to be reflected in the 'Staff Development Plan'.

Chapter-9

Wildlife Population & Habitat Assessment

9.1. Daily Monitoring & Forecasting:

The prevailing practice of monitoring of wildlife, especially Tiger should be augmented by a system of 'daily monitoring' and regularly generating weekly reports. It will be done through MStrPIES methodology. A monthly report will be compiled on the basis of weekly report. With experience & exposure to resident tigers & their pugmarks, the staff will be able to identify individual tigers from their track characteristics. It is a continuous practice at Corbett Tiger Reserve done by field staff to do sign surveys & individual tiger monitoring. The monthly data thus generated should be regularly mapped for analyzing the trend. It is also prescribed that trap cameras should be used to monitor tigers that stray into fringe villages and indulging into cattle killings. It is further suggested that a special effort has to be made to track the movements of tigers across the corridors. A photo repository should be maintained to ascertain the frequency of movement, location of residential tigers, etc between Corbett Tiger Reserve and other adjoining forest divisions.

The basis of the necessity of daily monitoring and forecasting is highly dependent upon the knowledge of the status of tiger population in the tiger reserve.

Minimum number of tigers:

The methodology of obtaining the minimum number of tigers in the reserve is as follows-

1. Maximum three pairs of camera traps to be deployed per beat and should be left open within a closed period of 40-45 days.
2. The period of leaving the camera traps open (closure period) is important owing to the fundamental assumption of "population closure" (no deaths births/ immigrations/ emigrations in the population). Leaving the cameras open for longer duration will lead to over estimation of tiger numbers.
3. The photographs obtained from camera trapping should be subject of analysis for fixing individual IDs of tigers.
4. A digital camera trap tiger photo database should be prepared for the reserve with

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location ID, date and time stamps as per format provided by NTCA.

5. The minimum number of tigers should be ascertained based on individual camera photo traps of tigers obtained within the closure period specified to be 45-60 days.
6. Details of new captures/ missing tigers should be recorded.
7. The camera trap capture data will be recorded in the format provided by NTCA.

Protocol for daily monitoring/ forecasting of tiger presence in a habitat:

The present practice of maintaining the 'daily patrolling log' should be continued which should be upgraded by adopting the following practice-

1. Each patrolling team should use a GPS unit and a digital camera. Date, time and GPS coordinates of beginning of patrol should be recorded. Preferably the GPS unit shall be switched on throughout the patrol in a track log mode. However, due to constraints of technical knowhow or other issues if this is not possible then a GPS coordinate recorded and written down in the data format every 30 min or at major deviations from a straight line path.
2. Total number of persons on the patrol are recorded along with number of armed personnel and type of arms. The mode of patrol is also recorded, e.g. on foot, bicycle, motorcycle, vehicle, elephant, boat etc.
3. Record of all illegal activities entered in data sheet along with time, date and coordinate stamp. A photo is also taken of the site with a time date stamp.
4. Record of signs and sightings of highly endangered species while on patrol is also maintained by entering the GPS coordinate, date and time of the sighting/sign as well as recording a digital picture of the same if possible.
5. After the end of the patrol, the GPS track log is either down loaded onto a computer (in MSTRIPES program) or the datasheet with the recorded information deposited at the range headquarters.
6. Beat-wise monitoring of signs and encounters of animals/vegetation/habitat disturbances will be carried out twice a year following the Phase-I protocols. The entire tiger reserve would be covered at the beat level, by considering the latter as a sampling unit, as done in Phase-I of the country-level assessment by following the

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standardized eight day protocol. This would involve beat-wise collection of data (in the standardized formats) twice a year (summer and winter) relating to tiger/carnivore signs survey, ungulate, encounter rates, habitat status, human presence and pellet/dung counts. Based on such data, beat level maps indicating spatial presence/relative abundance (index) of prey/predators species should be prepared in GIS domain for record.

7. Recording data from 'pressure impression pads' (PIP). As part of intensive monitoring of source populations of tigers, data will be recorded from pressure impression pads (PIPs, track plots) in every beat. A minimum of 5 PIPs will be permanently maintained in each beat. The dimension of the PIP shall not be less than 6 m in length and the width of the PIP. Should be equal the footpath, jungle trail or dry nullah's width on which the PIP is made. GPS coordinates of all PIPs need to be recorded. The location of the PIPs within the beat should be such that they maximize the possibility of recording carnivore tracks. Minimum distance between any two PIPs should be more than 1.5 km. The PIPs should be cleaned of debris, leaf litter and gravel and covered with fine dust of about 0.5 cm depth. After preparing the PIP, data should be recorded the next morning and the PIP cleared of all tracks. The PIPs should be sampled thrice every month during summer and winter. In case a PIP is disturbed due to rain, traffic etc, then it should be set again before data is collected. The topography and forest type should be recorded for each PIP. It is important to note that a track set is constituted by one to many pugmarks made by a single animal traversing the track plot (PIP). One need not identify the gender or individual animal (tiger), but if this information is known, it should be entered in the remarks column. If there are more than one track sets of "same" animal e.g. a tiger moving up and down the trail several times, they should be recorded as separate track sets.
8. Sudden drastic reduction in tiger evidences should be interpreted as a warning and it should be investigated under the knowledge of the senior officials.

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-Format for recording tiger presence-

Date ----- Time ----- Range-----Beat name -----

GPS Coordinate :----- PIP No: -----

Put tick (√) marks in appropriate column			
S.No.			
1	Tiger pugmark	<i>Present</i>	<i>Absent</i>
2	Plaster cast of pug mark	<i>Taken</i>	<i>Not taken</i>
3	Habitat Type	<i>note the habitat type</i>	
4	Male	<i>Tracks recorded</i>	<i>Not recorded</i>
5	Female	<i>Tracks recorded</i>	<i>Not recorded</i>
6	Cubs	<i>Tracks recorded</i>	<i>Not recorded</i>
7	Other Carnivore Tracks	<i>Present</i>	<i>Not present</i>
8	Leopard	<i>Present</i>	<i>Not present</i>
9	Sloth bear	<i>Present</i>	<i>Not present</i>

9.2. Tiger Population Estimation & Monitoring Frame Work (Phase I,II,III & IV):

For designing, implementing and evaluating the success of any conservation program for an endangered species, it is imperative to monitor the status, distribution and trends in the population of the target species. The monitoring program should be transparent in approach and holistic, addressing an array of parameters related to the survival of the species by using appropriate technology. Till recent past, experts based the countrywide monitoring of tiger population on the identification of individual pugmark. The system generated a total count of tigers, but gave no indication of spatial occupancy, population extent and limits, connectivity between population, habitat and prey conditions, etc. Realizing the shortfalls of the pugmark monitoring system, Project Tiger directorate evolved a program "Monitoring Tiger, co-predators, Prey and their Habitats" in collaboration with Wildlife Institute of India and State Forest Departments. This program is based on a four-stage approach.

9.2.1. Phase- I Spatial mapping and monitoring of tigers, prey and habitat:

For estimating the distribution extent & relative abundances of tigers the data will be collected in simple formats on carnivore signs in forested areas of the region within each forest beat. This stage consists of mapping of -

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- 1) Tiger presence & relative abundance.
- 2) Tiger prey presence & relative abundance.
- 3) Habitat quality and anthropogenic pressures at high spatial resolutions of 15-20 km². In this process entire landscape where tigers are likely to occur will be sampled (beat wise). The detailed methodical approach for sampling will be done as per the guidelines and procedures available from National Tiger Conservation Authority (NTCA).
- 4) It will be easy to collect as it will not require high level of precision on the part of the field staff.

9.2.1.1 . Sampling for Tiger, Leopard and Other Carnivore Sign Encounter Rate:

To obtain data on the presence, absence and intensity of use of a beat by tigers and other carnivores, one shall quantify the relative abundance of tiger, leopard and carnivore signs in an area. The following procedure needs to be followed for data collection:

- A beat will be considered as a sampling unit.
- Areas within the beat that have the maximum potential for tiger occupancy will be intensively searched.
- Since tigers & leopards have a tendency of using dirt roads, trails, foot paths, river beds and *nullahas*, these landscape features within the beat need to be searched and marked for identification.
- One to three persons who know the terrain and habitat features of the beat should conduct the search for tiger sign.
- Three to five separate searches (in different compartments within the beat and/or at different times 1-5 days interval) and each search covering about 4-6 km distance in areas having the best potential for tiger presence. It is important to record the distance covered and the time spent during each search separately (in the data sheet-1) and accurately. If the time spent resting or in other activities while conducting the search, this duration should be reported separately. It is mandatory that GPS coordinate of the beginning point of each search path should be recorded. For monitoring of, GPS track logs should be prepared.

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- The total minimum distance covered while searching for tiger and other carnivore sign should be 15 km per beat.
- Tiger & leopard signs should be classified into the following categories 1) Pugmark trails, 2) Scats (Old: dry with hair and bones visible; Fresh: dry but intact with shiny surface; Very Fresh: soft, moist and smelly, 3) Scrapes, 4) Scent marks (spray, rolling), 5) Rake marks on trunks, 6) Actual sighting, 7) Roaring (vocalization).
- A brief description of the topography and forest type is to be recorded for each sign.
- In case of pugmark trails, each trail set should be considered as one sign (not each pugmark as one sign). In case tiger (or other carnivore) continues to walk along a dirt road for a long distance (say 1 km), then this should be considered as one sign, and a comment recorded in the remarks section of the data regarding distance covered by a pugmark trail of a single tiger.
- Tiger and leopard signs if encountered outside of the sampling route should also be recorded with GPS coordinates and with appropriate comments.
- Special emphasis should be given to sign of tiger & leopards with cubs, and any authentic evidence of tiger cubs (sightings of cubs, lactating tigress, tracks, etc.) obtained within the past twelve months should be mentioned in the data sheet.
- While sampling for tiger and leopard signs, record should also be kept for signs of any other carnivore that are encountered.
- The number of livestock that are killed by predators within the past three months needs to be recorded in the questionnaire following the data sheet.
- It is important to report data sincerely. It is likely that there may be reliable information available that tiger/leopard is present in the beat being sampled, but no tiger/leopard signs are recorded during the intensive search survey. In such cases, mention should be made in the remarks column of the data sheets. However, failure in obtaining tiger sign from a beat is equally important as recording tiger/leopard signs and for appropriate analysis of this data the actual data should be reported. Because all kinds of information is necessary for appropriate analysis of the data.

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Data Sheet-1

Data Sheet for Tiger, Leopard & Other Carnivore Sign Encounter Rate

Observers name	Start Time
Date	End Time
Begin GPS: Lat:N.	Long
Forest Circle	Forest Division
Range	Beat
Total km. Walkedkm.	Times Spent in any other activity..... Minutes.

Sl. No.	*Carnivore Species	^ Sign Type	Forest Type	Terrain Type	Remarks
1					
2					
3					

* Carnivore species to be recorded: tiger, leopard, wild dog, bear, jackal ^ Sign types to be recorded are pugmark, scats scrapes, rake, vocalization. and direct sighting.

1. Has any tigress with cubs been reported during the past 12 months?

Yes----- No ----- Approximate date/month -----

- | | |
|-------------------------------|--|
| a) Seen by staff, | b) Pugmarks, |
| c) Reported by local persons, | d) Seen by officials (ç the appropriate) |

How many cubs _____ approximate age of cubs _____

2. In case tiger are known to be present in the beat, but no sign was obtained during the sampling period then mention on what evidence was this conclusion made (pugmark, direct sighting, scat, other sign) _____

Approximate date/ month _____ Tiger presence was last recorded in the beat.

3. Has any leopard with cubs been reported during the past 12 months?

Yes— No — approximate date _____

- | | |
|-----------------------|--|
| a) Seen by staff, | b) Pug Marks, |
| c) Reported by staff, | d) Seen by officials (ç the appropriate) |

How many cubs _____ approximate age of cubs _____

4. In case leopards are known to be present in the beat but no sign was obtained during the sampling period then mention on what evidence was this conclusion made (pugmark, direct sighting, scat, other sign) _____

Approximate date/month _____ leopard presence was last recorded in the beat.

5. How many livestock predation events have been recorded in the past 3 months, _____ by tigers, _____ by leopards, _____ by other carnivores (specify which carnivores if known) _____ carnivores _____

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6. Comments & Remarks:

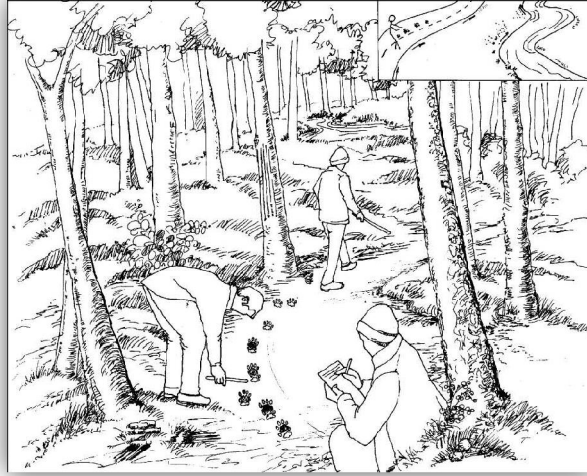


Figure 1. Sampling for tiger sign

9.2.1.2. Sampling for Ungulate Encounter Rates:

This protocol outlines a simple method for quantifying ungulate abundance in an area based on visual encounters while walking along fixed line transects. The following procedure needs to be followed for data collection:

- A beat would be considered as the unit for sampling.
- After considering the shape, size, vegetation, and terrain type of the beat, a transect line of a minimum of 2 km and not exceeding 4 km will be marked for sampling.
- The transect line should traverse similar habitat (broad vegetation types) as far as possible. If the beat is composed of 2 or 3 distinct vegetation types eg. Mixed Teak Forest comprising 40% of the beat and the remaining 60% comprised of Miscellaneous forest with bamboo, then 2 separate line transects should be marked for sampling as shown in Figure. 2b.

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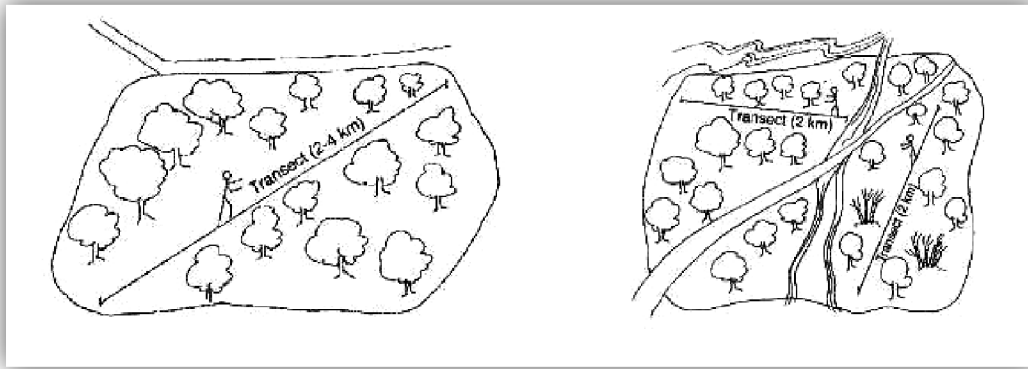


Figure 2. Marking Transects in a Beat.

- a) Line transect in a beat with similar habitat. b) Line transect in a beat with 2 habitat types.
- As shown in figure 2b, the line transect within a beat may be broken up into 2 or more segments so that each segment has a minimum length of 2 km and traverses similar habitat.
 - Care should be taken that a line transect is not located near a busy road nor should it run parallel to a river or other features of the landscape which may bias sighting of ungulates.
 - For each transect the point of beginning and end point coordinates (Latitude and Longitude) should be recorded by a GPS.
 - The broad forest type and terrain type that the transect traverses needs to be recorded.
 - Each transect should be walked by 1 -2 persons during the early morning hours (6:30 am to 8:30 am). Care should be taken that a well acquainted person should be included who has the expertise to identify wildlife from a distance.
 - A record should be kept of all mammals and peafowl seen during the walk in the prescribed format (see data sheet). For each animal sighting the following needs to be recorded: 1) sighting number, 2) time of the sighting, 3) species (eg. sambar, chital, wild pig, peafowl, langur, etc.) 4) group size - number of animals of the same

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species in the group sighted, it is important to try to count the number of animals in the group as accurately as possible. Animals are considered to belong to two different groups if the closest animals from the two groups are separated by a distance of over 30 m. 5) forest and terrain type where the animals were seen.

- If possible the number of young (fawns/calves less than 1 year of age) seen in the group should also be recorded.
- A broad habitat category (vegetation and terrain type) needs to be recorded for each sighting (for example Sl.No. 5, 12 chital (10 adults and 2 young) were seen at 6:40 am, in mixed teak forest, gently undulating terrain).
- Each line transect needs to be walked at least on three different mornings for estimating ungulate encounter rates, during the country wide monitoring done every four years.

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Data Sheet - 2

Encounter Rate on Line Transects

Observer Name: Start Time:
 Date: End Time:
 ID no. of Line Transect: Total Length: í í ...í í í Km
 Forest Circle: Forest Division:
 Range: Beat:
 Transect Forest Type: Transect Terrain Type:
 Weather condition: Cloudy/Clear sky
 Beginning GPS Lat :N; Long : í íí E
 End GPS Lat : N; Long :E

S.No	Time	Species*	Total Number (Adults & Young)	Young	Forest Type	Terrain Type	Remarks
1.							
2.							
3.							

*Species that need to be recorded on the transect: chital, sambhar, nilgai, barking deer, wild boar, langur, peafowl, hare, cattle (live stock), and any other mammalian species seen.

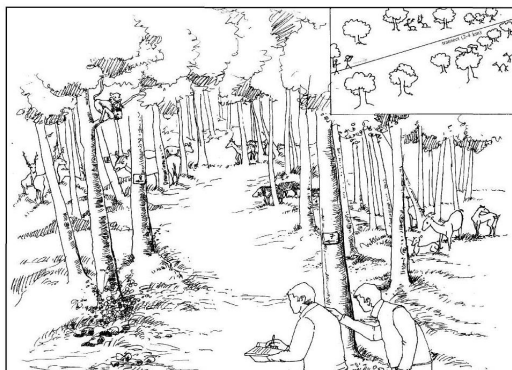


Figure 3. Sampling for ungulate encounter rates

9.2.1.3. Sampling for Vegetation, Human Disturbance and Ungulate Pellets:

To quantify the habitat parameters and determine relative abundance of ungulates sampling will be done along the same line transect on which ungulate encounter rates were estimated. For economy of time and effort it would be possible to first sample the line transect during early morning hours for ungulate encounter rate and then while returning along the same line, sample for vegetation , human disturbance and

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also for ungulate pellets. Sampling for vegetation, ungulate dung, human disturbance and ungulate pellets will be done only once on a transect.

- Again a beat will be the sampling unit, and sampling will be done along the established line transect.
- The beginning and end point coordinates of the line transect need to be recorded using a GPS unit.
- The same principle of laying line transects as explained in the section on ungulate encounter rates is applicable here (ref: Figure 2).
- Vegetation would need to be sampled every 400 m along the transect.
- The vegetation would need to be quantified visually at the following categories for each plot:

(a) 15 m. radius circular plot:

1. Within a distance of approximately 15 m of the observer the five most dominant trees (over-story, all vegetation >6 fit height, including bamboo) need to be listed in the order of dominance (abundance) (ref: Figure 4).
2. The observer needs to list the 5 most dominant shrub species (middle story, vegetation >40 cm and <6fit) in order of dominance (abundance) within 15m of the location. He needs to categorize shrub density (under-story vegetation) as absent, very low (25%), low (50%), medium (75%), and dense (100%). Shrubs will be assessed on five point scale (0 to 4 i.e. absent to most abundant) for density estimation.
3. If weeds are present, their abundance needs to be scored on 0 to 4 scale (0 being absent and 4 high abundance) and the three most common weeds seen in 15 m need to be listed in order of abundance.
4. Within the same 15 m distance the observer needs to record number of signs of looping, wood cutting and presence/absence of human foot trail. Mention need to be made if people and or livestock are seen from the plot.
5. The observer needs to visually quantify the canopy cover at the location. The observer should subjectively classify the proportion of the sky above him that is

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covered by canopy foliage and categorize it into <0.1,0.1 -0.2,0.2-0.4,0.4-0.6,0.6-0.8, >0.8 canopy cover (see Figure 5).

6. A mention needs to be made in the data sheet regarding the number of permanent human settlements, human population, and livestock population present in the beat (to the best of his knowledge).
7. A mention needs to be made based on the observers knowledge if any non timber forest product is collected from the beat. If yes, which NTFP and to score the magnitude of collection on a 4 point scale (0- no collection 4-high rate of collection).
8. If the beat was burnt (natural or management practice), the proportion burnt in the past 3 years need to be mention in the data sheet.

(b) 1 m radius circular plot:

This plot should be laid 5m away from the centre of the 15m circular plat. The observer needs to use a 2m long stick to define an imaginary circle around him with the stick as the diameter. Within this circular plot (2m diameter) the observer needs to a) quantify the percent ground cover, i.e. the proportion of the ground covered by herbs, grasses, litter, and bare ground, b) List the 3 most dominant grass species, and herb species in order of dominance (see Figure 6).

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Data Sheet-3A

VEGETATION (15m plot)

Name of Observer: í í í Date: í í í Forest Circle: í í í í Forest
 Division: í í í

Range: í í í í í í í Beat: í í í ID No. of Line Transect:
 í íí í í

Plot No.	Canopy Cover (0-1)	Tree Species (Descending Order of dominance, all veg. >6ft)					Shrub Species (Descending Order of dominance, all veg. >20cm & <6ft)					Shrub- Abundance 0 to 4 0- absent to 4- very high	Weed /invasive Species (Descending Order-of dominance)			Broad vegetation & terrain for the plot	
		1	2	3	4	5	1	2	3	4	5		1	2	3		

* Bamboo more than 2 m., should be entered in "tree" category, less than 2m in "shrub" category.

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Data Sheet-3B

Human Disturbance

Name of Observer: í í í í Date: í í í í Forest Circle: í í í í í í

Forest Division: í í í í Range: í í í í í í í í

Beat: í í í í ID No. of Line Transect: í í í í í í í í

Plot No.	Human Disturbances 0-4 Rating, 0-No, 4-Very high						
	Wood Cutting 0-4	Lopping 0-4	Grass/ Bamboo cutting 0-4	Presence of human/ livestock/ trail 0-4	Weed Abundance 0-4	People Seen Y/N	Livestock Seen Y/N

Are there any permanent human settlements in the beat? (Yes/No). If Yes, how many? ____.
 Approximate human population _____, approximate livestock population _____ Cattle, _____
 Goat/Sheep, _____ Other Livestock.

Is there NTFP collection in the beat ____ Yes/No. If yes, what NTFP is collected _____

Rate NTFP collection on a scale of 0-4, 0-No to 4-Very high _____

The proportion of the beat that was burnt during the past year was..... , second year was..... third year was



Figure. 4. Sampling tree and shrub species in a 15m plot every 400m along the transect.

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Data Sheet-3C

Recording Ground Cover (1 m radius or 2m diameter plot)

Name of Observer: í í í í Date: í í Forest Circle:.....í Forest Divisioní í í í

Range: í í í í í í í í í í Beat: í íí í ID No. of Line Transect:í í í í

Plot No.	Dry leaf litter %	Ground Cover (The total percentage of following 5 columns should be 100%)					Grass Species (Report in descending order of numbers)			Herb Species (Report in descending order of numbers)			Remarks	
		Dry Grass %	Green Grass %	Herb (Small Plants) %	Weeds %	Bare Ground %	1	2	3	1	2	3		

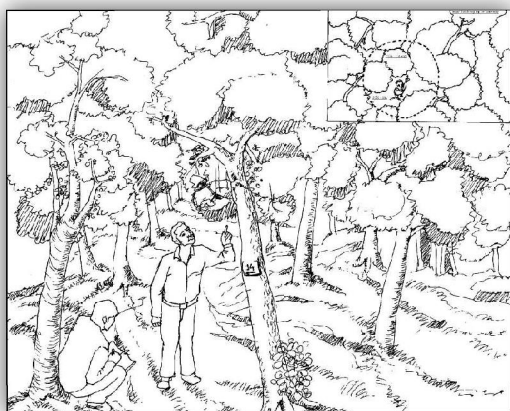


Figure 5. Estimating the canopy cover overhead in a 1m radius circular plot

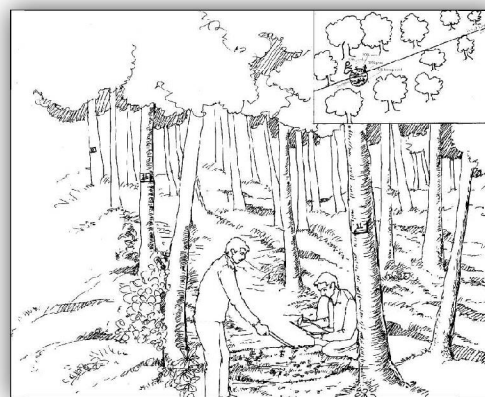


Figure.6. Estimating ground cover

9.2.1.4. Sampling for Ungulate Pellets:

Ungulate abundance will also be indexed by enumerating their faecal pellets. This exercise will be done on the same line transect that has been sampled for ungulate encounter rate. To save time, this exercise could be done after the line transect has been sampled in the early morning for ungulate encounters.

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- At every 400 m along the transect (line of walk) the observer needs to sample an area of 2m by 20m, perpendicular to the transect for quantifying ungulate pellets. This is done by using the 2 m long stick held at the centre horizontally in his hand and by walking slowly, 20m right and left of the transect alternately at every 400 m (ref: Figure 7). The topography and forest type should be recorded for each plot even if pellets are not seen.
- All ungulate pellets encountered need to be recognized as to which ungulate it belongs to and recorded in appropriate columns of the attached data sheet.
- The number of faecal pellets needs to be counted. In cases where the pellets occur in large heaps, then they should be categorized into the following categories: A(50-100), B (100-200) and C (>200).
- In areas where small livestock like sheep and goat are known to be grazed, it is possible that faecal pellets of these can be confused with wild ungulates especially those of chital. In such areas, a mention needs to be made that goat or sheep graze the area.
- In the last row of the data sheet the observer needs to report if ungulate/ animal listed in the data sheet occurs in the sampled beat to the best of his knowledge irrespective of whether its pellets/dung were recorded in the plots.



Figure.7. Quantifying ungulate faecal pellets

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Data Sheet-4

Pellet Counts of Ungulates

Name of Observer: í í í í .Date: í Forest Circle: í í Forest Division: í í í í

Range & Circle: í í í Beat: í í ID No. of Line Transect: í í í í í í

Plot No.	Forest Type	Terrain Type	Chital	Sambar	Wild Boar	Nilgai	Elephant	Barking Deer	Hog Deer	Hare	Langur	Cattle	Goat & Sheep	Other Domestic livestock	Others/Unid.
*Present / Absent															

*The observer to the best of his knowledge should mention the occurrence of the above mentioned species in the sampled beat irrespective of the fact that whether their dung was recorded or not.

1. Do goat/sheep graze the sample area? yes /no
2. In case pellet are obtained in large piles then these could be categorized in to the following categories.

No. of Pellets	Category
50-100	A
100-200	B
>200	C

This spatial data generated will be used to model tiger occupancy, detection probability of tiger signs, and relative sign density at high spatial resolution. The data will be analyse in GIS domain and several spatial and attribute data like human density, livestock density, road network, topographical features, forest type and cover, meteorological data, poaching pressures and landscape characteristics will be use as covariantes to model tiger occupancy and relative abundance in landscape and individual forest patches. Several corroborating variables like prey encounter rates, pellet group counts and habitat condition will help in ensuring quality data. National and international experts would act as observers while officials in charge would ensure adherence to the prescribed protocol and transparency of protocol implementation. This system will also monitor the status of other biodiversity resources.

9.2.2. Phase II: Spatial and attribute data:

The spatial attributes that are likely to influence tiger occupancy of a landscape will be used for modeling in the G.I.S domain. The vegetation map, terrain model, nightlight satellite

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data, drainage, transportation network, forest cover, climate data, normalized difference vegetation index, live stock abundance, human density, socio- economic parameters etc. will be used for modelling habitat condition and tiger occupancy. Beat wise vegetation sampling will be done to generate broad vegetation map. The mapping will be done with the help of expert agencies like FSI, Survey of India or any other professional body. This will help in determining current spatial distribution of tigers, potential habitats, threats to crucial linkage between occupied landscape & conservation planning. Digitized maps will be used for this purpose.

9.2.3. Phase III: Estimating the population of Tiger and its prey:

Phase 3 of the methodology answers the question of how many tigers and ungulates are there. Research Staff will be deployed in each area (landscape) for estimating tiger density and ungulates densities within stratified sampling units.

Tiger Numbers- Stratified sampling will be used in each area into tiger sign abundance classes of high medium, low and no tiger sign at the beat level. This job will primarily be done with remote cameras, based on stripe pattern of individual tigers. Population estimates based on mark recapture framework will be done using CAPTURE, CARE 2 and density 4. Based on relationship development between tiger density and indices. These densities will be extrapolated for the area under various density classes within the landscape to arrive at tiger population estimate.

9.2.4. Phase IV: Intensive monitoring of source populations:

Regular monitoring of the status of tigers, co-predators and their prey is the most important task of the management to ascertain the overall performance of the Tiger Reserve. The Tiger Task Force constituted by the National Board for Wildlife (2005) has endorsed the revised methodology propounded by the erstwhile Project Tiger Directorate (now the National tiger Conservation Authority- NTCA) and the Wildlife Institute of India for country-level estimation/monitoring of tiger/prey status and its habitat. This includes a country-level assessment of tiger, co-predators, prey and habitat in 17 tiger states once in every four years; intensive monitoring of tiger source populations in TRs and protected areas in each tiger landscape complex (Phase-Iv), and maintenance of a centralized photo- database of tigers at NTCA; routine management-oriented monitoring and survey design (for all tiger reserves except Sundarbans) for spatially explicit mark-recapture study involving research workers/scientists.

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The NTCA, after much deliberation, prescribed the minimum standards for Phase IV protocols, which is as follows:

- Camera trap density one pair per 4-5 sq km
- Minimum trap nights of 1000 per 100 sq km. (i.e. 25 pairs of cameras in 100 sq km for 40 days)
- Minimum area coverage of 400 sq. km.
- Closure period of 40-60 days.
- Minimum of 20 spatial replicates of line transects each of a minimum of 2 km. length (for entire reserve)
- Entire reserve needs to be sampled. Each sampling occasion will cover minimum 400 sq. km. (100 pairs of cameras) and in case of larger reserves, the area should be covered by dividing the area into 400 sq. km. blocks and camera trapping done successively, within the closure period of 60 days. Corbett Tiger Reserve being a large tiger reserve, it will be divided into 400 sq. km. blocks.

The Phase-IV is known as an advanced protocol involving scientists for intensive monitoring of source populations of tiger reserve. The Corbett Tiger Reserve will do the Phase-IV monitoring through active cooperation of the scientists of Wildlife Institute of India. The annual exercise will aim at obtaining tiger population size for the entire reserve using spatially-explicit capture recapture framework and obtaining prey population size using line transect sampling. The camera traps deployed as per the survey design and should be left open for a period of 40-60 days. The tiger population size may then be estimated over the entire tiger reserve using mark-recapture methodology. The analysis of data needs to be done in collaboration with a technical expert/scientist conversant with spatially-explicit capture-recapture process/analysis. In this regard Corbett Tiger Reserve enjoys an advantage of getting expert advice and cooperation from Wildlife Institute of India, Dehradun. The period of leaving the camera traps open (closure period) is important owing to the fundamental assumption of "population closure" (no deaths/births/immigrations/emigrations in the population). Leaving the cameras open for longer duration may lead to over estimation. The format for summary record of camera captures and the basics of mark recapture process using camera

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traps are provided. The analysis of capture data between years (using open population models) should also be done in collaboration with technical experts/scientists/WII.

For obtaining prey densities, line transects must be systematically placed with a random start according to the survey design and implemented in program distance. The line transect data should be analysed using the "distance" software for prey density. The analysis of the data needs to be done in collaboration with a technical expert/scientist conversant with the distance sampling analysis. The standard format for collecting line transect data to facilitate analysis using "distance" software and the basics of distance sampling using line transects are to be used.

The Phase-IV report/2011- ' Status of Tigers in Corbett Tiger Reserve' has been appended as **Annexure-3/2**.

9.3. Habitat Assessment and Monitoring Framework:

The data collected during phase I for sampling for Vegetation, abundance of ungulates, dominance of weeds etc., along with human disturbance will be collated and put in GIS Domain. This can be correlated with tiger and prey base presence. Any change in the habitat can be monitored by spatial data present in GIS Domain. Following are the protocol of monitoring of the tiger, co-predator, prey and the habitat ó

9.4. Spatial Database Development, analyses and reporting Framework:

As has been discussed earlier all the data generated will be maintained in the GIS domain and analysis of the same will be done by trained officers with necessary help from NTCA and WII. MSTRIPES is a great tool which can be used as a base for reporting framework. Necessary cooperation will be taken from NTCA and WII.

9.5. Analysis and Reporting Framework:

The data collected from the phase-I,II,III,IV are to be analysed as per the protocol given by the NTCA/WII. Other institutes of repute will be solicited to analyse various data collected during the daily patrolling. The MSTRIPS protocol will be used for the purpose.

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9.6. Coordination Role for Director Corbett Tiger Reserve in the landscape:

Till recently, CSS support under 'Project Tiger' was available only for Tiger Reserves. Acknowledging the significance of areas immediately outside tiger reserves for long term tiger conservation at the landscape level, NTCA has also extended funding support for various activities to several territorial and social forestry divisions both in Uttarakhand and UP. In the new scheme of things, the Director Corbett Tiger Reserve is expected to play a pivotal role in coordination of tiger conservation related activities within the Corbett landscape which includes such territorial forest divisions in Uttarakhand and UP surrounding Corbett Tiger Reserve.

Director Corbett Tiger reserve will be the focal point for all tiger conservation related issues in the landscape. This will include the following areas:

- Ramnagar Forest Division
- Terai West Forest Division
- Terai East Forest Division
- Haldwani Forest Division
- Nainital Forest Division
- Lansdowne Forest Division
- Bijnore Forest Division, UP
- Bijnore Plantation Forest Division, UP
- Moradabad Forest Division, UP

The list is indicative and may be modified as per directions of the NTCA.

The Director, Corbett Tiger Reserve will be the anchor for planning of camera trap operations in the area and as a regional repository for such capture images. He would also monitor tiger habitat occupancy in the neighboring areas, payment of ex-gratia, monitoring of progress of Court Cases related to tigers and will provide capacity building support through the Corbett Wildlife Training Centre, Kalagarh. He will convene periodic meetings to discuss issues related to the above and will be the focal point for interface with the NTCA.

9.7. Protocols for the establishment of a national repository of camera trap photographs of tigers (NRCTPT) PART-I:

The above protocol is made mandatory for all Tiger Reserves by the NTCA, hence Corbett Tiger Reserve will follow the same.

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Work to be done at reserve and state level before images are sent to the national tiger conservation authority (NTCA)

1. Introduction:

Photographic images of tigers are accumulating rapidly across India as a result of camera trap surveys, general photography, forensic work and other activities by multiple agencies. If these images are systematically collected and compiled in a retrievable and useful manner, they can be of immense assistance to the protection, management and rigorous monitoring of wild tiger populations in India. The purpose of this note is to outline the establishment of such a National Repository of Camera Trap Photographs of Tigers (NRCTPT) under the direct control of National Tiger Conservation Authority (NTCA) with facilitation for instant sharing of information with States and other participants.

Intensive camera trapping has been now mandated as the main methodology for annual monitoring of tiger populations in key source populations and tiger reserves (http://projecttiger.nic.in/whtsnew/Protocol_Phase_IV_Monitoring_r.pdf). Additional tiger photographs may be made available by individual reserve or through any other ad-hoc camera trapping efforts as well as from photographs of dead tigers, skin seizures and photographs of wild tigers' obtained by tourists, forest officials and other individuals. All statistical information about tiger populations in the country will be derived from these individual identifications based on rigorous analysis conducted by NTCA / outside experts at NRCTPT.

The first January of 2006 will be treated as the starting date for accumulating these tiger identifications in a rigorous, secure national database. Given the maximum life span of about 15 years for wild tigers, the database will have to be continually accrued over the years. An initial capacity for 99,999 individual tiger ID records is suggested.

Although the tiger photo-ID database can be a powerful tool, the possibility of problems arising from accidents, errors, and deliberate manipulation is substantial. Therefore, a carefully designed protocol to regulate and validate the inflow of photographs right at the establishment stage of NRCTPT is crucial. Furthermore, to use the software program '*ExtractCompare*' (Hiby et al. 2010) with its associated standard MS Access data-base, it is imperative to establish strict quality control regimes right at

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the inception to maintain high levels of data integrity. This document contains details on how such a reliable National Repository of Camera Trap Photographs of tigers (NRCTPT) can be established and maintained.

This document also contains five data forms which are used to ensure authentic recording of tiger photo data from Field level to the State level. ONLY 'Data Form -C' is filled by hand in the field by survey personnel. Other four data forms are filled by authorized official/researcher at Reserve / State level.

2. Responsibilities of the central database management facility at the NTCA, New Delhi, after the database is established:

1. Receiving tiger photographs and ancillary information in a properly labelled, formatted and authenticated manner on hard copy forms and digital form together with authentication documents duly signed by authorized personnel certifying them.
2. Scrutinizing, selecting photos and entering the camera-trap photo-capture data and their associated photo-images into the database together with all the meta-data (including location, date, time, personnel involved, and other meta-data from storage media, camera traps, film rolls etc.)
3. Using software program *Extract Compare* to perform batch level automated matching followed by visual examination to identify unique individuals and assign the unique ID numbers.
4. Documenting and archiving all received images (including those not entered into the database) for future reference, vouching, resolving disputes etc.
5. Generating all statistical analyses and interpretation of results.
6. Sharing these results with the respective states, parliament, participating scientific institutions/partners, etc.

The Regional Offices of the NTCA will facilitate the process by interacting with the States involved.

3. Protocols to be followed at the state and tiger reserve level before commencing field data collection:

Each state with help from technically qualified, persons/institutions will develop a *Survey Design* for each Tiger Reserve (i.e. Corbett Tiger Reserve) or Source Site (here Forest Divisions like Ramnagar, Tarai West and Lansdowne), keeping in view

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requirements specified under Phase IV of National Tiger Estimation and the *ladder process* of moving from Section 2 to Section 3 provisions therein.

Once the Survey Design is approved by the Chief Wildlife Warden (CWLW) of the State and necessary logistical needs, personnel and other resource needs are identified, the steps listed below will be required to implement field surveys for reliable data collection.

1. Each Tiger Reserve or Source Site will identify a "supervisor" to oversee the entire field survey operations. The supervisor can be either a Forest Department officer at the rank of Range Forest Officer or above, or a qualified scientist authorized by the state Chief Wildlife Warden to implement Phase IV protocols.
2. The supervisor at the Tiger Reserve or Source Site level will assign a unique *location label* to each *trap location* where camera traps will be deployed in the field following the survey design approved by NTCA.
3. The supervisor will record and list all such *trap locations* with their GPS coordinates as well as a *geo-referenced descriptive name* associated with a map at 1:50,000 scale using the '*Data Form - A*'.
4. Each camera trap unit and film roll or electronic disk used for gathering camera trap data will get a unique, non-repeated identification number which should be inscribed on it.
5. The supervisor will prepare a deployment plan and schedule covering all trap locations identified in the approved survey design. Using the '*Data Form - B*', he/she will track the deployment of units at all locations in Tiger Reserve or Source Site.

4. Protocols to be followed by field survey teams:

The field protocols outlined below will be strictly followed and adequate checking / validation and supervision will be in place to ensure data integrity:

1. Each "double sided camera trap" (hereinafter called camera trap) consists of two cameras and tripping systems, each one with its own unique ID numbers.
2. While setting up camera traps 'Date' and 'time' settings of both the cameras at a trap location will be synchronized.
3. Only image storage device (e.g. memory card or film roll) which have unique ID

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inscribed on them, will be loaded into the cameras.

4. While out in the field, camera traps will be set up initially, checked routinely and removed systematically according to the deployment plan prescribed in *Data Forms A and B*. The set up and checking activities for camera traps will be carried out with all relevant ancillary data being recorded exactly as shown in '*Data Form - C*'.

It is important that all field survey personnel, supervisory personnel and others write their names legibly, sign and date the filled forms exactly as shown above. This will form the basis of authenticity of the entire exercise and will be diligently done. The supervisor will ensure authentication of the data forms and associated data received from the field and ensure its safe keeping.

5. Protocols to be followed at the level of tiger reserve:

The carefully stored data and storage media (films, disks) will be handled by the Tiger Reserve or Source Site level supervisor authorized by the Field Director or the qualified researcher appointed by the Chief Wildlife Warden. He/she will ensure that the following steps are implemented:

1. The data to be integrated at reserve level will include: The raw camera trap data (on memory cards from digital cameras or film rolls from film cameras) each with its own Individual ID, imprinted meta-data and associated data forms.
2. Downloading and storing images as 'field copy' at Tiger Reserve or Source Site level: Create a new folder on the computer hard disc, and name it by joining the 'name of the field technician' from whom the images were received, and the 'date of receiving data'. For example, images received from Mr. ABC on 8th October 2012 (this will be on *Data Form - C*) is copied into a computer drive with a specific folder name that identifies it as below:

Example folder name: Mr. ABC 8-10-2012

Each data form received from Mr. ABC on 8th October 2012 should also be tagged/filed under the same name (Example: *SantoshNaik-8-10-2012*).

3. Create sub-folders within this folder that is named by pairing the 'camera ID' and 'memory card ID' (or Film roll ID).

Example sub-folder name: *KA-CAM192-MC003*

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Download images from the memory cards into these respective folders. Do not rename them, so they retain their original names as generated in the camera.

4. Images stored as above are considered as '**field copy**' of images received from field survey personnel. Store all images like this and not just tiger images; As an Example, the folder structure of storing this 'field copy' of image will be:

Example: *Mr. ABC -8-10-2012 > KA-Cam192-MC003 > {Img001.jpg, Img002.jpg, Img003.jpg, etc.}*

The next, and further subfolders for images received from *Mr. ABC* on 8th October 2012 will be:

Example: *Mr. ABC -8-10-2012 > Cam213-MC006 > {Img001.jpg, Img002.jpg, Img003.jpg, etc.}*

5. Now, leaving this 'field copy' of images as it is on the hard disc, create a second 'backup copy' of these images in a separate folder.
6. After downloading images from the memory card as two copies, format the memory cards. Always make sure the memory cards are formatted before giving the camera units back to the field survey personnel.
7. Documenting tiger capture details in '*Data Form - D*': At the Tiger Reserve or Source Site level, examine all images carefully and enter details related to each tiger photo-capture in a fourth data-form.
8. The two images from two cameras of a trap location are linked as 'complementary images' of each other, as shown in the example '*Data Form - D*'.
 - When establishing the link between two images as the 'right flank' and 'left flank' of same individual through the same photo-capture event, take extreme care in using the date-time information from the meta-data of the image or time-stamp on the images.
 - Counter-check this 'linking' of images with information recorded in '*Data Form - C*', and by looking at other images captured immediately before and after these tiger images.
 - The supervisor will also look at the 'set-up time' and the next 'check time' at a location to ascertain if a tiger capture in the image was from the same location using '*Data Form - C*'.

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6. Protocols to be followed at the state level:

The task of recording, compilation, authentication before submission of data to the NTCA will be performed at Chief Wildlife Warden's office or at Head Quarters of the scientific institution conducting the survey.

1. After camera trapping is completed for the season or for a pre-defined period, four data-forms (*'Data Form - A'*, *'Data Form - B'*, *'Data Form - C'*, and *'Data Form - D'*), all authenticated by and countersigned by the reserve director/head of research institution will be sent to the Chief Wildlife Warden as well as to NTCA (two identical copies) for further authentication.
2. Field Director will also send images collected at Tiger Reserve or Source Site level (the 'field copy' of images) on CDs/DVDs to the Chief Wildlife Warden for further authentication.
3. If any individual tiger can be identified based on preliminary visual comparisons, at Tiger Reserve or Source Site, 'Annual Temporary Tiger ID number' will be assigned by the Chief Wildlife Warden, using *'Data Form - E'*.
4. Till this point all data will be in the form of paper field data-sheets, and films or digital images on CDs/DVDs. Entries in a MS Excel spreadsheet will be recorded at state level and sent to the NTCA.
5. At State level the data received from all Tiger Reserves or Source Sites will be thoroughly validated and authenticated.
6. Apart from *'Data Form - E'*, and an 'authenticated version' of data, no other new document is created at State level. Also, DO NOT rename or reorganize the images in any way. This data sent to the NTCA will be deemed as authentic and final. The necessary forms are as follows:-

'Data Form - A':

1. This form is to be filled by an authorized official/researcher at Tiger Reserve or Source
2. Site level to record all Camera Trap Locations are recorded and give unique Spatial Camera Trap Location Label is given.
3. This form lists all the Camera Trap Location Labels strictly based on the Survey Design Map prepared by the scientific collaborator.

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Name of the Tiger Reserve I Source Site: Corbett Tiger Reserve

Supervisor's (Authorized official/Researcher) Name & Signature:

Camera Trap Location Label	Geo-referenced Description of Camera Trap Location	Latitude (by map or GPS)	Longitude (by map or. GPS)	Range/Section Name	Beat/Sub-beat Name

'Data Form B':

1. This form is to be filled by an authorized official/researcher at Tiger Reserve or Source Site level.
2. This form is essential for tracking the deployment of camera traps and image-data collection.

Name of the Tiger Reserve / Source Site: Corbett Tiger Reserve

Supervisor's (Authorized official/Researcher) Name & Signature:

Sl, No.	Camera Trap Location ID	Camera ID	Memory Card ID	Date of Deployment	Date of Removal	Date of Downloading images

'Data Form C':

1. This form is to be filled by field survey personnel/technicians by hand while they are actually setting up or checking camera traps. This is only form to be filled in the field by survey personnel.

Names of Camera trapping field survey personnel:				Name of Supervisor			Tiger Reserve/Source Site name and year of survey:	
Signature of survey personnel:				Signature of Supervisor:			Sheet No: 1 of 3	
Date	Time	Camera trap location label	Camera ID	Memory card ID	Start image	End image	No. of images	Remarks

'Data Form D':

1. *Photo-capture details* for each tiger image, and its *opposite flank image* is recorded in this form.
2. This form is filled at the Tiger Reserve or Source Site level after preliminary processing of images by referring to data given in 'Data Form - C'.

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3. Only record file name of the image and file location in the 'filed copy' images folder are recorded. The JPG images are not to be pasted on the form!

Camera Trap Location Label	Date	Time	Folder path and file name of the left flank	Folder path and file name of the left flank

'Data Form E':

- Yearly Temporary tiger ID, age-sex class details (if available) for each photo-capture are recorded in this form, reserve/source site wise for the entire state.
- This form is filled by authorized representative of Chief Wildlife Warden for the whole State:

Name of the State: Uttarakhand

Name and Signature of authorized representative:

Chief Wildlife Warden's Name & Signature:

Tiger reserve/ Source Site	Camera Trap Location Label	Date	Time	Folder path and File name of the left flank	Folder path and File name of the left flank	Temporary Tiger ID	Sex	Age

All Ranges of Corbett Tiger Reserve will maintain a register of the above formats. The adjoining forest divisions like Ramnagar, Tarai West and Lansdowne will also do the above mentioned exercise with the fund available from NTCA. These forest divisions are accorded special status by the NTCA by allocating Rs.75 lakh for protection of tigers. These divisions have considerable number of tigers and they are known for high quality of tiger habitat. The areas in question are frequented by tigers from CORBETT TIGER RESERVE and vice versa. The Phase-IV tiger estimation shall be carried out by these divisions annually and the CORBETT TIGER RESERVE administration will guide them. The results should be regularly reviewed by the Chief Wildlife Warden, Uttarakhand. One MoU was executed between NTCA and CWLW, Uttarakhand for funding of these divisions. The MoU has been given as **Annexure-9/1**.

Protocols for the establishment of the national repository of camera trap photographs of tigers (NRCTPT) PART-II:

Covering work to be carried out after images are received by the NTCA.

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1. Responsibilities of the central database management facility at the NTCA, New Delhi, after the database is established and images are received.
 - 1) Receiving tiger photographs and ancillary information in a properly labelled, formatted and authenticated manner on hard copy forms and digital form together with authentication documents duly signed by authorized personnel certifying them.
 - 2) Scrutinizing, selecting photos and entering the camera-trap photo-capture data and their associated photo-images into the database together with all the meta-data (including location, date, time, personnel involved, and other meta-data from storage media, camera traps, film rolls etc.).
 - 3) Using software program *Extract Compare* to perform batch level automated matching followed by visual examination to identify unique individuals and assign the unique ID numbers.
 - 4) Documenting and archiving all received images (including those not entered into the database) for future reference, vouching, resolving disputes etc.
 - 5) Generating all statistical analyses and interpretation of results.
 - 6) Sharing the results in the form of unique Tiger IDs with the respective states, parliament, participating scientific institutions/partners and the public.

The Regional Offices of the NTCA can facilitate the process by interacting with the States involved. However, all the procedures below are to be implemented by technically qualified personnel.

2. Protocols for the processing of images, archiving and analysis at the NTCA, New Delhi

All images (including tigers), eleCorbett Tiger Reserve onic meta data and ancillary data in hard copy forms, duly authenticated at Reserve and State level and countersigned by officials as mentioned on the forms will finally arrive at the NTCA from the office of the Chief Wildlife Wardens for further processing and assignment of National Unique Tiger IDs (UTID). The exact format in which these data are received will be as below:

Images will be received on CDs or DVDs, or negative film rolls. These disks and rolls will contain images termed as original 'state copies'.

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- These disks MUST HAVE linked authenticated Data Forms A, B, C, D and E.

These camera trap images will be processed for individual identification of tigers by fully following the protocols/steps as described below:

I. Re-organizing and re-naming all cameras trap images in windows explorer

Authenticated 'STATE COPIES' of images are stored in folder structures already described in document 1. These images are required to be re-named / re-labelled in a standardized manner for the whole country before they can be entered into the National Tiger Photo Database. To maintain data integrity, and also to facilitate easy storing of data in the database, these images received as STATE COPIES must be re-organized as per steps below.

STEP 1:

Retaining the same folder structure, make A FRESH DUPLICATE COPY of all the images and meta-data on the hard disk of a separate computer with adequate storage space. On the copy, the images get a new name (or label) by fixing a 'date-time stamp' to the image number. This date-time information will be derived from *EXIF metadata* (Exchangeable Image File Format) embedded in images by the digital cameras. There are standard software tools for renaming images by stringing EXIF meta-information of images with their original image numbers.

Example:

Label of image received: *IMG0001.jpg*

New name after re-labelling: *20.12-10-02_20-13-37 MG0001.jpg*

STEP 2:

Create a new folder structure. for each tiger reserve or source site create as many new folders as there are unique camera trap locations. each new folder must have a label using the camera trap location id contained in data form a described in document 1.

Example: for location '*Sambar Road 2.4*' create a folder by its Camera Trap Location ID NH 24 .

1. Refer to 'Data Form - C' and 'Data Form - D' to identify TIGER images as captured at specific camera trap location, and then copy these images into appropriate Camera Trap Location folder.

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Example: copy images from *Mr. ABC-8-10-2012 > KA-Cam192-MC003* into folder *NH24 > {images captured at MNKR 2.4}*, and images from *SantoshNaik-8- 1-0-201 2 > KA-Cam2J3- MC006* into folder *NH24 > {images captured at MNKR -2.4}*

2. Please note that most camera trap' units would have been moved around, so please do the following to take care of this issue: If, a camera trap unit was deployed in more than one location before downloading images at tiger reserve office, one should be very careful in ascertaining the location for images because they will be downloaded into a single folder in the field copy of images. For example, if the camera unit 'KA-Cam192' was deployed in two locations, the folder *SantoshNaik-8-10-2012 > K4-Cam192-MC003* will have images taken from these two locations. It is very important to refer to 'Data Fo;m - C' (and cross-validate with 'Data Form-B') to ascertain the dates when the unit was shifted to a new location, and accordingly copy the images into two different folders.

Example: copy images captured in location NH24 from *Mr. ABC R-8-10-2012 > K4-Cam192-MC003* into folder *NH24 > {images captured at Camera Trap Location ID NH24}*, and images captured in location NH25 from *SantoshNaik-8-10-2012 > K4-Cam192-MC003* into folder *NH25 > {images captured at Camera Trap Location ID NH25}*.

3. By stringing together the 'Camera Trap Location ID', 'date-time of capture' with the 'original image number', a unique reference image file name is created for all images received at NTCA.

Example: *NH25 _2012-10-02_20-13-37 MG0002.jpg* Where,

Source site code	Location ID	Date/time stamp of Image	Image number

Note: Each image gets linked to a Tiger Reserve (of possible and nearest source site) in India. We have used the list of Tiger Reserves (current and potential source sites identified by NTCA) to generate codes for each of the Tiger Reserves (see Appendix1).

Referring to Data Forms C, D and E, select all tiger images and copy them into a new folder. Label this new folder by site and year of trapping.

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Example: Corbett 2012

Establish and validate opposite flanks for each photo-capture by looking into Data Forms C, and D.

Thoroughly cross check temporary IDs assigned to individual tigers by state CWLW in data form e, by visually comparing all tiger images received.

II. Inserting the camera trap data to national tiger photo database using ms access form

Finally ALL images of camera trapped tigers from all source sites/tiger reserves, and their capture details are consolidated into NTPD. This is done in two stages.

- 1) First, the camera trap data from a single tiger reserve or source site is appended to a carrier database 'tiger_append'. A final validation of the data can be performed at this stage, and if there are any irregularities they are resolved. Please note that all tiger images received from field get included in the database.
- 2) In the second stage, data from 'tiger_append' database are imported into the central database. A subset of these tiger images is tagged for extracting patterns in *Extract Compare* software. These patterns are then compared with all other images using the *Extract Compare* software and the tigers that do not find a match with any tiger in the database get a new ID. The scheme of naming the tigers is defined in the next part of this document.
- 3) This comprehensive database from all tiger reserves/source sites and from all previous years also records National Unique Tiger ID.

III. Assignment of unique national tiger IDs (UTIDs) using extract compare software

Establishing the identity of each the tiger, and then to have unambiguous NOTATIONAL identifications to all photographed tigers is central to maintaining a reliable national database from camera trap data.

The general naming scheme outlined below reflects two important aspects about the individual tiger identity: first the landscape from where the individual was captured, and second the 'strength' of the identity of the individual tiger based on its photos (so as to be able to separate out ambiguous identities from unambiguous identities).

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1. To avoid multiple counting and controversies it is essential for each tiger to have one PERMANENT national ID (UTID). It is logical and ecologically meaningful to have these IDs linked spatially to one of the five disjunct tiger landscapes as well as to the year of First capture. These IDs should not be assigned to states or tiger reserves because tigers often move across these boundaries either permanently or temporarily. We propose the following general scheme for UTID:

Example: *WG- stands for Western Ghats, followed by a unique running serial number that is nationally assigned and continued over the years .*

WG-12387, CI-19680, NE-3427 etc.

Each individual tiger is spatially coded to the landscape from where it was first captured. We have used the list of landscapes identified by NTCA to generate the codes for each landscape (see Appendix 2)

2. Based on the quality of photos and the number of photos in each capture there can be four types of names or "IDs" for each tiger: (a) IDs for unusable images, (b) IDs for 'unidentifiable' individuals, (c) Partial IDs, and (d) Permanent IDs.

a) Not-usable image (NUI).

Photos that are merely recognizable as that of a tiger but without any necessary and sufficient stripe patterns available for individual identification should be described as 'unusable' images. Following ID format will be used for such images.

Example: WG-12-NUIOOOI

Where 'WG' indicates the landscape and '12' indicates the year of capture

b) Unassigned image (UAI)

There will be cases of camera trap images of a single flank that cannot be compared with all the same flank images in the dataset, even when stripe patterns are visible in the image. For example, a left hind leg image cannot be compared with an image that has only left front leg visible in it.

Such images are temporarily labeled as 'unidentified', and can potentially match images in the ensuing season. An unidentified individual during the camera trap survey in year 2012 can be named as follows.

Example: WG-12-UAIOOOI

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c) Partial ID

When only a single broad side profile image of either the right or the left flank of the tiger exists for a new individual tiger, its identity will be ambiguous because a left-flank-only image and a right-flank-only image may logically belong to either the same individual or two different individuals.

In such cases it is best to reflect the ambiguous identity of the individual in its ID, and such IDs will be considered as Partial IDs. If in the ensuing camera trapping season, these images with 'ambiguous identity' match images of a capture with both the flanks then the individual tiger will be assigned a Permanent ID.

Examples of Partial ID: *WG-L00335*, and/or *WG-R00333*

Where, ID series with 'L' refers to individuals with only usable left-flank photos, and 'R' series to individuals with only usable right-flank photos.

d) Permanent ID

The identity of a tiger is unambiguous only when there is at least one capture with clear broad side profiles of both flanks in the data set. Only for tigers with both flank images, a permanent ID is assigned. The permanent ID has a spatial component (a code for the landscape) and a serial number which is national.

Example of a permanent ID: *WG-2875*

Once these National Unique Tiger IDs are assigned at the NTCA, they should be communicated to the each STATE (Chief Wildlife Warden) to replace temporary IDs assigned by them earlier in the process.

IV. Additional information in the database:

This database can be used to record sightings from naturalists who have taken clear photos amenable for individual identification, as well as to record tiger mortalities with images of either their carcasses or pelts seized, to establish / ascertain reliable identity of the individual tiger. In all such cases, pattern matching software *Extract Compare* can be effectively used to match these images with camera trapped individuals in the database that will greatly enhance tiger conservation. But such images from other sources should be included in the database ONLY when reliable information on the location and date of photograph taken is available.

Chapter-10

Protection and Intelligence Gathering

Corbett Tiger Reserve is particularly famous for tigers and elephants. The high density of tiger and large number of tuskers poses a great challenge to save them from poachers and retaliatory killings by villagers/Gujjars, who may be victims of human-wildlife conflict. A robust protection plan augmented by well organised intelligence network is the primary requirement of the management of the tiger reserve. The Corbett Tiger Reserve has a well organised protection system and it remains successful to keep poachers away most of the time. However constant up gradation of the plan is required to make it synchronised with the demand of the time and smart enough to outwit the nefarious intention of trouble makers. The area under any beat also needs to be rationalized and should be around 7-8 sq. km. and their headquarters should be located strategically to ensure effective protection.

10.1. Strategy for protection & communication:

An exhaustive 'Protection Plan of Corbett Tiger Reserve' has been prepared which prescribes extensive measures to be taken for overall protection of the Reserve and is flexible enough to incorporate new methods of protection as and when the changing situation warrants. Following is the operative excerpts of the Protection Plan.

10.1.1. Strategy for protection:

10.1.1.1. Issues and challenges:

The main issues for the proper protection of wildlife in Corbett Tiger Reserve are as follows ó

1. Prevention of poaching:

No species on earth can survive and flourish without adequate protection both physical as well as the protection of its habitat. The wild species of our country have been subjected to hunting since time immemorial. Corbett being one of the most important source population of tiger and Asiatic elephants, smooth coated otter, mugger and *Gharial* crocodile and more than 600 species of resident as well as migratory birds, should have a robust protection plan to keep the trouble makers away from the tiger reserve. Poaching by villagers or by organized groups, for food or for trade, all of such

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nefarious activities needs to be stopped both inside and outside the reserve. Regular checking of all permanent and dugout temporary water holes will be carried out to sanitized the water sources from any kinds of traps including thin wired snares. The use of Deep Search Metal Detectors (DSMDs) will be encouraged towards this end. The combing party will also check for the absence of any kind of poisons including urea etc. at each water hole. All animal tracks leading to each water hole will be regularly sanitized. This operation will be called as "Anti-snare" exercise. The respective SDOs will personally conduct and monitor the above mentioned exercise at least 4 times a year. A compendium of the result of the above exercise will be maintained in the office of Deputy Director and DFO, Kalagarh.

2. Mitigation of human-wildlife conflict:

The long term survival of our natural heritage is to a large extent dependent on the fact that how much public support we can take for the cause of conservation. The cases of human-wildlife conflict always go against the wild animal. Thus to create an atmosphere of goodwill among the masses, the mitigation of human-wildlife conflict is important.

3. Effective and efficient rescue operation:

Rescue operations are important for the safety of wild animals as well as the humans. To be effective, these should be performed by trained and well-equipped personnel. Corbett Tiger Reserve has a well equipped Quick Response Team which comprises of a well equipped team of field personnel with a specially designed vehicle, who can respond to any emergency swiftly and instill confidence amongst local people. There is need to constantly upgrade the skills as well as equipments such as tranquilising guns, nets, restrain poles, post mortem kits, forensic sample collecton kit, search lights etc. there is also need to increase the number of such QRTs in Corbett Tiger Reserve

4. Wildlife disease management:

Wild species are prone to disease like any living organism, but the detection and treatment of such diseases requires specialized staff and equipment. Corbett Tiger Reserve now has the benefit of a full time vetererianian on deputation from the Animal Husbandary department. The veterinarian will be responsible for developing a prophylactic plan for disease management including the following components:

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1. Disease surveillance of key wild species including by scat analysis and postmortem of specimens found dead or killed.
2. Regular health monitoring of captive elephants
3. Preventive vaccination of cattle on the periphery
4. Establishment of protocols for identifying field signs of some major disease outbreaks likely to occur.

5. Contingency plan:

The terrain of Corbett necessitates visualizing and foreseeing different scenarios regarding protection, human-wildlife conflict, wild life rescue etc. This will help in the preparation of contingency plan for each eventuality. These plans come in handy at the time of crisis. The Security Planning guidelines for Tiger Reserves also have a component of contingency planning incorporated in them and these will be strictly followed.

6. Protection of habitat & its improvement:

Mere physical protection cannot save a species from extinction unless it is coupled with the maintenance of a good habitat. Habitat improvement includes practices and measures that ensure the quality of a good habitat.

The role of an ideal habitat for long-term survival of species needs no elaboration. The spread of exotic weeds, plantation of exotic species, biotic pressure and many other factors have contributed to the deterioration of habitats. Unless remedial measures are taken up in time, these habitats will lose their value. Habitat improvement will be an important ingredient of Range Level Protection Plan. This will also take care of the availability of water in different areas during the critical summer months and will suggest measures to overcome the water shortage in specified areas.

7. Wildlife crime hotspots:

Though a Range-wise identification of wildlife crime hotspots is essential for effective crime control, but in general the whole of the Southern boundary (especially the forest areas near Terai West Forest Division and Kalagarh, Amangarh, Badhapur which are close to U.P-Uttarakhand boundary), Lal-darwaza, around Saneh, the peripheral area of Bijrani Range in the vicinity of Ramnagar city, the stretch of Ramganga River near Domunda, the area of Sarpdulli Range lying across river

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Ramganga and Sonanadi region of Kalagarh Tiger Reserve are sensitive areas with regards to wildlife crime which need special attention and strategy.

Continuous surveillance for habitual poachers and other forest offenders and their areas of operation are important and their record should be maintained at the range level and should be utilized in the formulation of Range Level Protection Plan. The *Babaria's* normally camp in the in the revenue land, on the vicinity of forest areas. Beat wise identification of such sites will be undertaken and the nearby forest entrance points will also be identified. This data will be depicted in the *Poaching sensitivity Map*.

8. Settlements of poaching communities around Corbett:

Tigers of Corbett Tiger Reserve are vulnerable of some professional poachers who are mostly belong to *Pardi, Bawaria and Bahelia* communities while some tribes of the North-East are specialized in killing of the elephants. In many cases, the local *Kanjar* communities have acted as helpers. With the passage of time *Kanjars* have come to master the art of killing of tiger and in some cases of the Elephant also. The *Babaria's* normally live as nomads and pitch their tents near a forest patch. They are in a practice to cover their sinister motives by doing proxy business like selling of plastic flowers, utensils, bangles, etc. These people are in a habit of shifting their camp sites. The most probable camps sites are near Kashipur, Ramnagar, Mohan, Afzalgarh, Nazibabad, Kaladhungi, Bel-parao and Haldwani. Constant vigil is necessary to track their activities through a strong intelligence network and cooperation from local police and forest divisions. Efforts should be made to gain confidence of the community to discourage them from illicit activities and welfare measurers can be taken up to educate their children and arranging alternate livelihood opportunity though 'conservation foundation'.

9. Capacity building of staff:

Most of the staff working in the reserve has a good understanding of the behavioural patterns of important wild animals, but the need of periodical training on important issues cannot be underestimated. The staff is required to be regularly updated about the following areas.

- Wildlife crime detection and procedure.
- Wildlife and forest laws
- Role of forensic science in wildlife offences

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- Processing a scene of crime
- Effective rescue operation
- Tranquilization techniques
- Secret information gathering
- Use of modern techniques in wildlife management
- Use of GPS and computer applications.
- Arms training.

10. Strength and weaknesses:

Corbett Tiger Reserve has achieved considerable success to ensure safety of its wild life and in its efforts to minimize instances of human- animal conflict. Having said that, every effective, responsive and focused administrative setup has to keep on striving for higher goals through periodic introspection of the inherent strength and weaknesses of the system and Corbett Tiger Reserve is no exception to this rule. A careful analysis of the present protection setup revealed following facts-

Strengths:

- A highly motivated, responsible and disciplined staff, which feels pride in working for Corbett Tiger Reserve.
- A team of dedicated officers which has continuously strived for making Corbett the well managed Tiger Reserve, not only of our State but throughout the Country.
- The people of surrounding villages who are the forebears of tradition and culture of Uttarakhand, which is not only the land of *Chipko Movement* but has a long history of worshipping and showing compassion to all life-forms.
- The present protection strategy based on zonation on the basis of threat perception, thus a three tier protection setup.
- An effective wireless network.
- 24 x 7 electronic surveillance system (e-eye) working with 9 towers along the southern boundary is helping to detect movement of human beings from the adjoining villages of Uttar Pradesh as well as animals across the southern boundary. It also helps to detect forest fire during the summer season. It has a great potential to check entry of poachers by alerting the staff.

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- The protection force working under schemes-'Operation Lord' and 'Tiger Protection Force' augments the security of the core area by constantly patrolling in the peripheral areas.

Weaknesses:

- The whole landscape is dense and has a heavy ground cover, which restricts visibility. Thus despite on-foot patrolling, a large forest area remains un-scanned. The problem is further compounded during monsoon months. Use of elephants for patrolling is restricted to limited areas due to undulating terrain.
- If a small and trained group of poachers manages to enter into the inner areas of the reserve it may not be easy to detect them physically.
- The reserve area lies in the foothills and a large number of streams and watercourses criss-cross the periphery. These streams serve as the entry and exit points for both the wild animals and poachers. Round the clock monitoring of all the streams and water courses is a very difficult task.
- The tiger reserve area has many peaks and ridges. If unscrupulous elements manage to reach these vantage points they can easily hide themselves, while monitoring staff movement.
- Weak network of informers.

11. Rescue team and veterinary services:

Human- animal conflicts are not uncommon in the Corbett landscape and the neighbouring divisions always look towards the Corbett administration for help in such cases. Thus it is very important for us to have a well trained and well equipped rescue team at Ramnagar and Kalagarh. This will reduce the response time and will help the cause of wildlife conservation. The services of a full time veterinarian is now available to look after diseased, injured or trapped animal. Two rapid response vehicles are available which should be used not only by the Corbett management but also in the neighbouring divisions.

The Corbett Wildlife Training Centre has to play an important role in such capacity building needed to respond to such emerging requirements.

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12. Strategy for conflict management:

Conflict in the form of human-wildlife interface needs to be dealt with promptly and with humane touch. It is no denying the fact that conflict management has a major effect on the protection strategy of any Tiger Reserve. Corbett Tiger Reserve has cultivated this asset with consistent effort. However it has been prescribed that some extra importance has to be given in comparison to the prevailing situation. Adequate funding has to be ensured to achieve desired result.

- Construction of stonewall fencing at the periphery of southern boundary to check crop raiding by animals in the adjoining villages.
- Solar powered fencing around villages and agricultural fields to ward off animals from entering human settlements.
- Prompt disbursement of ex-gratia to loss of human life and live-stock, destruction of crop, and injury to human caused by wild animals as per the prevailing orders of the State Government.
- Rescue and medical health care to the affected human being/wild animal.
- Eliciting people's support in wildlife conservation through a continuous and meaningful interaction with villagers through EDC's.

10.1.1.2. Present protection practice & future strategy:

From administrative point of view the whole tiger reserve is divided among 11 Ranges and 69 beats. The average area of a Range is around 117.12 Sq.Km. and that of a beat is about 18.67Sq.Km. Forest beats are the primary administrative as well as protection units of the Reserve and Ranges are the key control and monitoring centres of these units. The working of the ranges is overseen by sub-divisional forest officers who work under the concerned Deputy Director/Divisional Forest Officer. The Director Corbett Tiger Reserve is the overall in-charge of the reserve.

The focus of protection planning for future will be strengthening of beat level protection mechanism. Keeping in view the above-mentioned priority, the protection plan for future has laid emphasis on preparation of protection plans at beat level. The beat level plans combined together will form the Range level plans and all the range level plans combined together will make division level protection plan. Thus the whole planning process will be bottom-up instead of the traditional top-down approach.

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A Security Plan will be prepared as per the guidelines of the NTCA to strengthen the security regime of CTR over the long and short term. The security plan will be based on a realistic assessment of the threat perceptions before CTR and an institutional framework to respond to such threats.

A proposal for reorganization of Corbett Tiger Reserve has been sent to the PCCF Uttarakhand. This envisages the reorganization of beats from the present 69 to 134, thus bringing down the average Beat size from 18.67 sq.km to a much more manageable 9.6 sq. km. This will provide a major boost to protection efforts in the Tiger Reserve.

A. Analysis of sensitivity:

All the compartments of the Tiger Reserve will be analysed and classified on a poaching and a human-wildlife conflict matrix. They will be classified as *highly sensitive, sensitive less sensitive & non-sensitive*. This exercise will be carried out at the beat level by involving the field staff. Human-wildlife conflict classification will be done for the nearby villages which are prone to the conflicts. Using the above data, separate maps up to beat level will be maintained for *Poaching sensitivity & Human-wildlife conflict sensitivity*. The poaching sensitivity maps will also show the routes and probable camping locations that the poachers may use. The human-wildlife conflict map will also show the routes, which the animals normally use to enter and exit the forest. The map will also show seasonal movement of wild animals.

1. Sensitive index classification: (Core and Buffer)

As per the directions laid down in this plan, sensitive index classification exercise was carried out in all the beats of Corbett Tiger Reserve. The division-wise results of the exercise are as follows. This kind of exercise has to be done every year.

S. N.	Division	Range	Beat	Status				
				Poaching	Felling	Encroachment	Fire	Conflict
1	Ramnagar Tiger Reserve Division	Dhikala	Dhikala-E	S1	N	N	S2	N
			Dhikala-W	S1	N	N	S2	N
			Phulai	S1	N	N	S2	N
		Sarpdulli	Khinanauli	S1	N	N	S2	N

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S. N.	Division	Range	Beat	Status				
				Poaching	Felling	Encroachment	Fire	Conflict
			Sarpdulli	S1	N	N	S2	N
			Thakalgaddi	S3	N	N	S2	N
			Sultan	S1	N	N	S2	N
			Dhangarhi-Park	S2	S1	N	S2	N
			Dhangarhi-Buffer	S2	S1	N	S3	S1
			Gargia	S2	S1	S1	S3	S2
		Bijrani	Sawaldeh	S2	S1	S1	S3	S2
			Amsot	S2	S2	S3	S3	S2
			Amdanda	S2	S2	S1	S3	S1
			Bijrani-E	S1	N	N	S2	N
			Bijrani-W	S1	N	N	S2	N
			Mailani	S1	N	N	S2	N
		Dhela	Patherua-E	S2	S2	S1	S3	S3
			Patherua-W	S2	S2	S1	S3	S3
			Dhela-E	S2	N	N	S2	S1
			Dhela-W	S2	N	N	S2	S1
			Sawaldeh-N	S1	S3	S1	S2	S3
			Sawaldeh-M	S1	S2	S1	S2	S3
			Sawaldeh-S	S3	S1	N	S2	S2
		Jhirna	Jhirna	S3	S2	N	S2	S2
			Laldhang	S3	S1	N	S2	S1
			Phanto-E	S3	S3	N	S1	N
			Phanto-W	S3	S3	N	S3	N
			Jamunagwar	S1	N	N	S2	N
		Kalagarh	Dhara	S3	S2	S1	S3	S2
			Kalagarh-N	S2	N	N	S2	N
			Kalagarh-S	S3	S2	S2	S3	S3

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S. N.	Division	Range	Beat	Status				
				Poaching	Felling	Encroachment	Fire	Conflict
			Kalagarh-W	S2	N	N	S2	N
			Nalkatta	S3	S2	S2	S3	S3
			Paterpani	S2	N	N	S2	N
			Gaujpani-N	S2	N	N	S2	N
			Gaujpani-S	S2	N	N	S2	N
			Jamunagwar-N	S2	N	N	S2	N
2	Kalagarh Tiger Reserve Division	Sonanadi	Pakhro	S3	S3	S2	S3	S2
			Dhaulkhand	S3	S3	S2	S3	S2
			Kalusahid-E	S3	S3	S2	S3	S2
			Kalusahid-W	S3	S3	S2	S3	S2
			Mota-Sal	S2	N	N	S2	N
			Seesham-Khatta	S2	N	N	S2	N
			Hathikund	S2	N	N	S2	N
			Laldarwaza	S2	N	N	S2	N
		Palain	Kugadda	S2	S2	N	S2	S1
			Khansur	S2	N	N	S2	N
			Tumadia	S2	N	N	S2	N
			Mandalti	S2	N	N	S2	N
		Adnala	Silwar	S2	S2	S2	S2	S2
			Mundiapani	S2	N	N	S2	N
			Chapret	S3	S2	S2	S3	S2
			Vatanvasha	S1	N	N	S2	N
			Belanala	S2	N	N	S2	N
			Nauninala	S3	S2	S2	S3	S2
			Gauzera	S2	N	N	S2	N
		Maidawan	Kartiya	S2	S2	S2	S3	S2
			Mandal-E	S2	S2	S2	S3	S2

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S. N.	Division	Range	Beat	Status				
				Poaching	Felling	Encroachment	Fire	Conflict
			Teria-I	S3	N	N	S2	N
			Teria-II	S3	N	N	S2	N
			Gouzera	S2	N	N	S2	N
			Kanda	S2	N	N	S2	S1
			Tauliya	S2	N	N	S2	N
		Mandal	Ira	S2	S2	S1	S2	S1
			Sankar	S2	S2	N	S2	S1
			Dumanda-E	S2	S2	N	S3	N
			Dumunda-W	S2	S2	N	S3	N
			Lohachaur	S2	N	N	S2	N
			Kalakhand	S2	S2	S2	S3	N

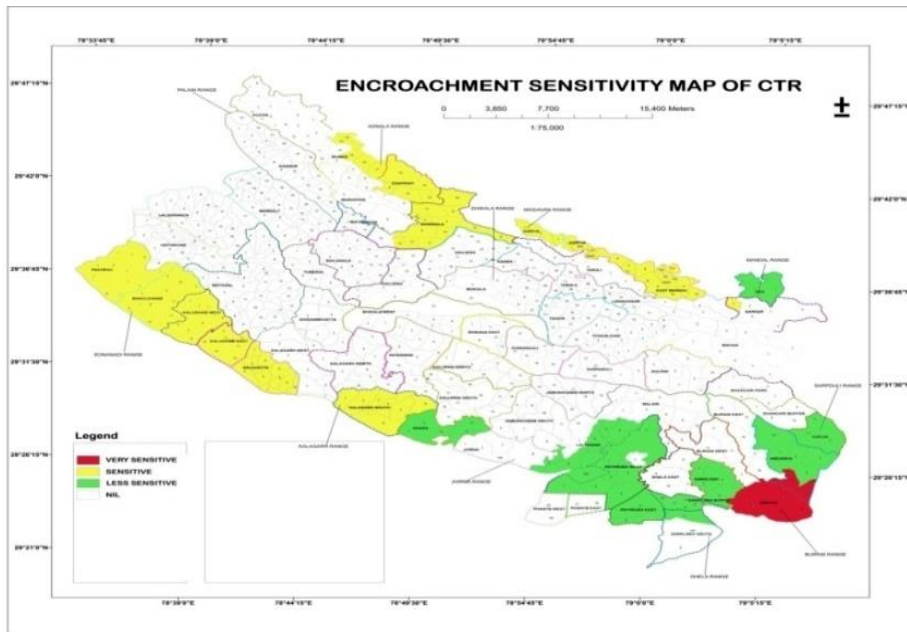
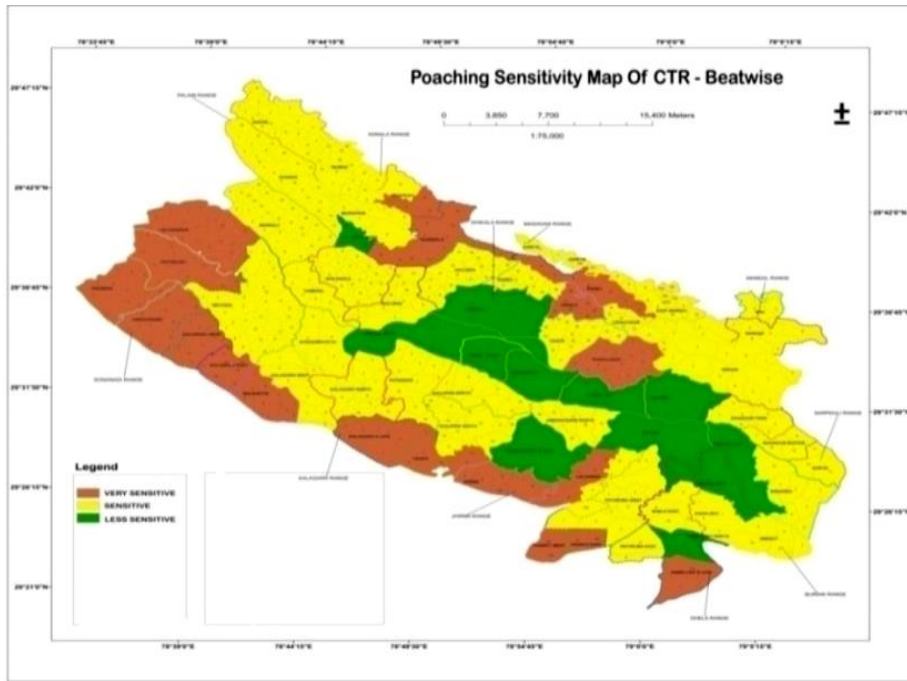
Index- S3=Very Sensitive, S2 =Sensitive, S1=Less Sensitive, N=Nil

2. Sensitivity maps:

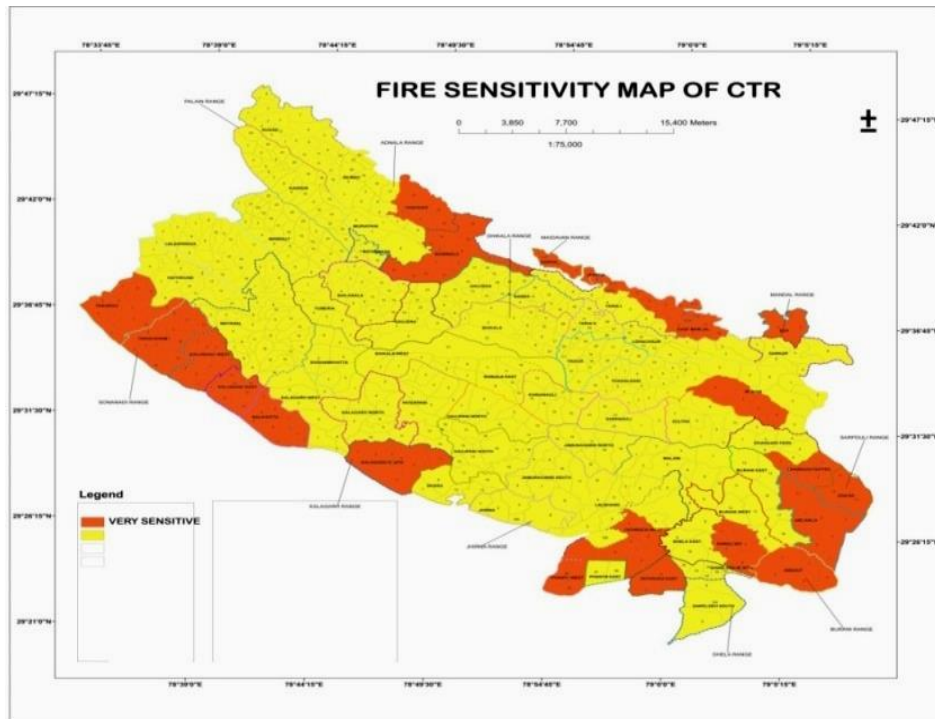
The protection strategy involves dividing the reserve area into three protection zones which are manned by separate teams. This practice will be continued and each tier will be shown by different colour on the *Poaching Sensitivity Map*. This will automatically indicate which patrolling team ('operation Lord'/tiger protection force'/departmental staff) manning which compartment.

Following are given some sensitivity maps which shows various trends based on which strategies have to be formulated to keep the vulnerable areas safe for the wildlife. These maps are dynamic with the flexibility of reorientation of the areas depending upon change of sensitivity towards particular situation, like poaching, illicit felling, forest fire encroachment, etc. The maps are designed for the entire Corbett Tiger Reserve. Such type of exercise has to be done annually.

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B. Protection Zones:

1. The threat perception is different in different areas of the Tiger Reserve and from the protection point of view the areas outside the boundary of the reserve are no less valuable than the ones inside the reserve.
2. Based on the above threat perception the tiger reserve has adopted a three tier protection strategy by dividing the reserve area in three protection zones and setting different protection parameters for different tiers.
3. The three zones of protection are- the first is the circle adjacent to the periphery but outside the reserve. The second is a strip of roughly 2 km width running along the periphery of the reserve and the rest of the area lies in the third zone.
4. The **first zone** is important for intelligence gathering, crime detection, human-wildlife conflict and control on illegal wildlife trade. The area is manned by the staff posted at the periphery, youths of nearby villages working as Operation Lord labours who doubled up as informers and Jawans of Tiger Protection Force.
5. The **second zone** is the most critical and is the place where most of the visible action takes place. All the tracks and routes that lead to the reserve need to be manned continuously so as to detect any unwanted or suspicious movement inside the reserve. Tiger Protection Force plays most important role in this area and the regular field staff work in coordination with TPF. The third zone is the innermost and most vulnerable from poachers. This zone is manned by the regular field staff posted inside their respective beats of the reserve, who will patrol their areas of jurisdiction.

C. Physical patrolling and electronic surveillance:

1. Physical patrolling plan:

Patrol plans for every beat will be prepared utilizing the information generated above. The patrol plan will have a patrolling map which will show the routes of daily patrol, long term patrol and special patrols with separate colours. This will separately mark the areas which are less frequented during daily patrol. Each patrol team during debriefing has to give its details of routes patrolled, observations with GPS coordinates so that this information can be used in GIS domain for monitoring, evaluation and wildlife occupancy etc.

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For effective and intense patrolling following patrol formats have been designed:

i. Long distance patrol:

Based on the above data a range level protection plan will be prepared. The exercise will start by making *Range Level Protection Sensitivity Map*, which besides showing the above mentioned beat level data will also show the daily patrol routes, special patrol routes and long term patrol routes using different colours. The Range level plan will have detailed patrolling, rescue and contingency plans as well as human-wildlife conflict, wildlife rescue and disease management plan.

The Corbett landscape is highly undulating and the size of a beat is usually very large. Despite the best efforts by the field staff some important but distant places may remain unsupervised for a long time. To counter this, concept of long term foot patrol was initiated. This patrol is organized at the sub-division level once every fortnight. In this patrol a group of 6-7 field staff lead by a forester or senior FG, traverse a route (selected by the SDO) continuously for 5-7 days and cover a distance of about 80-100 km. The track of the patrol party is determined in such a way that the remote and unsupervised areas are covered on a priority basis. The patrol starts with the proper briefing of the SDO concerned and de-briefing is also presided by the concerned SDO. De-briefing helps in improving the future strategy of patrolling and offers corrective measures. Regular monitoring of the patrolling plan should be carried out. Every effort has to be made to stop conversion of the exercise into a self imposed target to reach the destination. The party will be encouraged to scan the area thoroughly and spend their night inside the forest not in the chowki. This will deter the poachers and the goal of such patrolling exercise will be fulfilled. The SDOs concerned will analyse the results of such patrolling professionally and will try to bring innovative ways to keep the spirit of the frontline staff high. As discussed in the chapter ' Protection through Electronic Surveillance' a GPS track-log will be prepared to monitor the areas covered by the patrolling parties and the areas left to be scanned. Based on such maps, future strategy of patrolling will be planned by the respective SDOs.

The concept of long term patrol has been extended further to inter-division and inter-state long term patrols to ensure protection in the whole tiger landscape and to elicit support of nearby forest divisions and the State of UP.

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Anti-poaching camps have been made at the sensitive and strategically important locations and entrance points to the reserve. These camps ensure round the clock surveillance of sensitive entrance points and movement inside the reserve area.

An effective and robust wireless network has been working throughout the tiger reserve with 4 repeater units, 65 base stations and 156 handsets. This network is the back-bone of communication inside the reserve area where other means of communications are not available. Almost all the beat headquarters have base stations and anti-poaching camps are connected through handsets. Very few forest areas lie in the shadow zone of communication. Recently one satellite phone unit has also been commissioned and five fixed satellite phone stations has been established to cater to specific needs of the core area.

Four wheel vehicles (such as Cars, Gypsy, Jeep etc) have been provided to field officers up to the level of Range Forest Officer, and a few motorcycles have been provided for the use of Foresters and Forest Guards. There is an urgent need of providing new vehicles to the field staff.

Double barrel guns & .315 bore Rifles with sufficient ammunition are available to the field staff .32 bore revolvers have been given to officers up to the rank of Range Officers. The details of firearms is as follows-

1. .315 bore Rifle - 79
2. 12 bore Gun - 94
3. .32 bore Revolver - 11

The arms are in working order and proper upkeep will be ensured by the concerned authorities. The respective Range Officers will ensure the regular maintenance of the weapons.

Regular firing practice will be conducted with cooperation from the local police, Garhwal Rifles Regimental Centre, Lansdowne as well the Army Remount Unit at Hempur.

ii. Beat patrol plan:

- Sensitive zones have been identified in every beat.
- 4-6 patrol routes are designed based on above information.

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- Patrol units formed consisting Forest guards as leader & 4-5 local anti poaching staff.
- Patrol party attempts to cover each route in a full week.
- Track logs of patrol recorded with help of GPS.

iii. Range level special patrol:

- It is conducted during festivals of Holi, Deepawali, Christmas, New year and before & after monsoon.
- Track logs of patrols recorded with help of GPS.
- Range officer leads the patrolling party.

iv. Inter state patrol:

- Along the boundary of U.P.
- Range level & beat level coordination patrolling done with staff of Amangarh, Nagina (Bijnore division) & Sahuwala range (Nazibabad division).
- Conducted specially during winter months.

Patrolling is a major activity for the staff here. They spend most of their energy in patrolling. Regular and intense patrolling is done in the same territory (beats) week after week making it quite monotonous. It drains them physically & mentally. In spite of regular and intense patrolling, total & fool proof scanning is not possible. of the topography of Corbett Tiger makes this even more difficult. Corbett Tiger Reserve has taken an initiative in this direction. GPS technology is being used to help frontline staff in patrolling. This helps in analysing area coverage and effectiveness of patrolling effort. Proper and effective scanning can be done in larger areas with optimum utilization of resources.

2. Protection through electronic surveillance:

i. Application of GPS for monitoring of patrolling in Corbett Tiger Reserve:

Corbett has a distinct place in the arena of wildlife conservation due to its rich biodiversity, spectacular faunal variety and impeccable track record of protection and conservation. It is one of the very few habitats, where the Tiger and the Asiatic Elephant are not only safe but are flourishing. It lies in the foot hills of Kumaon and Garhwal divisions in Himalayas. The terrain is highly undulating and altitudinal variation is from 385 mt. to 1100 mtrs. Several rain fed rivulets pass through it. On

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northern & southern side of Corbett Tiger Reserve habitations are interspersed with forest areas. Southern part usually forms boundary with U.P. and is most vulnerable area of Corbett Tiger Reserve. Almost 30 Km. boundary bisects U.P. with Uttarakhand. More than 25 small streams pass through this area from north to south providing passage for humans and wild animals. It makes the area very sensitive to illegal activities and animal conflict. Whole landscape is undulating and it has dense ground cover which restricts visibility to few meters. Unique topography having steep peaks & valleys make patrolling a very tough job. Healthy population of Tigers, leopards, elephants & other wild animals makes it more susceptible.

ii. Mechanism:

- Most field staff are trained to use GPS, recording stations, saving & deleting track logs of patrol and trip computer reading.
- Briefing at start and debriefing in end are carried out by the SDO/ Range Officer to laid down the track to be scrutinised and discuss about the outcome with the staff at the end of the patrolling respectively.
- Track logs of patrol recorded, important stations/sightings /events recorded as waypoints.

iii. Data transfer/processing:

- After each patrol, GPS units & field book is collected at SDO Office and data downloaded with help of map source.
- Processing of data ó waypoints are categorized, track logs/active logs are renamed and merged.
- Range master copy of each patrol is formed by merging data of all beats.
- Track logs viewed in *Google Earth* to view the topography of patrol operation.

Information is then used to identify area which is left and topography of that area. Future patrol routes are designed accordingly.

iv. Limitations of GPS unit:

Some of the limitations in current GPS unit, making large scale field exercise difficult, are given below:-

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- Limited device memory & level accuracy. Units are frequently sent to office for downloading data. Larger device memory will help in reducing office work.
- No geographical/topographical details in unit screen, no reference points. Map is drawn in a plain screen.

v. Use of Google earth:

Track logs are viewed in a map having topographic/geographic details. From that the SDO in-charge can see topographic view of patrol tracks as well as the areas which were not covered by the patrolling staff. Those un-scanned areas can be covered in the next patrolling. The 3D ground and arial views helps in planning the subsequent patrol routes.

vi. Limitations of Google earth:

The Google map does not have reference points and landmarks details of the forest area such as the boundaries, chowkis, bridle paths, etc. Thorough toposheet reading is must to ascertain the routes to be covered by the long distance and short distance patrolling parties. 3D GIS maps, compatible with GPS unit & software, will help this exercise further.

vii. Benefits of GPS:

Following are the benefits of using GPS in patrolling ó

- Authentic record/documentation of scanning exercise is available.
- Guidance to demarcate next petrol route, if main stations are pre-recorded.
- If 3-4 patrol tracks of a beat are merged, left over area can be easily be seen in combined map.
- It is a good monitoring tool. Distance-travelled, routes followed, area covered, speed, date & time etc .This Information gives wildlife managersø a good monitoring tool.

viii. Utility of GPS:

- a. Patrolling:** After each major patrolling exercise, processed maps of patrol tracks are shown to concerned staff. Scanned and un-scanned area of each beat is viewed and discussed with them. It helps in understanding the process. They are encouraged to create a new track log in scanned areas during next patrol. Process makes it

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interesting and is giving proper results. New track logs are being recorded with every patrolling exercise.

- b. Monitoring:** At managerial level, the officer can easily assess the level, frequency, intensity and seriousness of patrolling exercise. Further one can easily identify the un-scanned area with help of software. This helps in designing new patrol routes.
- c. Animal occupancy and movement pattern:** During each patrol, staff records animal sightings and their indirect signs of occupancy. Software provides categorization of waypoints recorded. With this feature we can easily track periodic movement, presence & absence of tigers/leopards/elephants/bears etc. in a particular area.
- d. Recoding fire lines & water bodies:** In nutshell, use of GPS technology have helped both field staff & managerial staff by providing major inputs in patrolling techniques.
- e. Strategy:** This practice needs to be continued further. The Deputy Director should have the responsibility to improve the ongoing practice by constantly updating with the latest technology and feedback from the SDOs, ROs and the members of the patrolling party. He should ensure regular training of the same and ensure applicability of this practice throughout the Corbett Tiger Reserve. A repository of records of the GPS track-log should be maintained by the concerned SDOs with a copy in the Director's office. The practice of utilizing GPS for patrolling is well developed in the Dhela, Klargarh and Jhirna Ranges which are on the most sensitive southern boundary of Corbett Tiger Reserve. Inadequacy of fund is the constraint to equip all the patrolling parties of remaining Ranges with GPS and this needs to be addressed. Advanced GPS with larger data capacity and workability in the dense forest should be procured for all Ranges to avoid inconvenience of frequent downloading of data to make space for fresh data. Priority should be given to those Ranges, which are highly sensitive, and the sensitivity should be regularly monitored to avoid stereotyped approach.

3. E-eye surveillance:

The E-eye electronic surveillance system was installed in Corbett Tiger Reserve under a MoU between NTCA and the Binomial Solution Private Limited in 2011. This was the first of its kind anywhere in the world.

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This is an integration of electronic devices and computer software. e-Eye is a high end 24x7 anti-poaching and surveillance system. It will assist the management in the live monitoring of the activities of various out stationed locations from desired headquarters. The tool is effective and useful for the live surveillance of sensitive locations also. However this system can only augment the human effort of field patrolling and by no way a replacement of foot patrolling.

i. Working: Remotely operated high-end long range thermal sensors are placed on top of towers, these sensors collect information and transfer it to a central control room, where all the processing and filtering of data takes place. These sensors are also accompanied with a long range visible camera which is useful in the day time .Data is further transferred securely to the headquarters after processing, thus live feed is available at headquarters. All the sensors and cameras can be controlled from a Web Application at the headquarters and central control room.

ii. Features: The e-Eye system has the following capabilities

- 24X7 Live Surveillance with recording.
- Detection and alert about forest fire.
- Human Interference detection and alerting.
- Habitat destruction i.e. cutting of trees, grazing can be tracked and appropriate alarms are raised.
- Animal movement alerting includes tiger, elephant, deer, blue bull groups etc.
- Helps in planning and decision making as all the activities are summarised in the form of reports.
- Trespass of Cattle and human beings.
- Detection of vehicles and tracking within the restricted areas.
- Accidents and other such activities can be tracked and detected.
- Trends showing areas sensitive to poaching.
- Alerts related to diseases, abnormalities and mortality.
- Tracking activities around the waterholes and potholes on 24X7 basis.
- Changes in the poaching trends can be easily integrated and traced.
- Self-secure and automatic monitoring system.

The e-eye surveillance system has been installed at the southern boundary of Corbett Tiger Reserve with nine strategically placed towers having long range thermal

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sensors cameras. The southern boundary of Corbett Tiger Reserve is very critical given the vulnerability of intrusion by prospective trouble makers and movement of wildlife for crop raiding and occasional cattle lifting by tigers. These nine towers are streaming information to the control room which has been setup at Kalagarh. The SDO, kalagarh subdivision is the overall in-charge of the control room. Experts of the Binomial Solution are handling the equipments for now and they need to impart training to willing forest staff to manage the system when the system is finally handed over to the Forest Department. Since the control room runs from a make shift arrangement, an exclusive infrastructure should be setup keeping an eye about the future expansion of the system.

Following is the list of towers along with the location of the control room:

SI No.	Locations
1.	Laldhang
2.	Kothorao sot
3.	Kothirao peak
4.	Jhirna peak
5.	Kusumsot peak
6.	Dhara sot
7.	Dhara peak
8.	Khatpani
9.	Kalagarh Control Room
10.	Sukha Sot

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Surveillance Dashboard indicating the location of the towers-



iii. Scope for future expansion: Corbett Management is planning to extend the e-Eye cover to more areas, 1 more step on their way to dedicated wildlife conservation efforts. The e-Eye system is also to be put up in Kalagarh Tiger Reserve Division covering all the gates as well as the southern boundary. The following areas have been chosen for the same:

Sl. No.	Place	Latitude	Longitude	Elevation
1.	Pheeka Sot Tower	29°24'47.21"N	78°55'26.62"E	314 meters
2.	Dhela Barrage Tower	29°20'43.68"N	79° 0'26.93"E	272 meters
3.	Gujjar Camp Tower	29°22'46.99"N	79° 1'12.88"E	301 meters
4.	Hathidangar Chauki Tower	29°21'51.08"N	79° 2'55.85"E	293 meters
5.	Sot Location Last Tower	29°24'34.62"N	79° 3'54.53"E	402 meter
6.	Repeater Tower	To be decided after actual alignment of towers.		

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Below image shows the details of each points.



D. Strengthening the chowkis:

- i. The area above Sal Khetu (Dewal Bari Danda, Chokham Donn etc.) are good elephant habitats and fall within the Corbett Tiger Reserve. Since, the area has been most vulnerable to elephant poaching in the past, the Chowki at Sal Khetu requires to be fortified with some additional staff, who would constantly patrol the area.
- ii. After Sal Khetu, while proceeding up the ridge to Basai Khan Dhar (end of the Corbett Tiger Reserve boundary) and down to the totally isolated/deserted Basai Khan Chowki of the Lansdowne Division, which now lies abandoned, till Nauri and Dhimki, there is no presence of any watch and ward/forest staff. This area is most vulnerable to poaching and needs protection. The Basai Khan Chowki needs to be manned which will be possible only if water is made available. This can easily be done by pumping up water from a km. or so below, in the valley, or finding a source above.
- iii. For better control, a Chowki needs to be established in the Mandalti Sot at Semal (Sain) Parao, which is about 8 km from Chaubeli, en-route to Haldu Parao.

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- iv. A new Chowki at Chokham has been constructed.. The Chowki needs to be equipped with all modern protection facilities, such as, powerful Wireless Set, Night Vision Device, Binoculars, Cell Phone, Jeep and Motorcycles.
- v. A Chowki at Lal Darwaza would have been desirable, but since, there is no water availability here, the temporary anti poaching/patrolling hut (situated further down), in Lal Darwaza Compartment No: 4 needs to be repaired and made permanent. A gate/barrier needs to be set up at the entrance of the Corbett Tiger Reserve at Lal Darwaza Compartment No: 3. This will have to be unmanned and will act only as a psychological deterrent, as it is not possible to make a Chowki here because of the paucity of water. The area can be well controlled form the adjoining Chowki.
- vi. The patrolling hut in Lal Darwaza Compartment No: 4, is in shambles and a "pucca" Chowki needs to be established here, which will control this vulnerable, Western Area, of the Corbett Tiger Reserve.
- vii. A Chowki needs to be built on the ridge behind Hathikund, at Kandi Khal (water is available), to intercept poachers from entering the Haldu Parao area, which is very porous.
- viii. A proper pucca chowki needs to be made at Kamla Ban.
- ix. Nagina Tiraha in Sonanadi Range is one of the most vulnerable area of the Corbett Tiger Reserve, and hence a chowki water bore/well, and electric fence are being constructed there.

E. Revival of abandoned forest roads:

- i. From the Khansur Sot, to the east, a road exists till about 6 km. and was being used for timber extraction by the corporation. This road needs to be pushed through for another 1 km. till "Danda Pani" on the ridge (50 foot fire line) (All Area in Corbett Tiger Reserve) and then to continue down 7 km to "Chaubeli" and on to "Chokhamb" of the Lansdown Division. This alignment, in the past, was very successfully used by Jeeps. This area would be important and is essential, for vehicle/foot patrols etc.
- ii. Old existing road/access path and batia network may be maintained for forest protection. Some of the important ones are Magnukhal-Gaujera, Bhitiri Adnala-

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Jabalpurbazpur Ghatti-Gaujera, Chaukham-Mandalti Sot-Halduparao and Hathikund-Halduparao.

- iii. From Chaubeli a tract exists to Haldu Parao along the Mandalti Sot. This tract of 18 km approximately, must be maintained as a Jeepable road to link Haldu Parao with Chaubeli, for better protection through patrols.
- iv. New patrolling roads need to be developed to approach Tumeria, Shishamkhatta and Motasal block. The old patrolling route from Dhikala to Kanda has been destroyed by large landslips and an alternate route should be developed quickly as it is vital for patrolling and strengthening protection.

F. Strengthening Hatikund part of KTR:

- i. The Hathikund area has a large number of Gujjar camps along with their cattle. The Gujjars have requested for resettlement, which needs to be expedited. The Hathikund camp requires strengthening.
- ii. The presence of staff needs to be increased at Hathikund, with the addition of more personnel of 'Operation Lord'.
- iii. The electric fence needs to be remain operational throughout the year.
- iv. A length of a low wall (i.e. 75 cm high and about 200 m long) is required to be built at the rear, to protect the Chowki Complex from being washed away.
- v. The water handpump is non functional at the high water level, which needs to be setup near the chowki.
- vi. A tin shed needs to be erected to shelter staff, over night patrolling parties, etc.
- vii. A boat with an engine needs to be stationed during the monsoon.
- viii. Two Doongas need to be provided till such a Boat is obtained as vital areas such as the "Garappu Sot", "Andheri" etc. are not accessible in the monsoon.
- ix. 2 Motorcycles need to be stationed to patrol the area up to the Lal Darwaza, Kamala Ban etc.
- x. Additional Wireless handsets, Solar Lights, Spotlights, Torches, Binoculars, Sleeping Bags, Patrolling Gear are required.

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10.1.1.3. Constitution of 'Tiger Cell' & the Strike Force:

i. Tiger Cell:

Two tiger cells will be constituted, one at Kalagarh Sub-division and another at Sonanadi Sub-division. Following will be structure of the Cell.

- | | |
|---|----------|
| 1. Assistant Conservator of Forests (in-charge of Sub-division) | - Head |
| 2. Two Range Officers | - Member |
| 3. Two Deputy Range Officers | - Member |
| 4. One Forester | - Member |

The tiger cell will be equipped with vehicle, motor cycle, wireless handsets, arms/ammunition, survival kit, GPS, binoculars, torch, mobile phone, digital camera, etc. Services of support persons such as Computer Operators etc. may be provided as per requirement on contractual basis.

ii. Duties and responsibilities:

The tiger cell will be entrusted with the responsibility of gathering information relating to offenders, and to establish an intelligence network and monitor the progress of pending court cases related to wildlife offences. The Cell will also collaborate with the Wildlife Crime Control Bureau, local NGOs, the Police department and informers for achieving the above objectives under guidance and direction of senior officers.

The respective Assistant Conservator of Forests should submit their report to the DFO/DD and the Field Director.

iii. The Strike Force:

The protection of the core area is the responsibility of the regular field staff of Corbett Tiger Reserve. Although Corbett Tiger Reserve is struggling with inadequacy of regular staff, it is not safe to deploy Operation Lord daily wagers who has been given patrolling responsibility at the periphery of the core area as well as in the Buffer. Same is the case with the retired army Jawans (Tiger Protection Force) who are engaged for the same purpose. As the core area is vulnerable for poaching by audacious poachers, a strike force should be constituted under the leadership of the Deputy Director and the DFO Kalagarh.

Following is the prescription regarding the constitution, training and duty of the strike force.

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1. Two strike forces will be created of 10 well trained personnel in the field of jungle craft, wildlife crime investigation, GPS, arms and ammunition, etc. Only willing personnel will be selected across the Tiger Reserve and they will be trained at Corbett Wildlife Training Centre by expert resource persons on the field of Jungle Craft, GPS, and Wildlife Crime Investigation. Regular mock exercise will be carried out and they will be exposed to wildlife Crime investigation in adjoining Forest Divisions.
2. They will remain under the command of the Deputy Director and DFO Kalagarh.
3. To tackle the wildlife Crime and intelligence gathering one SOG was constituted in the Corbett Tiger Reserve. The SOG has been successful for breaking through complicated wildlife crime and as a result some dreaded criminals were put in the jails. The SOG also providing support to neighbouring villages. It will be strengthened further and more facilities will be given to the personnel. The SOG will work directly under the Field Director and will coordinate with other elements of protection such as Strike Force and Tiger Cell.

10.1.1.4. Developing indicators for monitoring of plan effectiveness:

Regular monitoring of the status of tigers, co-predators and their prey is the most important task of the management to ascertain the overall performance of the Tiger Reserve. The entire protection plan revolves around the safety and security of the tiger and its habitat. A plan can not complete its objectives without the development of suitable indicators and their monitoring mechanism. The present plan lays down the following indicators ó

1. Data generated from the indicator register (which should be regularly maintained by the field staff). Monthly 'occupancy maps' should be prepared.
2. Sighting records by tourists which indicate the place of sighting should be maintained by the staff.
3. The data of last All India Tiger Census which has been provided by WII.
4. Details of human-wildlife conflict cases, showing loss of human and cattle as well as injured human beings. Data of crop damage should also be maintained. Funds disbursed for ex-gratia for all of the above cases should also be mentioned in the

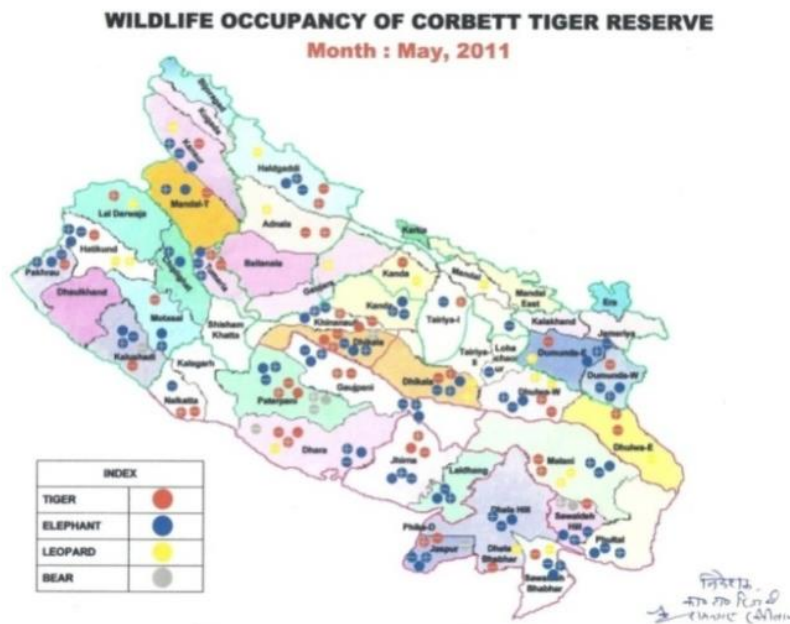
Tiger Conservation Plan, Core Zone

record. Yearly comparison of the incidents will indicate valuable information about the trend of human-wildlife conflict.

5. Number of cases relating to poaching, illicit felling and encroachments.
6. A wildlife crime database is a very effective tool for wildlife crime control and enforcement. It is envisaged that a database of wildlife crime and criminals will be established at Ramnagar.
7. Data generated from annual Phase-IV (estimation of the status of tigers, co-predators and prey) should be critically analysed to ascertain the direction on which the management is heading and strategy should be planned accordingly.

a. Occupancy map of wildlife:

Occupancy map is an important tool to monitor the movement and status of Tiger, Elephant and Bear. It also gives us an idea of the relative presence of some species in an area and any abrupt change in the status due to many reasons and one of them is poaching too. Thus a careful and systematic study of occupancy map can help in the detection of wildlife crime.



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Occupancy maps should be prepared every month, based upon the daily occupancy reports coming from Ranges. Protection strategy should be mentioned every month and any drastic change in the map should be dealt with utmost urgency and care. The Deputy Director and DFO should be in-charge of such operations for their respective areas.

Effort will be made to prepare occupancy map of the prey. This will be possible from the Phase-IV exercise which will gather data of Tigers along with its prey population.

10.1.2. Strategy for Communication:

The effective protection of the tiger reserve largely depends upon well structured and meticulously maintained communication facilities. These facilities comprised of network of motorable roads, foot paths/bridle paths, departmental vehicles, manual and motorised boats, wireless and telephone network and elephants. These integral necessities are used for physical patrolling of the sensitive forest areas as well as the vastly spread out water courses. Some stretches of roads are also used for movement of tourists.

Objectives:

1. To keep the network of roads operational.
2. To maintain the wireless and telephone networks.
3. To maintain and upgrade vehicular transport facility along with boats.
4. To keep the elephants fit for patrolling.

Problems:

Following are the problems which needs attention so that future strategy can be planned to strengthen the protection measures of the tiger reserve.

1. All most all roads are vulnerable to monsoon rains. The stretches of roads where natural streams used to cross are swept away leaving deep gorges. The culverts and cause ways are also damaged during heavy rains.
2. Inadequate financial resource causes difficulties in the procurement of batteries for hand-held wireless sets and for fixed stations. Arduous field work sometimes

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- reduces the expected life span of wireless sets (hand-held sets as well as the mobile sets fixed on the patrolling vehicles).
3. All most all fixed-wireless stations which are situated in the core-critical areas are depending upon solar energy which needs up gradation to deliver power for longer duration than what is available today.
 4. The critical terrain of Corbett Tiger Reserve is un-forgiving on the life of vehicles. The Jeeps allotted used to Range Officers are very old and undependable. The state of the vehicles using by SDOs are also in very bad conditions.
 5. There is no provision of two-wheelers for all Foresters.
 6. Corbett Tiger Reserve does not have dependable motor boats. The three available boats have crossed their serviceable age and need immediate replacement. One boat has been received recently as a gift while orders for the procurement of two new boats has already been placed.
 7. Though five departmental elephants are available for monsoon patrolling, their utility remains confined to tourism during the tourist season which at times causes problem to take the service of the elephants for special patrolling in a short notice.

Strategy:

In order to keep the network of roads operational, following operations has to be carried out:

- All roads should be opened by 1st week of November. The road along the southern boundary should be open throughout the year. Minor repair should be carried out throughout the monsoon so that vehicular patrolling can be continued. The detail of forest roads has been given in the **Annexure- 10/1**.
- To maintain the wireless and telephone networks.
- To maintain and upgrade vehicular transport facility along with boats.
- To keep the elephants fit for patrolling. New camp elephants need to be procured to augment protection and ecotourism activities.

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10.2. Fire protection:

Corbett Tiger Reserve is highly vulnerable to forest fire. The fire season starts with 15th February and ends with advent of monsoon. Forest fire management works starts from November/December to prevent occurrence of fire in the summer season. It is a common knowledge that forest fire is induced by anthropogenic interferences. Sometimes it is intentional and at times accidental. The best practice to save forest from fire is the identification of causes followed by meticulous planning of prevention and remedial measures to be taken in case of forest fire breaks out. It is no denying the fact that the thorough knowledge of the field staff about the terrain is the deciding factor to contain fire.

Protection of forest from forest fire remains to be a great challenge before the tiger reserve management. It is a sacred duty and responsibility for the forest officer to prepare an annual 'comprehensive fire plan'. While the detail about the management of forest fire has been given in the annual 'comprehensive fire plan', following is given is the broad prospective which should be referred while preparing the annual fire plan.

Objectives:

1. To reduce occurrence of forest fire to minimum.
2. To study the effect of intensive forest management on biodiversity.

Problems:

1. The difficult terrain formed of highly undulating hills and deep valleys. It remains a great challenge to control fire in such areas.
2. Grasslands remains highly vulnerable for forest fire along with sal forest (fire season coincides with leaf fall of sal).
3. Exposed core area along the southern, western and eastern boundary remain vulnerable from intentional fire caused by villagers.
4. Scanty to no rain fall during the long dry spell in the summer season.
5. Cooperation from the locals is not adequate.
6. Budget constraint.

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Strategy for fire protection:

Summer fire in the Tiger Reserve is of common occurrence which restricts in the boundary of the core areas. Due to extreme hilly terrain, the forest fire, aided by high winds during summer, spreads very swiftly sweeping large areas in very short time.

For mitigation of adverse impact of un-controlled forest fire, numbers of precautionary measures were taken successfully. Based on the past management practices the following line of action with an objective of reducing the probability and impact of such forest fires inside the Tiger Reserve area is recommended:

1. **Forest Fire Protection sensitivity study:** Identification and categorization of fire prone area like Ultra sensitive, Very sensitive and Sensitive has to be carried out annually. This parameter of sensitiveness has a tendency to change from time to time. Proper ground-truthing has to be carried out annually which has to be incorporated in the fire protection plan.
2. A detail 'Fire Protection Plan' should be prepared annually taking into the account of the previous year's short comings and should be approved by the Chief Wildlife Warden.
3. Timely detection of forest fire should be ensured by using fire watch towers, e-eye surveillance system, and sourcing from villagers. A fire reporting telephone number should be arranged and the number should be made public so that people can inform about fire incidents.
4. A centralized fire control room should be set up at Corbett Tiger Reserve headquarters (Ramnagar) followed by one each at Kotdwar (O/O SDO Sonanadi) and Kalagarh range headquarters. These two control rooms should be under the direct supervision of the respective SDOs.
5. All existing fire lines shall be cleared off inflammable material along with grass as well as any herbaceous growth. Burning of these fire lines has to be done once during the winter and again after the leaf fall (about the end of March) under very controlled conditions.
6. Adequate number of fire watchers (two watchers per Forest Guard) will be maintained during the fire season from the 15th of February till the break of

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monsoon. There should be additional provision of extra fire watches only in the event of serious dry spell.

7. Roads used by public as well as tourists will be regularly cleaned to remove inflammable material such as leaf litter.
8. Floating crew centres should be established according to the prescription of the forest fire sensitivity study. A crew centre should be manned by a Forester & 5 to 6 other members equipped with fire fighting equipments. The number of crew stations should remain flexible to facilitate maximum utilization during the fire season. These crew stations should be under direct supervision of the respective Range Officers.
9. Wireless net work should remain operational round the clock to facilitate exchange of information from field to headquarters & vice-versa. Fire watch towers should be regularly maintained.
10. At least 3 **flying squads** have to be maintained, each at Sarpduli/ Dhikala, Kalagarh and Sonanadi Range for any emergency arising during fire season. The constitution of the flying squad will be as follows.

Forester	:	In-charge
Two Forest guards	:	Member
Four/ Fire watchers	:	Member

The main responsibility of such squad will be to mobilise the resources for immediate control of forest fire. They patrol the designated 'most vulnerable areas' and keep an eye on the preparedness of the staff and casual labourers at Crew Stations and watch towers. The annual duration of the squad would be from 1st April to 15th June. The squad will remain under the command of Assistant Conservator of Forests.

11. The power line running through the core area should be maintained keeping in view of snapping of the power line, which may result in forest fires. Periodic clearance operation, like lopping and clearing of inflammable material below the power line should be carried out.
12. Corbett Tiger Reserve will try and enter into an agreement with institutions like the NRSA for satellite based monitoring of fire. This system is also capable of generating real time alerts which can be most helpful in quick response.

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Note: Detail of the forest fire management operation can be referred from the 'Annual Forest Fire Plan'.

10.3. Intelligence gathering & coordination:

Intelligence gathering is most important step in prevention of crime. There should be a proper network of informers. Informers should be cultivated personally. The name of informer should not be disclosed. There should be proper system of payment to informers. Identify local person and imparting then the basics of wildlife crime detection so as to avail their services as and when required as informers. A local staff and watchers can provide valuable information, which should be systematically recorded and further investigation may be taken. Some key persons like shopkeepers, taxi drivers, hoteliers and some wildlife-oriented persons may also provide valuable information.

Collating of intelligence information needs specializing training which is lacking in the part of the Corbett Tiger Reserve. However the network of NGOs, the Central Crime Control Bureau and concerned public share the movement of the professional poachers which found to be beneficial of keeping the flagship animals safe from poaching. The Corbett Tiger Reserve administration should strengthen the system of Eco-Development Committees to gather local intelligence about any movement of offenders and prospective poachers.

A confidential security plan should be prepared which will have detail of the intelligence operations. This plan should remain in the personal custody of the Director.

Coordination:

Proper coordination between Forest Divisions, Anti Poaching Cell, the WCCB, NGOs, EDCs, local Police and District Administration can curtail wildlife crime not only in Corbett Tiger Reserve but also the Corbett Landscape. For proper coordination following measures may be taken ó

1. **Regular Crime Meeting** – There should be a regular meeting with senior police and revenue officials of concerning district. The exchange of crime dossiers must be carried out at range and police station level by concerning range officer and police station in-charge.

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2. **Meetings with district judge** – A periodical meeting with district judge to expedite to disposal of pending cases relating to wildlife cases must be carried out.
3. There should be a regular meeting with neighbouring district officials like Collector, DFO etc. for exchange of information on wildlife crime to facilitate joint action.
4. There should be surprise raids jointly with the local police in railway stations, local trains, bus stands, buses and cafeteria may be organized.
5. A regular tri monthly interstate meeting with officer of the adjoining state must be organized. The interstate crime control coordination strategy may be developed.
6. Regular periodical meeting with other law enforcing agencies like narcotics, revenue & others through tiger cell and other bodies.

Security Audit: Protection strategies need to be innovative and constantly evolving keeping in view emerging threat perceptions. Towards this, there is need to conduct periodic security audits, preferably involving external experts to review and refine security and protection aspects in Corbett Tiger Reserve. Any lacuna brought out in such audits should not be seen in a negative light but as an opportunity to take corrective action before any damage is done.

Chapter-11

TOURISM PLAN FOR CORBETT TIGER RESERVE

Introduction:

Corbett Tiger Reserve is one of the most famous destinations for nature lovers. This tiger reserve is well known for its breath taking landscape with the imposing background of Himalayas, tigers, elephants, birds, crocodiles, etc. The tiger reserve is visited by lakhs of tourists and has its positive and negative impacts. On one side the tourism activity attracts huge investment on tourism related infrastructure and created substantial employment opportunity for the local people as well as the investors. On the other side, it has created lots of resorts, hotels and restaurants on the adjoining revenue land which was used by tigers, elephants and ungulates to cross over to river koshi and the forests of Ramnagar Forest Division. It has been a great challenge to balance the pressure of tourism vis-à-vis conservation of tiger and its habitat.

Conservation of the tiger, our National Animal, is the paramount objective of tiger reserves and generating public support through regulated tourism is an invaluable tool for harnessing public and community support for tiger conservation. Regulated tourism results in enhanced awareness and is of educational value especially for the younger generation. Non-consumptive, regulated, low-impact tourism is the norm within core or critical tiger habitat. With this importance of tourism in tiger conservation in mind, approx 20% area of the core zone is used for regulated, low-impact tourism.

The present practice of strict adherence to rules and regulations and site specific carrying capacity pertaining to tourism will be continued.

11.1. Organization Setup:

Objective:

The primary objective of tiger reserves is to conserve tiger and its source populations that also act as an umbrella for biodiversity conservation. These areas provide a whole host of ecosystem services and opportunities for tourism.

The other objective of tourism plan is to move from wildlife tourism to ecotourism which is defined as -responsible travel to natural areas that conserves the

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environment and improves the well-being of local people'. Ecotourism includes tourism that is community based and community driven. The aim will be to move towards a system of tourism around Corbett Tiger Reserve which is primarily community based tourism. Such tourism will be low-impact, educational and conserve the ecology and environment, while directly benefiting the economic wellbeing of local communities.

It has to be ensured that ecotourism does not get relegated to purely high-end, exclusive tourism, leaving out local communities. Relevant modifications in State rules and regulations should be carried out to make sure adherence to these standards by tourism developers and operators. The NTCA guideline mandates that the State Government shall notify the State level Tourism and Ecotourism Strategy within one year from the date of notification of these Guidelines i.e. by 15-10-2013.

Need of the hour:

Unplanned and unregulated growth of tourism infrastructure (particularly in the adjoining areas) in such landscapes can destroy the very environment that attracts such tourism in the first place. Hence, there is a need to move towards a model of tourism that is responsible and compatible with these fragile landscapes.

Tourism, when practiced appropriately, is an important economic and educational activity. It has the scope to link to a wider constituency and build conservation support while raising awareness about the worth and fragility of such ecosystems in the public at large. It also promotes the non-consumptive use of wilderness areas, for the benefit of local communities living around and dependent on these fragile landscapes.

In the absence of proper planning and regulation, there has been a mushrooming of tourist facilities along the boundary of tiger reserve as well as in the tiger rich forest divisions of the Corbett Landscape. These facilities have the adverse potentiality to exploit, degrade, disturb and misuse the fragile ecosystems. It has also led to misuse of the term 'ecotourism' often to the detriment of the ecosystems and towards further alienation of local people and communities.

Synergy and collaboration amongst the Central Government (NTCA, Ministry of Environment and Forests, Government of India), and State Government Departments like Forests and Environment, Tourism, Revenue, PWD, Police and the forest dwellers, local communities (Gujjars and fringe villager population) and civil society institutions

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(Eco-development Committees and Van Panchayats) are vital for ensuring successful implementation of the 'Tourism Plan for Corbett Tiger Reserve'.

The State Government of Uttarakhand has taken a significant step towards land use policies related to tourism in the ecologically sensitive landscape surrounding tiger reserves. In this endeavor, the Government had issued letters to District Magistrates to stop buying and selling of revenue lands in the abandoned villages as well in the adjoining villages falls within two kilometers from the boundary of the tiger reserve. This will discourage of further mushrooming of commercial tourism facilities along the boundary of the Tiger Reserve.

The State Government has declared 'Silence Zone' in the width of 500 mtrs. adjoining the boundary of Corbett Tiger Reserve. The notification vide G.O. letter No. 301/x-3-2012-08(23)/2010 dated 20th April 2012 is appended as **Annexure-11/1**.

Principles:

The 'Tourism Plan' is based on following principles.

- To strengthen and enrich visitor experience in Corbett Tiger Reserve without compromising on objectives of tiger conservation. Emphasizing local community rights, participation and benefit-sharing;
- To promote conservation education and training;
- Adequate machinery for monitoring and evaluation of the impact of ecotourism activities on wildlife conservation and local communities;
- Low-impact wildlife tourism which protects ecological integrity of forest and wildlife areas, secure wildlife values of the destination and its surrounding areas;
- Participation of the EDCs and other local dwellers in the process of decision making;
- Developing mechanisms to generate revenues from wildlife tourism for the welfare and economic upliftment of local communities;
- Highlighting the biodiversity richness, their values and their ecological services to people; as well as the heritage value of India's wilderness and tiger reserve;
- Building environmental, cultural awareness and respect among tourists and all stakeholders;
- Facilitating the sustainability of tourism enterprises and activities;
- Promoting sustainable use of indigenous materials for tourism activities;

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- Reduction of tourism in core area in a phased manner and strengthening tourism initiatives in the buffer and surrounding landscape in a planned and regulated manner as per the NTCA guidelines

A. Tourist zones in Core area:

. There are five tourist zones available for tourists, of which four zones have certain areas which fall in the core area of Corbett Tiger Reserve. Dhikala being the most famous among them is followed by Bijrani and Jhirna. The others two zones are Sonanadi and Durgadevi. The Durgadevi tourist zone lies in the buffer area. A new Zone to be called as Dhela Ecotourism Zone has been opened on 1st December 2014 and lies completely in the buffer area. The famous Haldupadav FRH lies in the Sonanadi tourist zone. The Dhikala, Bijrani and Jhirna are part of the Corbett National Park and accessible for tourists. The area statement of the zones is as follows:

Status of Tourist Zones in Core area of Tiger Reserve:

Sl No.	Name of the Tourist Zones	Area in the Core Zone	Remark
1.	RTRD	155.43 Sq.km	Approx 20% of 822 Sq.km of Core area is used for tourism as per the guidelines on Ecotourism by NTCA
2.	KTRD	7.78 Sq.km	
	Total	163.21 Sq. Kms	

The Tiger Reserve is visited by lakhs of tourists every year. Apart from getting pleasure by experiencing breathtaking natural beauty, these tourists get chance to aware themselves about the importance of nature, biodiversity and of course tiger. Corbett is offering diverse habitats like grassland, pure sal forest, rich miscellaneous forests, a large water body (the back water of Kalagarh Dam), the Ramganga riverian ecosystem, vast stretches dry and rocky beds of numerous sots (rivulets), etc. All these natural endowments offer a vast expanse of knowledge for visiting tourists about wildlife as well, herbs, shrubs and trees. It has great potentiality to educate our future generation about the importance of healthy and self-sustaining ecosystem, and about the tiger which is the apex animal in the ecological pyramid.

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The other significant fact associated with this tiger reserve is that the tourism activity is generating livelihood opportunity for considerable number of local population through various employment options having forward and backward linkages. The people of the area have, by and large, helped in the protection and conservation of tiger in particular and wild life in general. As per point 2.2.12 of NTCA guidelines regarding ecotourism, which have been vetted by the Supreme Court also, the permanent tourist facilities located inside core or critical tiger habitat which are being used for wildlife tourism shall be phased out. The guidelines issued by the Chief Wildlife Warden regarding ecotourism activities and the orders issued by Director Corbett Tiger Reserve, regarding managing the ecotourism activities in the Corbett Tiger Reserve shall be strictly adhered to.

Tourism Zones Map Attached

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1. Dhikala Ecotourism Zone:

Dhikala Tourist zone is the most famous zone of Corbett Tiger Reserve. It is situated in the Core Critical Zone of Corbett Tiger Reserve, spreading through Sarpduli and Dhikala Ranges. The tourist zone is a part of Dhikala and Sarpduli Range. Dhangarhi is the entry gate to this zone, where a new gate has been constructed in 2011 to mark the Platinum Jubilee of Corbett National Park.

Limited opportunities for day excursion to Dhikala are available through Canter rides. The number of rooms available for night halt at Dhikala are limited and are being regulated as per NTCA guidelines. The other famous forest rest houses are Khinanauli, Sarpduli, Sultan and Gairal (It is a mini complex having old FRH, new FRH and dormitories. This complex is situated in the buffer of Corbett.)

Development of Gairal:

Gairal, on the banks of the Ramganga is a much preferred tourism complex in Corbett Tiger Reserve. It is situated just outside the National Park in the Buffer Area. As the facilities are gradually phased out in the Dhikala zone, it is envisaged to develop Gairal as a hub for planned ecotourism activities including day visits from Dhangari gate.

Following are the facilities available in the Dhikala Zone:

- **Elephant ride:** Five elephants are available for ride by the tourists.
- **Canteens:** There are three canteens operating in the zone. One at the Gairal Complex and two at Dhikala proper. Out of the two canteens the larger one is run by KMVN (Kumaon Mandal Vikash Nigam) and the smaller one which was used to run through tender, will be run by Tiger Conservation Foundation for or any Govt. owned/run entity as envisaged in the guideline.
- **Library:** Dhikala tourism complex has a small visitor library with excellent collection of old books on different subjects on wildlife. It is a favorite for wildlife enthusiast. Off late some books have been added and it needs continuation up gradation. The old books need special care as many are out of print. On the occasion of the Platinum Jubilee of Corbett National Park, a small but highly informative interpretation facility has been added to the existing

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library where the life of Jim Corbett as well as the history of the National Park was depicted through excellent pictorial exhibits.

- **Amphitheatre:** It is used for showing wildlife related films to tourists and to conduct small workshop for visiting IFS and PFS probationers and officers.
- **Dhangarhi Visitor Centre-** The entrance gate to the Dhikala tourism zone is located at Dhangarhi at a distance of 18 km from Ramnagar. The Dhangarhi Visitor Centre has displays of trophies of tiger, elephant and other animals. The centre remains open throughout the year for tourists. This museum needs regular maintenance and the up gradation should be done with the help of professionals. Paucity of fund is the reason for its poor maintenance. Funding from newly constituted Tiger Conservation Foundation for CTR can be of great help to upgrade the museum into a proper wildlife interpretation centre. Similarly entry tickets should be printed in color & professionals should be hired to do the jobs. A new entrance gate has been constructed to mark the Platinum Jubilee year (2011) of Corbett National Park.
- **Conducted Day Visits:** Govt. of UP permitted conducted day visit by a open mini bus of maximum capacity of 20 people in place of light vehicles from 15th November 1996 vide G.O. no. 3133/14-4-96-860/96, dated 28.10.1996. The conducted tour is managed by following procedures-
 1. Permits should be issued based on the online booking for day visit by Canters.
 2. Tenders should be invited for the registration of mini buses as per the conditions laid down by Field Director, Corbett National Tiger Reserve.
 3. The general prohibition on day visit by tourists in their own vehicle will continue in Dhikala zone as before, subject to special relaxations by the Field Director.
 4. Number of visits should be regulated as per directions of the CWLW keeping in view NTCA norms on ecotourism.
- **House Keeping and Room attendents:** The prevailing system of charging housekeeping fee for facilitating better lodging facility to tourists which otherwise not possible to manage out of government fund should be continued

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with periodical revising the rate based upon the market trend. About 25 room attendants are employed out of this fund. The major expenditure incurred are on diesel for generators, clean linen, general hygiene, toiletries, wage for the room attendants, etc.

- **Post office and dispensary:** These facilities are for the benefit of the field staff.
- **Nature shop:** The nature shop at Dhangarhi was run through process of annual tender will be managed by 'Tiger Conservation Foundation for CTR' as envisaged in the guidelines. This shop deals with apparels, caps which bear the logo of Corbett Tiger Reserve along with books written by Jim Corbett and other naturalists. The visitors also can purchase some artifacts of Uttarakhand.
- **Watch Towers:** Visitors can use watch towers to enjoy the panoramic view of the andscape and for wildlife spotting.

Occupancy Trend in Dhikala Complex:

Sl. No.	Tourist season (15 th November to 15 TH June)	Total No. of rooms available	Total No. of rooms (No. of Rooms X No. of Days)	Total No. of rooms occupied	Percentage of Occupancy
1.	2005-2006	31	6603	5357	81.13 %
2.	2006-2007	31	6603	5480	82.99 %
3.	2007-2008	31	6603	5973	90.46 %
4.	2008-2009	31	6603	5798	87.81 %
5.	2009-2010	31	6603	5450	82.54 %
6.	2010-2011	31	6603	5801	87.85 %
7.	<i>The average occupancy in the last four years is 85.46 % .</i>				

2. Bijrani Ecotourism Zone:

This is one of the most beautiful zones of Corbett. Though it is small in area in comparison to Dhikala, it offers good sighting of tigers, elephants and birds apart from other prey animals. This zone has two elephants which are available for ride by the

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tourists. This zone also has a nice canteen as well as a nature shop which caters to the day visitors as well as the tourists residing in the forest rest house. The canteen and nature shop was renovated in 2011. The dilapidated Interpretation Centre building was also renovated which needs various exhibits to be setup. The Centre will also be used as a place for conducting workshops for EDCs and visiting forest officers.

3. Jhirna Zone:

The Jhirna Zone is situated in the highly sensitive southern part of the tiger reserve. It is usually kept open around the year, subject to suitable weather conditions. This is the only zone that offers serious bird watching by experts and enthusiasts round the year. Besides giving opportunity for field visit by officers and trainees of various institutions, it also provides employment to tourist guides and tour operators.

This zone has a two room forest rest house along with an annexe having additional two rooms.

4. Sonanadi Ecotourism Zone:

The Sonanadi zone has its maximum area in the buffer of the tiger reserve. The famous Haldupadav Forest Rest House of this zone is situated in the core zone of CTR. This zone remains favourite for hardcore wildlife enthusiasts and researchers. It is famous for birds, elephants, otters, crocodile and tigers.

5. New Ecotourism Zones:

No new ecotourism zones are planned for the Core Area but the option could be explored in the periphery in the Buffer Zone, keeping in view the NTCA guidelines. A new tourism zone known as Dhela Ecotourism zone in the buffer area has been done on 1st December 2014.

5. Further details about the zone wise facilities:

Following are the ecotourism zones operating in the Core Zone of Corbett Tiger Reserve. The following table shows the detail about the zones.

Sl. No.	Tourism Zone	No. of vehicles permitted	Forest Rest Houses	Operating Period
1.	Jhirna. The entry gate is at Dhela, and Kalagarh	Morning & Afternoon 6 upto 32 vehicles each.	3 FRHs having 6 rooms. One each at Jhirna, Dhela and - Kalagarh. 2 rooms	Opens throughout the year.

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	colony gate.		are also available in the annex of Jhirna FRH.	
2.	Bijrani. The entry gate is at Amdanda.	Morning & Afternoon upto 32 vehicles each.	7 rooms at Bijrani FRH and 2 suits at Malani FRH.	Remain open from 15 th Oct to 30 th June.
3.	Dhikala (Only Gairal tourist hub is situated in the buffer area). The entry gate is at Dhangarhi.	Conducted tour by Buses.	Rest houses of Dhikala proper, Khinanauli, Gairal, Sarpduli and Sultan has 46 rooms and 35 bed in dormitories	15 th June to 15 th November.
4.	Sonanadi Zone The entry gate is at Vatanvasa.	FRHs like Haldupadav, Morghati	18 rooms are available at Morghatti, Pakhrau, Haldupadav (core zone), Rathuadhav, Mudiapani and Sindhikhal.	15 th June to 15 th November.

Forest Rest Houses in core area:

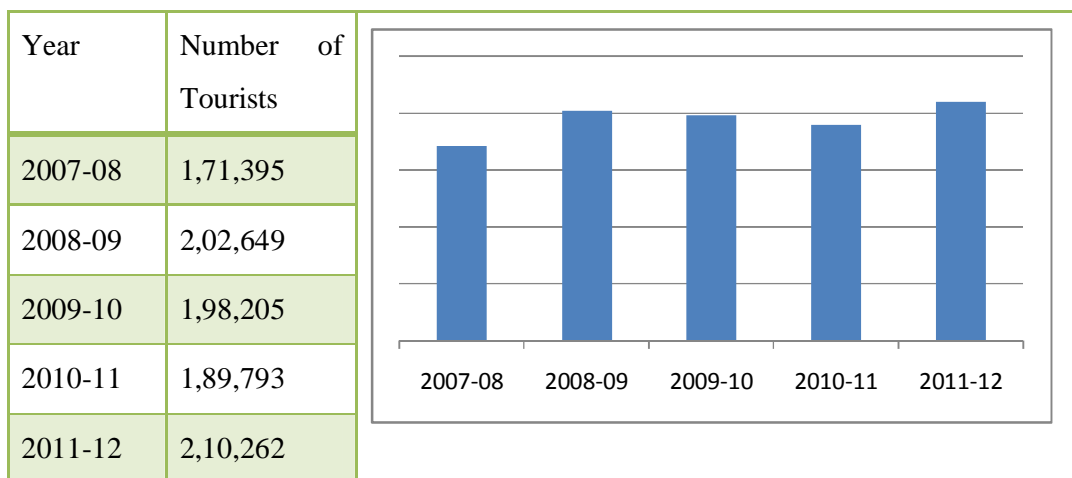
Name of Division	Name of Range	Name of Forest Rest House	Remark
Ramnagar Tiger Reserve Division, Ramnagar	Bijrani	Bijrani	Available for visitors
		Malani	Available for visitors
	Sarpduli	Sultan	Available for visitors
		Sarpduli	Available for visitors
		Khinanauli	Available for visitors
	Kalagarh	Paterpani Forest Rest House	Not Available for visitors
		Gaujpani Forest Rest House	Not Available for visitors
	Dhikala	Old F.R.H.	Available for visitors
		New F.R.H	Available for visitors
		Cabin -3,	Available for visitors
		Log Hut	Available for visitors
		Annexe	Available for visitors

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		Hutment	Available for visitors
	Jhirna	Jamunagwar Forest Rest House	Not Available for visitors
Kalagarh Tiger Reserve Division, Lansdowne	Palain	Halduparao	Available for visitors
		Rathuwadhab FRH	Available for visitors
		Mundiyanpani FRH	Available for visitors
		Lohachaur FRH	Available for visitors

7. Tourist (Domestic as well as Foreign) inflow in five years:

The tourist inflow in last five years is as follows-



Free educational trip of about 1400 school children and senior citizens has been organised in the Platinum Jubilee year-2011 of Corbett Tiger Reserve. It will be a norm to conduct free educational group tourism for local school students and citizens as per norms laid down by the Field Director, Corbett Tiger Reserve. A Library, a small interpretation centre and a museum are available to make visitors aware about various aspects about wildlife and Jim Corbett.

B. Periodicity of opening and closing of tourist zones:

The areas marked for tourist activity is not available throughout the year. As most of the roads get damaged during monsoon, the tourism season ends on 15th June every year barring Jhirna zone. It was a conscious decision by the authority to keep the Jhirna zone open throughout the year for the protection of wildlife and habitat. However heavy rain fall often damage the roads which sometimes causes difficulties for the tourists but that does not stops patrolling by the staff.

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The opening of the zones requires massive arrangements which includes repair of long stretches of roads, whitewashing and repairing of rest houses, and many other allied activities to keep ready the zone. Since Dhikala is the largest zone, the time requirement is proportionately higher than that of Bijrani, Sonanadi or Durgadevi. It is because of these requirements, that different times has been fixed for opening of different zones.

The opening and closing time of different zones:

Sl. No.	Name of the Tourist Zones	Opening Date	Closing Date
1.	Dhikala	15 th November	15 th June
2.	Bijrani	15 th October	30 th June
3.	Jhirna	May remain open throughout the year subject to weather and other local conditions	
4.	Sonanadi	15 th November	15 th June

11.1.1. Management of Tourism:

Objectives:

1. To minimize anthropogenic pressure on wildlife.
2. To promote and ensure responsible tourism.
3. To discourage tiger centric tourism by promoting interest on other animals like elephant and dynamics of natural beauty of forests and water bodies and such other activities like watching birds and butter flies.
4. To achieve inviolate status of core area by shifting tourism to buffer areas and other neighbouring Forest Divisions through proper planning and execution.

Problems:

There are certain problems related to tourism in Corbett Tiger Reserve. The foremost being the tiger centric tourism which promotes only sighting of tigers. Primarily it is linked with the business of the tour operators and resort owners. They consciously promote - tiger sighting through their web sites and other means among the prospective tourists. This tendency is harmful for the tiger reserve as well as for the

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tigers and other wildlife. Sometimes unwanted activities like commotion take place out of excitement of seeing a tiger.

Given the huge number of tourists visiting the tiger reserve, field staff have to manage various responsibilities, starting from bookings for day excursions and night halt in the forest rest houses to manage various tourism related services. Under the prevailing situation of high demand for protection and allied activities relating to conservation of wildlife and its habitat, it is very difficult to divert regular staff to manage tourism. Lots of man days are lost for booking of the day excursion and night halt in the rest houses. It is a huge challenge for the staff to manage such a large number of tourists.

It is also difficult on the part of limited staff to implement all the rules and regulations framed for responsible tourism. This inadequacy runs a risk to bring disrepute for the tiger reserve due to inappropriate behavior by visitors.

The visitor centre at Dhangarhi needs immediate renovation and up gradation. It should be upgraded to a proper interpretation centre to provide all kinds of information related to Corbett Tiger Reserve and basic knowledge about the state of tigers in other 40 tiger reserves of India.

A new Interpretation Centre should be developed near Ramnagar, preferably around Amdanda to cater to visitors who stay near the town.

11.1.2. Strategy:

A. Need for responsible tourism:

Detailed guidelines for conduct of ecotourism in Corbett Tiger Reserve have been issued by the PCCF (Wildlife)/CWLW in December 2013. These and any further directions are to be followed to streamline ecotourism and help enrich visitor experience.

1. Restrictions on number of vehicles:

Restrictions have been imposed for entry of maximum thirty numbers of vehicles each in Bijrani and Jhirna, fifteen vehicles in Durgadevi and four canters for Dhikala for morning excursion and same number in the afternoon excursion. The Corbett Tiger Reserve management has imposed strict discipline for visiting tourists.

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2. Sighting rules:

Certain restrictions are framed by the tiger reserve authority to enable the tourists to remain disciplined while sighting tigers and moving around the designated paths. The tourists, while following the rules and regulations can enjoy their visit into the tiger reserve will also contribute towards the welfare of the tiger reserve. The tiger reserve has been doing and should continue to enhance modalities to aware and educate tourists about the rules and regulations. The violators are subject to be fined and in serious violations should be booked under relevant sections of Wildlife Act, 1972 (amendment up to 2006) or debarred from future entry to the Tiger Reserve, as the case may be. Some of the important regulations are as follows.

- b. All tourists should sign indemnity bond before entering into a zone.
- c. No tourist or vehicle should enter into areas restricted for tourism.
- d. Visitors should keep a minimum distance of more than 20 meters from all wildlife.
- e. Minimum distance between vehicles while spotting wildlife shall be maintained at 50 meters. Vehicles shall not monopolize a wildlife sighting for more than 15 minutes.
- f. No tourists are allowed to disembark from vehicle while on excursion.
- g. All vehicles are subject to random checking at the entry points.
- h. Only permitted vehicles can enter into the tourism zone.
- i. No horn, music and any kind of loud noise is allowed.
- j. No littering is allowed inside the forest.
- k. The cross over pathway of tiger should not be blocked by vehicles.
- l. No animal and birds should be feed and teased by tourists.
- m. Night safari is not allowed. They have to follow the strict timings for entry and exit from the forests.
- n. Tourists should refrain from loitering in the FRH campus after 9 pm.
- o. Lights should be switched off after 10 pm.
- p. Any other rule as framed by the authority based upon the prevailing situation.

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Apart from above, whatever suitable suggestions come from different sources for restricted and controlled ecotourism, the management would try to implement them after thorough examination.

It is important to appreciate that such rules can be implemented in letter and spirit only with the cooperation of stakeholders including Nature Guides and drivers. These are primarily to ensure visitor safety and enrichment of their experience rather than a regulatory mechanism alone. As such, awareness will be key to implementation of such regulations.

3. Regulations on tourism:

With an aim to emphasize on responsible tourism, constant monitoring and evaluation has to be carried out to regulate tourism by highlighting following parameters:

1. The Corbett administration has implemented a policy of turning all white and other colored vehicles into olive green. It was also decided to allow only those vehicles who are registered with the tiger reserve management. Stickers have been affixed in the more than 200 eligible vehicles to check unauthorized entry of other vehicles. Entry of private vehicles has been stopped in the tourist zones. The Director can decide to allow private vehicles based upon genuine need of tourists. However it is prescribed that for safe keeping of the private vehicles, three parking places should be developed at Bijrani, Dhangarhi and Kotdwar. A system has been made to register the vehicles every year with due regards to various provision of Motor Vehicles Act and antecedents of the driver.
2. Only registered guides can enter into the tourist zone.
3. Adequate facilities should be developed for parking of the vehicles of the tourists.
4. One tourist facility centre should be developed at Dhangarhi entrance gate where they can get requisite instructions regarding wildlife viewing in the reserve as well as aware them regarding good practice of 'responsible tourism'. Basic amenities will be provided at the tourist facility centre.
5. A Visitor Centre will be developed near Amdanda Gate to provide an opportunity to visitors to get better informed and acquainted with the values of the Tiger Reserve.

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As this is closer to the main town and resorts, it is likely to be better utilized by visitors.

6. Tourists can avail permission to enter into the Tiger Reserve through Online Booking Facility.
7. Under no circumstances, the number of the tourists should be increased from the prevailing limit approved by the Government.
8. There shall be a complete ban on burying, burning or otherwise disposing non-biodegradable or toxic waste. There should be strict norm for garbage disposal, abatement of pollution, guideline for wildlife sighting, provision for penalty, strict hygienic condition at canteens and boarding lodges.
9. The camp elephants should be put more for patrolling duties than to carry tourists.
10. More Camp elephants will be procured to replace aging ones and to augment protection and ecotourism duties.
11. Since Corbett Tiger Reserve has constituted the Tiger Conservation Foundation, the entire ecotourism activities should be under the oversight of the Foundation to enable Eco-Development Committees/ staff welfare society to strengthen the institutional framework through a Memorandum of Understanding.
12. The canteens shall not serve non-vegetarian food.
13. The canteens and nature shops available inside the core area should be managed by Tiger Conservation Foundation or government owned agencies.
14. The tiger reserve authority should review the regulations and periodically modify them to regulate and improve tourist activities.
15. The Deputy Director and the DFO Kalagarh will oversee the various aspects of ecotourism for their respective areas. The SDO, Bijrani, SDO Kalagarh, SDO Sonanadi and SDO Adnala should be responsible for the day to day smooth running of the various provisions regarding ecotourism, in the tourism zones which fall under their jurisdiction. With due consideration of the heavy pressure on the SDO Bijrani, one eco-tourism Unit has been established in 2011 under a Range Officer who will conduct day to day administration.

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16. Given the high profile nature of guests who routinely visit Corbett Tiger Reserve, there is need of a senior officer of the rank of ACF to serve as 'Protocol Officer' to facilitate tourism related functions of Corbett Tiger Reserve. This person would report directly to the Field Director. The Range Officer Ecotourism will be designated as Asst. Protocol Officer.

4. Managing the guides, drivers, room attendants, cooks etc.:

There are about 89 trained and registered guides available in this zone to acquaint the tourists about various aspects of wildlife of Corbett and ensure the adherence of 'tiger viewing rules' by the tourists. They also ensure to keep the tourist zone free from plastics and restrict the tourists from breaching various rules and regulations enacted by the Tiger Reserve administration. The guides are trained to aware tourists about the need for conservation of tiger. This system of 'nature guides' generates substantial livelihood for the local youth.

Visitors accompanied by a nature guide are allowed to move in vehicles on forest road in the tourism zone during 6 a.m. to 11 a.m. and 4 p.m. to 6.30 p.m. in summer and during 7 a.m. to 12 a.m. and 2.30 p.m. to 5.30 p.m. in winter. Movement by vehicle permits visitors to cover the largest possible area in briefest possible time. As many FRH particularly Dhikala, are located in the interior of Corbett Tiger Reserve the drive from entrance gate to the place of stay in itself represents a unique experience of drive in a wilderness area.

Apart from 89 nature guides, there are 25 room attendants, 227 Gypsy drivers and 50 Canteen attendants who derive direct employments from tourism. The present system of nature-guides needs revamping of their duties and responsibilities. Since the Corbett management fixes their fee which the guide has the right to collect from the visitor, they have to abide by the rules framed by the Director, Corbett Tiger Reserve. Off late, the guides and drivers are showing indiscipline in form of strikes causing much damage to the reputation of the tiger reserve and unknowingly causing harm to their own welfare. Constant dialogue between the Tiger Reserve authority and guides/drivers is necessary but it often remains ineffective due to political intervention and misinformation by ill informed persons. A healthy relationship is necessary to run the tourism activity and at the same time a strict code of conduct should be framed taking into account of all the stake holders. The basic underlining principle will be to ensure

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not to cause any hindrance of the smooth movement of tourists. Mutual trust is very necessary for effective management of the affairs of the stakeholders.

The old regulations need revision and a proper rule book will be prepared, based on broad parameters like- regular training on basic knowledge about wild flora and fauna, communication skill, about the history of Corbett Tiger Reserve, conduct with tourists and Tiger Reserve officials, etc. While framing the rule book, due opportunity should be given to the guides to place their genuine concerns about the management of tourism. Provision of penalty should be mentioned for any kind of indiscipline and misconduct done by guides. Similar rules and regulations should be made for drivers of registered vehicles and quality of vehicles and canters used for 'conducted tour' in Dhikala. The rule book should be so designed that the view points of guides must get due importance.

Since tourists are booking forest rest houses for overnight stay, they expect quality food. Though forest houses has a good reputation for fresh and tasty food, the cooks need training to know about preparation of new dishes. As serving of non-vegetarian food is not allowed in the forest rest houses, they should know as many vegetarian food recipes as possible. The cooks in the old FRH of Dhikala, Khinanauli has to be very proficient given the regular visit of VVIPs and dignitaries of national and international repute. Thus the cooks should be trained at reputed training institutes at the off-season and the expenditure should be borne by the Tiger Conservation Foundation from the fund generated from the eco-tourism activities. Similarly the room attendants should be periodically trained on the art of table manners as well as upkeep of suites.

5. Training and skill development of guides and drivers:

All guides and drivers shall compulsorily go through a short course in interpretation and rules and regulations followed by an oral examination before being certified by the Tiger Conservation Foundation. Courses may be scheduled during the non-tourist season. All certified guides and drivers shall wear appropriately designed uniforms with name tags and badges. This will instill a sense of pride, discipline and accountability. Prior to every tourist season, certified guides and drivers shall go through a refresher course or workshop. These shall also build up their capacity to identify birds and provide natural history information on other species, to slowly wean

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them away from a tiger-centric obsession. A periodic assessment of their performance shall be reviewed by the LAC before reissuing their licenses.

The PCCF (Wildlife) & Chief Wildlife Warden Uttarakhand has issued detailed guidelines for the regulation of tourism in Corbett Tiger Reserve by his letter no. 1638/15-1 Camp Dehradun Dated 2nd December 2013. These shall be strictly followed.

6. Booking facility:

1. Visitors can book their accommodation in FRHs and day visits by visiting the website www.corbettonline.uk.gov.in. The visitors are issued permits by paying the scheduled rate fixed by the Government of Uttarakhand. The tariff fixed by Government of Uttarakhand, which was made operational from 01-01-2010 has been given in **Annexure-11/2**.
2. Apart from this service, the web site should be designed to provide all information about the tourist activities along with general information about the Tiger Reserve. Efforts should be made to make the web site interactive to get feedback as well as to aware people about the cause of conservation of tiger and its habitat.

7. Silence Zone:

The eastern boundary of Corbett Tiger Reserve is crowded with lots of resorts and hotels which are causing all kinds of disturbance to the wildlife living at the edge of the core and buffer areas. Apart from congesting the corridors, these resorts are also badly influencing the movement of animals including tigers across the river Koshi to use the rich habitat of Ramnagar Forest Division. Since the most serious source of disturbance is from sound (cacophony) emanating from activities like DJ parties for marriage other such social functions. The forest department was unable to curb the menace as it has not empowered by the Environment Protection Act, 1986. Sensing the urgency of the matter, the Honourable High Court, Nainital upon reacting to a PIL directed the State Government to notify the area around the tiger reserve as 'Silence Zone'. The Government of Uttarakhand has notified 'Silence Zone' of 500 meters beyond the boundary of Corbett Tiger Reserve to curb noise pollution, emanating from resorts and hotels under section 3(2) of Noise Pollution (Regulation and Control) rules, 2000(amended up to 2010). The notification vide G.O. letter No. 301/x-3-2012-08(23)/2010 dated 20th April 2012 has been attached as **Annexure-11/1**.

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The Government has constituted a committee under section 2(c) of Noise Pollution (Regulation and Control) rules, 2000(amended up to 2010) to implement the level of sound and control the erring owners of commercial units including resorts through the enabling provisions of the Environment Protection Act, 1986.

The constitution of the committee is as follows:

- | | |
|---|--------------------|
| 1. SDM, Ramnagar | - Chairman |
| 2. Circle Inspector of Police, Ramanagar | - Member |
| 3. Regional Officer,
Uttarakhand Environment Protection
and Pollution Control Board | - Member |
| 4. SDO Ramnagar Forest Division | - Member |
| 5. Assistant Engineer, Irrigation, Ramnagar | - Member |
| 6. SDO/Warden, Corbett Tiger Reserve | - Member Secretary |

The ambient Air quality standards in respect of noise as per the rule 3(1) and 4(1) of Noise Pollution (Regulation and Control) rules, 2000(amended up to 2010).

Category of the area/Zone	Limits in db1 (A2) Leq3	
	Day Time	Night Time
Silence zone	50 dB	40 dB

1. dB- "decibel" is a unit in which noise is measured
2. "A" in (dB) Leq, denotes the frequency weighing in the measurement of noise and corresponds to frequency response characteristics of the human ear.
3. Leq: It is energy mean of the noise level over a specific period.

Presently there is only one committee which is entrusted with the responsibility of monitoring the whole tiger reserve. This arrangement is not practical because of the large area of the TR and other jurisdictional issues. Hence such committees should be made for each subdivisional levels for better implementation.

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8. Elephant Ride:

Elephant ride represents one of the most satisfying ways to observe animal behaviour and permit close range photography. Tigers and tiger kills can be located easily with the help of elephant. Foreigners find elephant ride an exotic novelty and enjoy the ride for its own sake. But extreme care should be taken for not disturbing tigers on kill & cub rearing tigress. Heavy penalty should be imposed for such activities and Mahavats should be responsible for any such disturbances to tigers. They have to ensure that tigers should not be chased under any circumstances and tourist should see the tiger from a safe distance.

9. Photography:

Photography of wildlife and natural landscapes is a desirable and permissible activity within Corbett Tiger Reserve. However, attempts to take close range photographs thereby causing disturbance and stress to the animals and also risk of attack will not be allowed. Visitors will be advised how to make best use of photographic opportunity through suitable publications and information. Requirements of photographers should be considered while designing watchtowers and viewing spots. Professional photographers and amateurs will be encouraged to share good photographs with CTR management for official publications, displays and records.

10. Bird watching:

Bird watching as a specialized kind of wildlife viewing represent one of the potentially most promising and as yet least explored activities, particularly for domestic visitors. Birds can be observed with greater ease in the peripheral areas where canopy density is less as well at the vast expanse of grassland and water bodies of the core areas. Tourists should be encouraged to use binoculars to enjoy viewing birds as they are not allowed to disembark from vehicles. Regular trainings and workshops on bird watching should be carried out by involving birdwatchers and eminent photographers.

11. Group Activities:

Wherever overnight visitors are present in large numbers of ten or above, it will be useful to encourage group activities though interpretive talks, film show etc. Such activities generate feeling of goodwill and harmony. They permit visitors to come out of their restrictive shells and share their knowledge and experiences with each other.

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12. Management of canteens and nature shops:

The canteens situated at Dhikala, Gairal, Bijrani and Jhirna should be managed by the 'Tiger Conservation Foundation for CTR'. This is a registered body constituted under enabling provision of Wildlife Act, 1972 (amended up to 2006). The foundation has the mandate to generate its financial resources and under this provision can run the canteens and recycle the profit for the betterment of the staff. The funding for staff welfare by the State and NTCA is meagre and needs a sustained and adequate source to meet various basic requirements of the field staff. The present practice of annual tendering of the canteens has its bad effect in the form of high price menu, and consequently difficulty for the tourists to afford the high cost, and more particularly for the staff and guides/drivers. Doing away with the process of tender and handing over the management of canteens to the foundation or to any government run agency can remove these problems. Similar process should be followed to manage the nature shops available at Dhangarhi and Bijrani.

13. Machans:

Although the Corbett Tiger Reserve has well distributed machans, which are accessible for the tourists to observe the movement of animals as well as used by the field staff for detection of fire, there is still lot of possibility to built new machans in the buffer areas. Existing ones should also be maintained properly. Machans in the tourism zones can be used for wildlife viewing by the tourists if not required for any other departmental purposes.

14. Conducted Bus Tours:

For safety of the tourists, it is the responsibility of the in-charge of eco-tourism unit to inspect the buses regularly and report to the SDO Bijrani regarding their worthiness to ferry tourists into Dhikala Zone, which overlaps both the core as well as the buffer area. Similar will be the system of checks regarding the vehicles for safari. The concerned SDOs will ensure the minimum standard of safety of the vehicles in the respective zones under their jurisdiction.

15: Taxation issues:

Currently, the Corbett Tiger Reserve is saddled with a large number of demands of tax under various heads such as Service Tax, luxury tax etc. The CTR administration has taken up the matter with the concerned authorities as also with the NTCA at the

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national level on this. The contention of CTR is that it is not engaging in any commercial activity but is conducting various ecotourism activities such as day visits, night halts etc. in discharge of its statutory and legal obligations of promoting ecotourism as a tool for eliciting public support for conservation as per Section 38X of the Wildlife (Protection) Act, 1972.

This issue needs to be resolved at the earliest as this is inhibiting generating additional resources for promoting conservation in CTR through nature shops and similar activities.

B. Restriction on infrastructure in the core area :

No new tourist infrastructure shall to be set up within the core or critical tiger habitat of tiger reserves, in violation of the provisions of the Wild Life (Protection) Act, 1972, and the directives of the Honourable Supreme Court. The relocation sites of Corbett Tiger Reserve, such as Laldhang, Dhara, Jhirna and Kothi Rau will not be used for development of any permanent tourism infrastructure. Same will be the case for any future relocation sites in the Tiger Reserve. Also, all infrastructure shall be used solely for the purpose for which it was constructed and in no circumstance will it be diverted for stay of any tourists.

C. State Level Steering Committee:

The State Level Steering Committee under section 38U of the Wild Life (Protection) Act, 1972 shall review the implementation of the State-level Tourism and Ecotourism Strategy in Tiger Reserve. The Uttarakhand State Government has already constituted the Steering committee. The Government order is appended as **Annexure-11/3**.

D. Gate Receipt as source of Tiger Conservation Foundation:

In order to ensure that gate receipts from tiger reserve are utilised by the management for specific conservation purposes and shall not to go as revenue to the State Exchequer, the State Government has allowed 20% of the collection from various tourism activities to be deposited in the accounts of the Tiger Conservation Foundation. In a recent meeting of the Foundation, chaired by the Hon. CM, it was decided to recycle 50% of the gate receipts to the Foundation. Formal orders for this are awaited. This will ensure that resources generated from tourism can be earmarked for protection,

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conservation and local livelihood development, tackling human-wild animal conflict and welfare measures of field staff. This will be gradually enhanced to 100%.

E. Conservation Fee:

Since the tourism industry in and around tiger reserves is sustained primarily from the non-consumptive use of wildlife resources and the local communities are the ones that bear the brunt of conservation, the State Government is willing to charge a conservation fee from the tourism industry. (Ref: Government of Uttarakhand view on the guidelines, **Annexure-11/4**). The Conservation Fee collected shall be maintained as separate head in 'Tiger Conservation Foundation of CTR' fund account.

The rate of conservation fee and tourist facility strata shall be determined by the State Government, and the fund thus collected shall be earmarked to address local livelihood development, human-wildlife conflict management and conservation through ecodevelopment and not go to the State Exchequer but to the account of the foundation.

The State Government will notify the rate of local conservation fee within a year from the date of notification of these Guidelines (i.e. by 15-10-2013). The rate of fee shall be revised periodically taking into consideration the cost of operation. The rationale for a local conservation fee should be clearly explained to the public at large, through clear signage at local tourist facilities. Transparent mechanism will put in place for utilization of these funds involving the tiger reserve management through the Tiger Conservation Foundation.

F. Local Area Advisory Committee:

The Forest Department of Uttarakhand has some reservations regarding the constitution and the terms of reference regarding of the Local Area Advisory Committee as envisaged in the guideline. Following the directive of the Honble Supreme Court, the Forest Department submitted its comments, duly approved by the State Government before the Honøble Apex Court. Taking into account of the peculiar need of the Corbett Tiger Reserve and the normative nature of the guideline, the following amended version of the constitution as well as the T.O.R. has been given for the approval of the NTCA, following which, the State Government will constitute and notify the formation of the LAC. (ref: para 2.6 of the guideline as well as the order of the supreme court, NTCA is requested to amend any provision taking into account of the special need of a Tiger Reserve).

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It is important to mention that given the role attributed to the Chief Wildlife Warden under section 38 (U), 38 (V) 4 (ii) and 38X of Wildlife (Protection) Act 1972 (as amended up to 2006) all activities inside the tiger reserve should be under his control, while activities outside the tiger reserve as envisaged under these proposed guidelines, should be as per advice of the LAC. In cases where such activities outside the Tiger Reserve involve issues related to wildlife conservation the same again should be carried out only after due consultation with the Chief Wildlife Warden of the State.

The forest department has very limited authority to enforce and implement activities outside notified forest areas such as change in land use, control of various kinds of pollution, control of traffic on roads running along the Tiger Reserve. For any such regulatory activities outside notified forest areas that may be recommended by the LAC, the District Collector may be made responsible for their implementation.

The LAC will have the following mandates:

1. To ensure site specific norms on buildings, and infrastructures in areas close to Tiger Reserves, keeping in mind the corridor value and ecological aesthetics.
2. To advise local and State Government on issues relating to development of tourism around Tiger Reserves.
3. Regularly monitor (at least half yearly) all tourist facilities around Tiger Reserves vis-à-vis environmental clearance, area of coverage, ownership, type of construction, number of employees etc., for suggesting mitigation/ retrofitting measures if needed.
4. Tourism industry should be encouraged to augment employment opportunities for members of local communities.
5. Tourism infrastructure shall conform to environment-friendly, low impact aesthetic architecture, including solar energy, waste recycling, rainwater harvesting, natural cross-ventilation, proper sewage disposal and merging with the surrounding habitat. Violations of these norms will be appropriately dealt with by the LAC. Any violation of the guidelines will be referred to the appropriate authorities under intimation to the NTCA, for taking action in accordance to the relevant provisions of the law.

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6. The District Revenue and tiger reserve authorities shall ensure that all tourist facilities within a zone of influence (to be notified as eco-sensitive zone) of the tiger reserves must adhere to all environmental clearances, noise pollution norms, and are non-polluting, blending in with surroundings. Severe penalties must be imposed for noncompliance.
7. All tourism facilities located within the zone of influence (to be notified as eco-sensitive zone) in the context of the tiger reserve shall adhere to pollution norms (noise, solid waste, air and water, etc.), under the respective laws or rules for the time being in force. Outdoor high intensity illumination shall not be utilized as it disturbs nocturnal wild animal activities.
8. The LAC will ensure that there will be a complete ban on burying, burning or otherwise disposing non- biodegradable or toxic waste in and around the tiger reserve. Proper plan for disposal for degradable waste shall be developed and strictly implemented.
9. All tourist facilities falling within the zone of influence (eco-sensitive zone) of a tiger reserve shall be reviewed regularly by the Local Advisory Committee vis-à-vis environmental clearance, area of coverage, ownership, type of construction, number of employees, etc., for suggesting mitigation and retrofitting measures if needed.
10. All tourist facilities, old and new shall aim to generate at least 50% of their total energy and fuel requirements from alternate energy sources that may include solar and biogas.
11. The use of wood as fuel shall be prohibited, except for campfires for which wood must be procured from State Forest Department or the Forest Development Corporation depots.
12. The LAC will ensure that tourist facilities and tour operators shall not cause disturbance to animals while taking visitors on nature trails.
13. Any violation of the guidelines shall be referred to the appropriate authorities under intimation to the National Tiger Conservation Authority, for taking action in accordance to the relevant provisions of the law.

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The Chief Wildlife Warden will have following mandate (in the context of LAC):

1. To review the Tourism Strategy with respect to the Tiger Reserve and make recommendations to the State Government.
2. To ensure computation of reserve specific carrying capacity and its implementation through periodic reviews.
3. To advise local and State Government on issues relating to development of tourism in the Tiger Reserves.
4. Management of habitat to inflate animal abundance for tourism purposes shall not be practiced within the core or critical habitat. Visitors shall keep a minimum distance of more than 20 meter from all wildlife; cordoning, luring or feeding of any wildlife shall be prohibited. Minimum distance between vehicles while spotting wildlife shall be maintained at 50 meters. Vehicles shall not monopolize a wildlife sighting for more than 15 minutes.

Reason: The Chief Wildlife Warden is empowered to do above tasks under the various sections of Wildlife Protection Act, 1972 (as amended up to 2006).

In addition to the above, the 'Tiger Conservation Foundation for CTR' will be the overseeing authority for the ecotourism activities carried out in and around the Tiger Reserve.

Composition of LAC

1. Divisional Commissioner (Chairperson)
2. MLA of the area concerned
3. Concerned Collector
4. Concerned SSP
5. Tiger Reserve Field Director (Member Secretary)
6. Concerned DFO/DFOs
7. Honorary Wildlife Warden
8. Official of State Tourism Department
9. Official of the State Tribal Department
10. Concerned Members of Local Panchayats (2)
11. One Wildlife scientist nominated by the Director, WII, Dehradun.

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In addition to the above, special invitees can be co-opted as per the specific requirement.

G. Phasing out the tourist facilities (Ref: Para- 2.2.12):

In this context, the departmental view approved by the State Government is that the Corbett National Tiger Reserve is the oldest National Tiger Reserve of India established in 1936. The tourism zones have infrastructures which are used by departmental officers in performing their regular duties as well as by the tourists. Therefore the facilities may only be phased out in a planned manner slowly. Meanwhile strict regulations which are in operation to ensure responsible tourism will be continued to be done by the Corbett Tiger Reserve officials under the guidance of the Chief Wildlife Warden.

H. Disposal of waste:

There shall be a complete ban on burying, burning or otherwise disposing non-degradable or toxic waste inside the tourist zones of the tiger reserve. The Tiger Reserve will always remain as plastic free zone. All the wastes should be collected and transported outside to municipal dump yards in regular intervals. Tourists should be continued to be sensitised against using non-degradable articles while they are staying inside the tourist zone.

I. Need of a separate setup:

The Tourism setup in Corbett is already over burdened. There is a need to have a separate setup to execute the tourism activity.

A tourism management committee should be formed, the constitution of which may be as follows.

- | | |
|---|------------|
| 1. Director | : Chairman |
| 2. Deputy Director | : Member |
| 3. DFO, Kalagarh | : Member |
| 4. All SDos of CTR | : Member |
| 5. A representative of CCF, Ecotourism | : Member |
| 6. Range officer, in-charge of Ecotourism | : Member |
| 7. A Special invitee from reputed NGO | : Member |

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8. A Special invitee from Resort Association : Member
9. SDO, Bijrani : Member Secretary

Following are the responsibilities of the committee:

1. To study the various aspects of tourism to suggest remedial and preventive as well as scopes for amendment regulations.
2. To follow the prescription of the Eco-Tourism Guidelines.
3. To manage various aspects relating to Guides and tour operators.
4. To prepare rule books for guides and drivers.
5. It should review the progress of tourism on monthly basis & suggest improvement / amendments.
6. It should be responsible for all the affair & its decision should be final in confirmation to the rules and regulations.
7. There should be a full fledge officer to look after the matter pertaining to ecotourism. The officer would be of the rank of Assistant Conservator of Forest & would be designated as Assistant Director for tourism. Two Range officers will assist him.
8. The prevailing ecotourism cell should continue, which will remain under control of the above committee. Its primary responsibility will be to conduct online booking and keep the records of revenue collected from tourism activities.
9. Other duties as demanded by the prevailing situation.

11.2. Determination of carrying capacity:

The number of tourists allowed to enter into the tourists zones of Dhikala, Bijrani, Sarpduli, Jhirna, Sonandi Ranges commensurate with the available rooms for night halt. Restrictions has been imposed for entry of maximum thirty numbers of vehicles each in Bijrani and Jhirna, fifteen vehicles in Durgadevi and four canter for Dhikala for. Each Gypsy can carry maximum 6 tourists, excluding the mandatory nature guide. The four Canter buses cater to maximum 64 tourists. However a proper study has to be conducted taking into account of the basic principle of the methodology described in the guideline. The peculiarity of Corbett Tiger Reserve will be focal point

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to determine the carrying capacity of the tourist zones. The determined carrying capacity will be subjected to examination once in five years.

11.3. Implementation of Ecotourism Guidelines:

The National Tiger Conservation Authority, MoEF, New Delhi has notified the normative standards for tourism activities and Project Tiger which is known as National Tiger Conservation Authority Guidelines, 2012, on 15th October, 2012, under clause (c) of sub-section (1) of section 38-O of the Wild Life (Protection) Act, 1972 (53 of 1972).

The notification has two parts namely the Part-A deals with guidelines under section 38-O (c) of the wild life (protection) act, 1972 for project tiger and the PART-B deals with guidelines for tourism in and around tiger reserves. The Honble Supreme Court of India ordered that all Tiger Reserves has to prepare a 'Tourism Plan' which will be approved under the enabling provisions of the Wild Life (Protection) Act, 1972.

Following the mandate of the para- 2.2.1 of guideline the tourism plan in question for Corbett Tiger Reserve has been prepared as part of the Tiger Conservation Plan vis-à-vis the technical guidelines of the National Tiger Conservation Authority. The notified 'guidelines for tourism in and around tiger reserves' have been appended as **Annexure-11/5**.

All tourism activities as mentioned in this plan shall be regulated and subject to orders of Honorable Supreme Court, NTCA guidelines, state level tourism guideline/strategy and provisions of Wildlife (Protection) Act, 1972 and other directions of the state government and Chief Wildlife Warden.

11.4. Tiger Reserve Interpretation Programme:

Interpretation can be defined as an out door informal education desired to change the attitude & knowledge of the people. Interpretation is a service which can be treated as a communication link between visitors & the resources. It is also a managerial tool for satisfying the people by informing about the activities taken by Tiger Reserve authorities & thus obtaining their opinion. So it is necessary to have a separate interpretation programme of the Corbett Tiger Reserve the following steps will be taken for this purpose.

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a. Signage: Corbett National Park has a tradition of having good interpretive signs. Simple, appealing and educative signage has to be put in such a way that they are easily readable, and with sync with the wild environment.

b. Website: A full-fledged website has been prepared with the help of professionals. The web based information is informative and compact. Slowly this would be updated to cover the entire gamut of Corbett Management & its administration.

c. Publications: A quarterly journal in English and Hindi should be published for the benefit of general public including tourist. The Journal will give the in sight of Tiger Reserve. Other educative and informative materials like folders, handouts, leaflets should be prepared on different subjects for distribution to the visiting delegates, school children, All India Service and Central Service probationers and officers, etc.

d. Corbett Newsletter: Corbett National Park became the first NP in India to have its own newsletter when the Corbett newsletter was launched by Mr. Rajamani, Secretary to GOI, Ministry of Environment and Forests at Dhikala on 21.04.94. Only a few issues of the newsletter have been brought, in English and Hindi. Involving local as well as eminent personalities should start this good practice.

The newsletter will be distributed free of cost to gram sabhas and educational institutions, situated in the vicinity of Corbett Tiger Reserve. Complimentary copies of the newsletter will be sent to office of the Director of all Tiger Reserves; office of CWLW, Uttarakhand; all regional and selected national research and training institutes; members of NTCA; members of State Wildlife Board, Uttarakhand; international conservation organizations; members of IBWL; all CWLWs; district administration of Nainital, Pauri Garhwal, Almora and Bijonore districts; all regional level officers of Garhwal, Kumaon and Moradabad commissioners; all offices of Ramngar, Kalagarh, Kotdwar and Lansdowne and all schools in the vicinity of Corbett Tiger Reserve; distinguished visitors to Corbett Tiger Reserve and members of the State and Central government will also be provided with complimentary copies of the newsletter during their visit. The number of complimentary copies should not exceed 500. A mailing list should be drawn up to facilitate the distribution of the newsletter.

e. Guide Book: There is no guide book on Corbett Tiger Reserve. So far, only one book has been written on Corbett National Park, Which is by Ramesh Bedi. The book is

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limited to Corbett National Park only and is now quite old. A guidebook is needed which describes the reorganized Corbett Tiger Reserve.

f. Films & documentaries: Films on the natural history of a NP attract attention and raise awareness about the NP, and also satisfy the curiosity of the visitors. The only full-length film on CNP is *Corbett Tiger Reserve* produced by Sanctuary Films. This film was produced as part of a series produced by MOEF on the 10 years of Project Tiger. The film is in 16 mm and of 30 min duration. It is regularly shown to the visitors at Dhikala and Bijrani and is much appreciated. However, the film has several limitations. It is not available on VHS, which severely limits its exhibition. Secondly, Corbett Tiger Reserve has undergone profound changes since 1983 when this film was made. There have been major changes in the perception of Project Tiger itself. A wider coverage is needed to orient the visitors to the changed scenario. Lastly, any film no matter how good it is cannot alone hope to capture all the facets of a vast NP like CNP. Keeping in view the requirement of an orientation film, an attempt was made on the occasion of the Diamond Jubilee of CNP to produce a one-hour documentary film. For want of funds only a small 18-minute version could be produced. It is amazing that apart from these two films, there is no full-length film on CNP. On the eve of Platinum Jubilee of Corbett National Park in 2011, the Bedi Brothers prepared a full length film, *Corbett Legacy*, on Corbett Tiger Reserve primarily focusing on Jim Corbett.

The other noteworthy films produced in CNP, included *The Man-Eaters of Kumaon* produced by BBC and some films on the various species of Corbett produced by Bedi Brothers. *Corbett at Sixty* and *India's Otter Paradise* were some of the noteworthy films made on Corbett Tiger Reserve. These films have made elaborate of CNP as a backdrop for wildlife sequences. A NP like Corbett deserves to have many more such films, which can truly bring out its tremendous beauty, diversity and uniqueness to worldwide audiences.

Production of TV programme and documentary films will need to be promoted. Based on the experiences of various problems faced by the applicants, the following prescriptions could be implemented by the Tiger Reserve authority.

1. The permission for foreign film producers should be cleared by a single window system at the level of Field Director and CWLW, after they obtain necessary permission from Ministry of External Affairs and NTCA.

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2. Assistance from the Tiger Reserve management will be provided to the film producers during the research phase of the production by way of information available with the management. They will also be provided with accommodation, guides, vehicles under the prevailing rule of the tiger reserve. However the producers of full-length documentary films will need to be treated differently from ordinary visitors. Depending on merit and the length of the film, they have to be provided with the following special permissions:
 - Access to the core zone. (For bare minimum time accompanied by Range Officer/ Deputy Range Officer).
 - Permission for filming during the closed period to cover all aspects of the NP.
 - Permission to set up hides.
 - Permission to walk up to vantage points for filming scenic and wildlife sequences.
 - Permission to shoot from dawn to dusk.
 3. Precautions need to be taken to maintain a strict control on all kind of filming done within Corbett Tiger Reserve. Any violations which are reported to the Tiger Reserve authorities will be taken up with the broadcasting agencies.
 4. There seems to be an absence of a clear policy for filming for TV news programmes. A variety of cases have been encountered where filming was done by TV programme with permission from CWLW. A clear policy is required as the number of such cases is on increase. It is recommended that except for accredited filming by Doordarshan for news, no other agency will be exempted from payment of filming fees and security deposits. Even private producers making films or TV programme for Doordarshan will be required to pay the filming fees. However, Director, Corbett Tiger Reserve, may give permission for bona fide filming for a maximum of 2 days to TV programmers for coverage for news purposes as has been done in the past. Foreign news crews will, however, be still required to obtain prior permission from the CWLW. No filming will be permitted by any foreign crew without valid permission.
- g. Film Shows:** At present different wildlife related films are regularly shown at Dhikala. This practice should be continued and improved.

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h. Film Library: Corbett Tiger Reserve regularly receives footage of TV Programme and soft copies of wildlife sequences from enthusiastic visitors and Tiger Reserve officials and staff. This material should be maintained in the form of a film library in the Dhangarhi Visitor Centre.

i. Production of in-house films: Film should be made on the works & achievements of Corbett Tiger Reserve on regular intervals. This will help improve the image of Forest Department in general & Corbett in particular.

j. Records: It is very important that a proper record is maintained of all permissions given for filming in Corbett Tiger Reserve. Such record will be very helpful in case of any legal disputes. The earlier practice of simply attaching permission letters into a loose file without any paging or record is unsatisfactory and has been done away with. Now, a *film register* is being maintained in the Research range in which all the details of applications followed by the permission given to the fees received and filming are meticulously entered and kept for future references.

k. Libraries: Dhikala Tourist Complex has a small visitor library with over 1000 books on natural history, wildlife and other subjects. It is quite popular with the visitors. The visitors should be encouraged to take books into their room for overnight reading after depositing a security amount. The library should be periodically augmented with new books and visitors can be made members by donating books and journals. Newspaper cutting related to wildlife and forests are obtained and kept in the Dhikala library for the benefit of the visitors. A small interpretation facility about the life of Jim Corbett along with various interesting issues related to the Tiger Reserve has been added on the eve of Platinum Jubilee of Corbett National Park-2011.

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Chapter-12

Miscellaneous Issues

12.1. Housekeeping of Departmental Elephants:

Departmental elephants are a very important part of wildlife management. They are very useful for traversing the interior areas of forest especially in the months of rainy season. They also cater to the demands of tourist & other VVIPs to roam around the permissible areas of Dhikala and Bijrani tourism zone.

The Corbett Tiger Reserve presently maintains seven female departmental elephants whose services are utilised for intensive patrolling in the monsoon and for wildlife tourism. All seven elephants are working in the core area out of which five elephants are stationed at Dhikala Range and two at Bijrani Range.

First and foremost, the number of camp elephants in Corbett Tiger Reserve should be immediately augmented by bringing new elephants from states like Karnataka which have a surplus.

Giving their invaluable importance for monitoring the habitats and patrolling against intrusion of potential poachers, it is imperative that the departmental elephants stay in good health. This calls for an effective housekeeping, regular health checkups and timely prophylaxis of the pachyderms. The various issues relating to housekeeping are governed by the guidelines issued by 'Project Elephant' authority.

Prescriptions:

- Range Officers Dhikala and Bijrani shall remain fully responsible for the up-keeping of the elephants under their jurisdiction.
- A Register will be maintained for day to day activity of all elephants & it will be duly signed by Mahaouts & counter signed by senior functionaries like Forester/Deputy Ranger.
- On the basis of above a monthly report will be prepared by concerned Forester/Deputy Ranger & sent to H.Q. for the through Range Officer for further perusal.
- Elephant will be bathed daily in summers & at least twice in a month in winter.

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- Daily diet of elephant will be checked by forest guard & monthly report of the same should be maintained in a stock book & periodically monitored by the Range Officer. Tender for annual diet (Wheat Flour, Sugarcane for winter, and Jaggery) of elephants should be finalised by the end of September.
- Under no circumstances the elephant should carry more than four adults.
- Elephant should be provided with high shade to protect it from extreme weather conditions
- Service of elephants should be avoided in extreme heat during summer season.
- Apart from the *mahawats*, a *characutter* should also be sanctioned for each elephant to ensure the basic housekeeping.
- Captive elephants tend to lose their inherent disease resistance owing to substantial change in their feeding habits. Many diseases like Kandi, Anthrax, Blue Tongue, Rinderpest, TB, Pasteurellosis, Trypanosomiasis are potential health hazards for departmental elephants. Though the information regarding susceptibility and prevalence of diseases is meagre, the disease like kandi is common in animals of this area. In distant past, four elephants had died of this diseases. Captive elephants are also prone to parasitic infections of alimentary tract.
- For maintenance of health and well being of captive elephants an annual health monitoring programme is essential before each vaccination schedule. Monthly health check-up would be done by veterinary doctor to ascertain the status of the elephants. Emergency medicines prescribed by veterinary doctor should remain in Range stock. Comprehensive yearly check-up should be done by senior officers like S.D.O. & Deputy Director. This will be done in the presence of veterinary doctors or their panel. The annual health-monitoring schedule must include the following parameters:
 1. Pulse and respiration rate
 2. Body weight
 3. Blood examination for blood parasites, blood chemistry and haematology
 4. Urine and faecal examination for parasites
 5. Care of feet
 6. management of nutrition

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12.1.1. Shelter, food and water:

a. Shelter

Shelter is a critical element in any elephant facility or camp. Corbett Tiger Reserve has maintained a high standard for the maintenance of the seven elephants.

However the following prescriptions has to be followed to ensure good housing.

- The shelter should be able to protect the elephants from sun and rain.
- Have good ventilation. Ideally housing should be open on all four sides and the roof should be at least six metres tall.
- Have a floor that is easy to clean, not humid, and not slippery. Floors are of two types, tightly packed earth and concrete, and each has advantages and disadvantages. Elephants are likely to have fewer problems with footpads and nails on packed dirt floors, but concrete floors are easier to clean.
- Have a system where excretions and refuse are easily cleaned and which has channels for draining water. The best system for cleanliness is the mahout himself, for he has to clean up after his own animal. There should be a drainage system for water and the floor should be smooth without any depressions which can collect excretions and refuse. The floor should also have a slight slope towards the drain.
- Have strong anchoring points for chains. Such points should have bases that are buried 1 to 2 metres deep in the ground. The posts supporting the roof should not be used as chaining points.

b. Water:

The elephant is an animal that is very susceptible to overheating, and consequently it is very fond of bathing and covering itself in mud. A mature elephant drinks approximately 120 litres of water daily, by sucking up water in its trunk (about 10-15 litres at a time) and then spraying it into its mouth. It is thus essential to always have clean water available for both drinking and bathing. The elephants of Corbett Tiger Reserve are extremely fortunate to have easy accessibility to natural flow of water in the Ramganga River and many natural streams at Dhikala and Bijrani respectively. The Mahavat should be aware of the fact that allowing elephants to drink immediately after hard work when the animal is overheated is likely to cause the elephant to choke and even to cause death.

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c. Food:

Food has incredible impact on the health of elephants. Proper nutrition makes for healthy elephants resistant to disease. The present practice of feeding which includes bread, jaggery, vegetable oil and sugar cane (for winter) supplemented by green fodder as prescribed by veterinary doctor.

Feeding of Elephants:

The Range Officer should ensure timely supply of wholesome feed with variety in required quantity to each elephant supplemented by green fodder as prescribed by veterinary doctor. Apart from the above each elephant should be provided with sufficient quantity of succulent food during hot climate. Elephants should be provided with sufficient potable drinking water to the elephant, preferably from a river or any other source of running water (natural stream).

Natural food:

Natural food is the best food for elephants, because it is what they have eaten through millions of years of evolution. Wild elephants will eat as many as 200 plant species during the course of a year, but their preferred staple food is grass and bamboo (which is a kind of grass). Natural food is the natural source of full range of nutritional ingredients. In addition to that natural food is free from chemical contaminants, most importantly insecticides, pesticides and fertilizer residues.

The older mahouts are masters of natural elephant foods. The young mahouts might know little, but their proper teachers are not books but rather the older mahouts. It should be endeavoured to take expert service of old/retired mahouts to train the young mahouts otherwise much of the older mahouts' knowledge about food plants found in the wild will surely die out unrecorded in the next few decades.

12.1.2. Guidelines for tethering elephants:

- Never tether an elephant in a place that is steep and slippery because if the elephant falls it can be crippled or killed.
- Mahouts must check chains to ensure they have not kinked, making them easily caught in trees or rocks, rendering the elephant immobile and vulnerable to fires and attacks from other elephants.

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- The place should be clear of metal scraps, nails, sharp pieces of wood, glass shards, etc.; these must all be removed.
- The elephants should not be tether too closely together because their chains can get entangled, which is dangerous.
- Never tether an elephant near very bright lights at night because the elephant will not sleep and will stare at the lights until its eyes get irritated and susceptible to infection.

12.1.3. Primary medical care:

The mahouts should be imparted training about primary medical care which will enable them to treat minor injuries. Primary medical care is very useful because the mahout can provide proper care for his elephant before the veterinarian comes to treat the animal. He should be able to provide follow-up care as prescribed by the veterinary doctor.

A. Common Medicines and drugs:

There are certain common medicines and drugs that the mahout can easily keep with themselves in order to treat minor or emergency health problems. Most of the medicines to be kept at hand are for external use (eye drops, pain-relief ointments, oral pain relievers, etc.) and are useful in emergency situations where there is no veterinarian nearby or where the veterinarian cannot be contacted and the mahout or manager must provide the initial treatment.

B. Medicines used on wounds:

1. Tincture of iodine: Used for treatment of fresh wounds.

2. Povidone-iodine 1%: A dark brown colour like tincture of iodine, but ten times less concentrated and not so irritating to wounds. It is beneficial for treating fresh wounds, sores, scaldings, etc., where it should be mixed one part Povidone-iodine 1% to ten parts water. Dilution is essential because stronger solutions will cause irritation. When washing infected tusks, Povidone-iodine 1% should be diluted 20 to 1.

3. Hydrogen Peroxide: A colourless transparent liquid used for cleaning infected and decomposing/rotten wounds that have pus. It should be used only once or twice at the initial treatment for cleaning the wound in order to clear the pus in a wound. It should not be used on a fresh wound.

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4. Antibiotic ointment & spreay: A yellowish cream used for treating chronic wounds, ulcers, decomposing/rotten wounds, scaldings, etc., two or three times daily. Antibiotic ointments stay with the wound reasonably long and help to promote tissue growth. A disadvantage of the stickiness is that it easily attracts dust and dirt to the wound. After application, it helps if the wound can be covered with gauze.

5. Anti-insect powder: A mixture of insect-killing compounds and antibiotics that helps wounds to heal. Available at veterinary supply stores. It should be sprinkled on wound to prevent formation of maggots.

C. Medicines for the skin and for muscles:

1. Inflammation-reducing medicines for the skin: Used after conditions such as damage from chemicals, insect bites, etc.

2. Analgesics for muscles and tendons: Used for strains, sprains, swellings, etc. There are two types, ointments and oils.

D. Eye medicines:

Eye drops and Eye ointments, prescribed by veterinary doctor should be available with Range Officer who may administer the same after due consultation with the doctor.

E. Equipments at an elephant camp:

This equipment is used by mahouts both for medical care and also daily needs in routine camp life.

- A plastic or metal **5-litre bucket** is necessary for bringing the elephant drinking water, for bathing the elephant, for cleaning wounds, for giving pellet foods, for unhusked rice, etc. There should be at least two buckets for each elephant. The buckets should be free of any bad smell and chemical contamination. If either the vessel or the water has a bad smell, the elephant is likely to be unwilling to drink it. The vessel must be washed thoroughly and left full of water until any smell has disappeared before using it to water elephants.
- A **thermometer** for taking temperatures of elephants that seem not well.

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- A **50 cc. plastic syringe**. For washing wounds or spraying wounds in situations where the elephant is not willing to have the wound handled. The syringe can be boiled and reused but it should never be cleaned or sterilized with an antiseptic.
- A **plastic syringe** with a capacity of 1 to 3 cc. to be used to apply eye drop medicine. The eye drop applicator can be re-used but it should be used for only one elephant. Keep it in a clean place.
- **Clean cloths** of about 1x2 feet square. There should be 3 to 4 clean [sterile] cloths for each elephant. They are used for cleaning the skin, for cleaning skin around wounds, cleaning medical implements, etc. Under some conditions such cloths might be used instead of gauze for wiping tears from the elephant's eyes or cleaning before applying eye drops. Use clean cloths only with one elephant. The cloth used should be soft and highly water absorbent, such as terrycloth. Cloths should be boiled after each use for 15 minutes.
- **Small garbage bags** are excellent for soaking elephants' feet whenever they get infected.
- **Pliers** for grabbing and pulling out nails, glass shards, stones, or other objects embedded in the elephant's foot.
- **Liquid soap**, such as dishwashing detergent, for cleaning tools.

12.1.4. Determining health:

Though the Mahaouts are aware about the general condition of the elephants it is prescribed that they should be regularly made aware about the following observations:-

a. Indicators of good health:

1. The elephant shows constant movement as seen in flapping ears, sweeping tail, and using the trunk to throw dirt.
2. The elephant constantly eats and is always ready to eat. The dung shows the food to be well chewed. The dung has no bad smell.
3. The eyes are clear, bright and well lubricated. The inside of the mouth and the trunk, the tongue, and other soft tissues are a rich pink colour.
4. The skin is thick but soft and feels moist. The skin above the toe nails is moist.

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b. Indicators of bad health:

- The elephant is restless. The ears, tail, and trunk hardly move.
- The elephant is exhausted, as noticed by little movement and the end of the trunk being rested on the ground for long periods of time.
- The elephant stands, eyes closed, and frequently yawns.
- The elephant is agitated and sometimes goes to the ground and bellows. It uses the trunk to gather dirt and apply it to the affected area. It uses the trunk to blow air on the affected area.
- The elephant eats and drinks very little or not at all.
- The eyes are dull, sunken, and with copious tears. There is a mucous-like discharge from the trunk. The skin is dry and stiff to touch.
- The inside of the mouth, the tongue, and the inside of the trunk are very pale or, alternatively, very muddy or bright red rather than the normal pink. The skin above the toe nails is dry.

c. Vaccination & De-worming Schedule:

The vaccination programme should be as per the prevalence and previous reports on outbreaks of infectious diseases in the area. It is essential that vaccination should be completed before monsoon. Sometimes, though rarely, vaccine may cause reaction in the form of anaphylaxis. Therefore, it is desirable that the vaccination should be done in the supervision of qualified wildlife veterinary doctor.

S.No.	Vaccine/ Medicine	Month of Vaccination	Periodicity
1.	FMD polyvalent vaccine	May/ June-Nov./ Dec.	Every 6 months
2.	HS Vaccine	April/ May	Annually
3.	BQ Vaccine	April/ May	Annually
4.	Anthrax Vaccine	April/ May	Annually
5.	De-worming schedule	March-Sept.	Every 6 months

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d. Miscellaneous provisions:

1. Arrangements should be made for medical check-up of the mahouts and 'chara-cutters' responsible for upkeep of the elephant at least once in two years to ensure that they do not have diseases, which may infect the elephant.
2. In the event of attack of anthrax, rudderpost, hemorrhagic septicemia, surra or any other contagious diseases the Range Officer shall inform to the Field Director, who will ensure necessary treatment of the affected animal by the veterinary doctor. In the event of death of the animal, extreme care should be taken for disposal of the carcass under the supervision of expert veterinary doctor, shall follow the instructions issued by the authorities regarding the treatment of the animal of disposal of the carcass. The Chief Wildlife Warden or an officer authorized by him shall ensure proper veterinary assistance and advice;
3. Any elephants having pregnancy of 12 months or above, or any cow elephant having a sucking calf of age below 6 months, or any elephant of height below 5 feet should not be put into any work.
4. No nylon ropes shall be used for tying the elephants and care should be taken that the weight of the chains shall commensurate with age and health of the elephant;
5. It is not permitted to use any type of harness which may expose the back or other sensitive organs of the elephants to pain and injury;
6. No permit should be granted to train elephant by a trainer who is not approved by the Chief Wildlife Warden.
7. In the event of the death of an elephant, post-mortem examination of the elephant shall be done by a veterinary doctor and shall submit the report to the Chief Wildlife Warden or the officer authorized by him within 07 days of the death.

e. Work load of Elephant:

1. The scale of load including gears, riders and materials for the elephant shall be as follow:

Height of elephant	Load
Below 1.50 m	not to be used for carrying load.
1.50 m to 1.80 m	not exceeding 150 kg (to carry only fodder and trainer)

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1.81 m to 2.25 m	not exceeding 200 kg
2.26 m to 2.55 m	not exceeding 300 kg
above 2.55 m	not exceeding 400 kg

2. The load scale shall be reduced by 50% in hilly or other difficult terrain;

f. Retirement of Elephants:

- (a) An elephant shall normally be allowed to retire from its work on attaining an age of 65 years.
- (b) Healthy elephants above 65 years of age shall be allowed to be put to light work under proper health certificate from the veterinary doctor.

g. Care of Old Elephants:

The departmental elephants are eligible for proper care after their retirement. They should be looked after till their death.

h. Records to be kept:

The Range Officer concerned (Dhikala and Bijrani) shall maintain the following records and registers in respect of the elephant in the format given below and such records and registers shall be produced before the Sub-divisional Officers and other senior officers for inspection at such time as may be called for.

- 1. Vaccination record.
- 2. Disease and treatment record.
- 3. Feeding register.
- 4. Movement registers.

1. Vaccination Record:

Following are the parameters to be maintained

- (a) Name of the Elephant:
- (b) Sex:
- (c) Age:
- (d) Date of Vaccination :
- (e) Name of Disease:
- (f) Due date for next Vaccination:
- (g) Signature of the Veterinary Surgeon:

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2. Disease and Treatment Record:

Following are the parameters to be maintained

- (a) Name of the Elephant:
- (b) Sex:
- (c) Age:
- (a) Date of Treatment by Veterinary Surgeon:
- (b) History:
- (c) Description:
- (d) Diagnosis :
- (e) Treatment :
- (f) Prevention Measure:
- (g) Signature of Veterinary Surgeon with date:

3. Feeding Register:

Following are the parameters to be maintained

- (a) Name of the Elephant:
- (b) Sex:
- (c) Age:
- (d) Ration prescribed by the Veterinary Surgeon:
- (e) Type of Food Quantity given :
- (f) Signature of Mahout with date :

4. Movement Register (For Patrolling in the monsoon season)

- a) Name of the Elephant:
- b) Sex:
- c) Age:
- d) Place to Move:
- e) Time:
- f) Signature of the Mahout:
- g) Counter Signature of the Range Officer with date :
- h) Starting Point-----Date-----
- i) Ending Point-----Date-----

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i. Breeding Policy

Facilities may be provided for breeding female elephants at least twice in a life span of 40 years. Financial assistance to meet the full expenses during pregnancy and motherhood will be given by the Forest Department.

j. Inspections:

A team constituted by the Chief Wildlife Warden (where an officer not below the rank of a Ranger officer, Forest Veterinary Doctor and a representative of SPCA- Society for Prevention of Cruelty to Animals) will inspect the elephant at least once in a year. This will be applicable to the resort owners who have captive elephants used for tourism on the periphery of the Tiger Reserve and the seven departmental elephants of Corbett Tiger Reserve. The owners of the private elephants shall inform the Forest Veterinary Officer about the availability of elephants, stating the locations for inspection. For easy identification of the private elephants the owners will continue the practice of maintaining the system of micro-chipping of the elephants. The certificates issued after inspection will be required at the time of renewal of license of the private elephants.

12.1.5. Act which are tantamount to cruelty to elephants: - The following acts shall be considered as acts of cruelty to elephant and is prohibited:

- (a) beating, kicking, over-driving , over-loading, torturing or treating any elephant so as to subject to it to unnecessary pain or suffering , or being owner permitting, any elephant to be so treated;
- (b) employing in any work or labour or any purpose, any elephant which by reason of its age or disease, infirmity, wound, sore or other cause, if unfit to be so employed, or being owner permitting any such elephant to be employed;
- (c) wilfully and unreasonably administering any injurious drug or injurious substance to an elephant or uses drug or intoxicants to control elephants particularly to suppress musth without proper veterinary advice;
- (d) conveying or carrying whether in or upon any vehicle or not an elephant, in such a manner or positions as to subject it to unnecessary pain or suffering or cause accident;

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- (e) keeping or confining an elephant, in any cage or receptacle , which does not measure the specification given in rule 4 of the guideline;
- (f) keeping for unreasonable time, an elephant chained or tethered upon an unreasonable short or unreasonably heavy chain of cord;
- (g) using an elephant for drawing any vehicle or carrying any load, more than nine hours a day or for more than five hours continuously without a break or rest for the elephant or exposes the elephant to hot climatic condition without ensuring enough succulent food and electrolytes;
- (h) failing to provide an elephant, with sufficient food, drinking water or shelter;
- (i) abandoning an elephant in circumstances, which will tender it to suffer pain by reason of starvation or thirst;
- (j) offering for sale any elephant, which is suffering from pain by reason of mutilation, starvation, thirst, over-crowding or other ill treatment;
- (k) not providing adequate veterinary care to sick, injured or pregnant elephant;
- (l) cutting the tusks of bull elephant too short so as to expose horn cord/pulp;
- (m) forcibly weaning away an elephant calf below 2 years of age from its mother;
- (n) using heavy chains and hobbles with spikes or sharp edges or barbed wires for tying elephants;
- (o) using "peti" (belly band) on cow elephants in advanced stage of pregnancy;
- (p) using pad and Haundah of improper size on working elephant exposing its spinal cord to injuries;
- (q) marching a sick, injured or pregnant elephant or young calf over a very long distances or for a long duration at a stretch;
- (r) marching an elephant over tarred roads or otherwise, during hottest period of the day and for a long duration at a stretch without rest for religious or any purpose;
- (s) transporting elephants on trucks of inadequate size or trucks with uneven floor, or tying them in an improper manner-subjecting them to severe jerks during journey by trucks;
- (t) transporting elephants in trucks for over 12 hours at a stretch;

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- (u) transporting elephant through any conveyance without making arrangement for adequate fodder and drinking water during the journey;
- (v) carrying load on an elephant without proper pad;
- (w) making an elephant carry load unevenly balanced on its back;
- (x) making the elephant to stand in scorching sun for long duration, or put the ceremonial gears or decoration for unreasonably long duration, or bursts crackers from or near the elephants for ceremonial purpose;
- (y) using an elephant in such a manner so as to cause any injury. over-stress or strain to the elephant for tourism purpose;
- (z) using an elephant for sports and games such as tug-of-war, foot ball etc. in such a manner so as to cause over stress or strain to the elephant;

12.2. Wildlife Health Monitoring and Disease Surveillance:

Wildlife health monitoring is an important issue while discussing the management of a Protected Area. The purpose of its monitoring is to control & prevent the outbreak of communicable diseases in wild animals. Secondly to rescue & rehabilitate injured and diseased animal & conduct investigations in cases of deaths involving Schedule I animals. To monitor its following actions are proposed.

- 1) The Corbett Tiger Reserve has started the practice of appointing a fulltime Veterinary Doctor on contract since 2009. Since May 2014, a full time veterinarian has also been posted here on deputation from the Animal Husbandary Department, Govt of Uttarakhand. A well equipped veterinary facility with all kinds of relevant medicines including tranquilising drugs, deep fridge, tranquilizing equipments, post-mortem kits, various instruments for rescue operations, etc. The present practice of exposing the doctor for various skill upgrading workshops and trainings conducted by WII and other institutes of repute will be continued. The veterinary doctor of Corbett Tiger Reserve will be given all facilities to study and prevent outbreak of any kind of diseases to the wildlife. The doctor will be available not only for the Corbett Tiger Reserve but also to the adjoining forest divisions of the Corbett Landscape.
- 2) Specialized training should be given to willing field staff to deal with diseased animals. All domestic animals within 5 Km radius of the core area should be

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inoculated for communicable diseases as prescribed in Wildlife Act 1972. The vaccination programme should be as per the prevalence and previous reports on outbreaks of infectious diseases in the area. It is essential that vaccination should be completed before monsoon. Sometimes, though rarely, vaccine may cause reaction in the form of anaphylaxis. Therefore, it is desirable that the vaccination should be done in the supervision of qualified wildlife vet. Regular monitoring will be carried out about the health of wild animals through periodic surveys & short term & studies.

- 3) Monitor the water quality of water holes & disinfects it in a proper way on the advice of veterinary doctor.
- 4) Adequate equipments, rescue equipments and medicines will be remain available with the veterinary doctor.
- 5) Good working relation should be maintained with the WII, I.V.R.I. & Pantnagar University.
- 6) Proper record of dead animals should be maintained.
- 7) Animal remains should be disposed off as per standing instructions.
- 8) Departmental elephants should be regularly checked to ward off any possibility of health risks.
- 9) Research officer/ or concern R.O. will submit a quarterly reported as regards the disease within & outside the Tiger Reserve especially within 5 Km range of the Tiger Reserve.
- 10) Further some arrangement has to be made for the willing staff to train about the health conditions of wild animal & symptoms of important diseases. The training will be organized with the help of Wild Life Institute of India (WII) Dehradun, Indian Veterinary Research Institute (IVRI) Bareilly & Pantnagar University. Corbett Tiger Reserve authorities will hold at least one meeting in a year with the various experts available in this field.

12.2.1. Disease Surveillance:

Surveillance of diseases inflicted on wildlife depends upon promptness of detection and reporting by the field staff. In the case of wild animals, detection of disease is only based on observation on animal behaviour and their day to day activities.

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Concept of landscape epidemiology that associates the occurrence of a certain disease with the existing landscape may also be kept in the mind. The knowledge of animal species typical to the given area and particular disease carried and spread by them may be extremely useful in disease detection and treatment. If such a disease is detected, its prophylactic treatment by immunization or water hole treatment can be done. To protect and maintain wildlife in PA with good health, it is necessary to conduct surveillance of diseases of ó

A. Native wild population

B. Domestic cattle of adjoining villages

12.2.2. Parameters for the monitoring of wild animals health:

1. General examination (i. Physical examination ii. Clinical observation)
2. Laboratory investigations (i. Faecal examination, ii. Heamatological examination, iii. Serological examination)
3. Study of kill / mortality
4. Detailed post-mortem examination
5. Collection of material for laboratory examination

Detailed criterion for assessment of body condition of ungulates and elephants have been provided in Fundamentals of Wildlife Management by Dr Rajesh Gopal, Second edition 2012, pp1010. These should be widely adopted for day to day monitoring.

The chapter has not the scope to deal with detail about the general examination, laboratory investigation, study of kill / mortality, post-mortem examination and collection of material of laboratory examination. This will be taken care of by the Tiger Reserve Veterinary Doctor.

12.3. Mortality Survey:

In a simple term mortality can be defined as the death rate in particular population. It begins even from the egg stage and thus, has got a major role to play in population growth of individual species and then survival.

öDeath rateö is the number of deaths occurring in a given time interval divided by the average population. It can also be expressed in terms of probability of dying

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(mortality rate) which is the number of individuals that died during a given period of time divided by the number alive at the beginning of that period.

It is important to find out the probability of living as the number of survivors is more important for the population than the number of dying or dead individuals. It is therefore, better to find out "mortality rate" and express it in terms of "life expectancy" i.e. the average number of year to be lived in future by numbers of a population. Mortality in animals can take place due to different reasons. The reasons may be following:

- 1) Inbreeding.
- 2) Disease.
- 3) Drought.
- 4) Other environmental stress.

The first two are very common & appropriate management steps need to be taken like increasing the area of along with increasing the quality of habitat and also the control on migratory population. If mortality in animals is related to environmental stress it should be stated e.g. droughts, acute cold etc.

The mortality survey of Schedule I animals can be entrusted to the research wing of Corbett Tiger Reserve under technical guidance of the WII. The primary objective of such study is to identify different causes of mortality and their effect on their population dynamics. Prescriptions has to come from such studies to minimise un-natural deaths of wildlife.

12.4. Standard operating procedure for dealing with tiger death:

1. **Subject:** Tiger death/seizure of body parts
2. **Reference:** Advisories of NTCA/Project Tiger on the subject
3. **Purpose:** To ensure that the causative factors for tiger death are ascertained and taken to logical conclusion in the interest of tiger conservation.
4. **Short summary:** This Standard Operating Procedure (SOP) provides the basic, minimum steps which are required to be taken at the field level (tiger reserve or elsewhere) for dealing with incidents of tiger mortality where the carcass is available or the body parts have been seized.

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5. **Scope:** The SOP applies to all forest field formations including tiger reserves besides other areas where the incident has occurred.
6. **Responsibilities:** The Field Director would be responsible in the case of a tiger reserve. For a protected area (National Park / Wildlife Sanctuary), the concerned protected area manager would be responsible. In the case of territorial forest divisions and other areas (revenue land/conservation reserve/community reserve/village/township) the Wildlife Warden, as per the Wildlife (Protection) Act, 1972 (under whose jurisdiction the area falls) would be responsible. The overall responsibility at the State level would rest with the Chief Wildlife Warden of the concerned State.
7. **Detailed instructions for the procedure to be followed in tiger death / seizure of body part / incident reported but no body part / carcass available but for corroborative field evidences:**
 - (i) **At Scene of crime / incident (responsibility: Range Officer, Assistant Director /Assistant Conservator of Forests, Deputy Director / Divisional Forest Officer):**
 - Reach the spot at the earliest, while informing the Field Director/Conservator/ Chief Conservator of Forests having jurisdiction
 - Call for Investigation Team to the spot immediately
 - Cordon off the area with the help of rope/tape so that evidences are not disturbed
 - Take photographs of undisturbed site/video record from different angles for comparison with camera trap recordings (if done in the area)
 - Divide the whole area into grids/circles for investigation and collection of evidences
 - Note down all finer details, date, time, GPS location, weather etc.
 - Do not manipulate evidences
 - Record foot prints of animals/human/tyre marks of vehicles if any
 - Search & collect all possible evidences carefully in original conditions, while preserving (if needed)
 - Search for evidences at ground level, eye level and above eye level (eg. hideout/machan/bullet marks on trees/freshly cut branches/traces of kindled fire on the floor/burnt matchsticks etc.). Samples to be collected from the spot may include:

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Blood, body-fluids, tissues, hair/fur/teeth/bone pieces etc., gun powder, cloth fibre, paint chips, soil, cartridge case, bullets, foot prints, tyre marks, gutka wrapper, match sticks, food items, water sample from waterhole etc.

- Properly label and seal the samples collected.
- Search the leads/trails/routes of escape/exit. Use sniffer dogs for leads (if available).
- Record external evidence from carcass: wounds, bullet injury/marks, symptoms of poisoning etc., apart from body measurement (if possible).
- Go for Post Mortem (PM) if team available or otherwise keep the carcass in deep fridge (available at Head Quarters, Ramnagar and Wildlife Training Centre, Kalagarh).
- PM should be carried out between sunrise and sunset.
- While doing PM - collect sample of visceral content and tissue sample. Send visceral sample for forensic analysis to a reputed laboratory; send the tissue sample to the Wildlife Institute of India (WII) or a recognized institute within the country having domain expertise for DNA profiling.
- Finalize the PM report, and send the same to the Chief Wildlife Warden (CWLW) under intimation to the National Tiger Conservation Authority (NTCA). In case the PM report is under process, send a preliminary report to the Authority indicated immediately.
- Dispose of the body as per rules in the presence of the competent authority. In case of seizures of body parts, the same may be required as evidence for prosecution in the courts of law and hence in such situations do not dispose the same.
- Issue a departmental preliminary offence report (POR)/FIR.
- Prepare a seizure memo with signature of accused (if present), witnesses etc. along with a site map, and a species identification certificate issued by a forest officer, not below the rank of an Assistant Conservator of Forests.

(ii) If suspect(s) is arrested:

- Collect name, address, biometric details, photographs, height, weight etc. of suspect(s).
- Prepare an arrest memo with ground/basis for arrest, citing reasons/basis for arrest

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- Record statements of suspects(s) and/or witness(s) along with signatures.
- Conduct medical examination of arrested suspect(s) and produce before the Magistrate having jurisdiction for remand and further investigation.
- Based on interrogations and leads, thoroughly investigate the matter, establish backward and forward links, arrest other links involved.
- Prepare a final report, charge sheet and file in the court of law.
- Submit a final report with conclusion regarding cause of death to the Chief Wildlife Warden under intimation to the National Tiger Conservation Authority through the Field Director/Wildlife Warden/Conservator/Chief Conservator of Forests having jurisdiction.

(iii) Actions required at the Office of Field Director/Wildlife Warden/ Conservator/ Chief Conservator of Forests having jurisdiction/Control Room:

- Send a preliminary intimation to the NTCA and Chief Wildlife Warden about the incident (SMS/telephonic call/fax etc.) immediately.
- Constitute a Post Mortem team as per the NTCA protocol.
- Send an investigation team/issue office order.
- Analyze the past and present intelligence reports for possible leads, cell phone records of history sheeters/suspects, check with neighbouring districts/divisions/States.
- Deploy vehicular checking on barriers, inform local Police and issue red alert for checking vehicles at all exit points.
- Check the photographs of carcass and compare with the National Repository of Camera Trap Photographs of Tigers (NRCTPT) in NTCA or the Phase-IV camera trap monitoring database or other research database to establish the identity/source area.
- Issue an official version of the incident through the Chief Wildlife Warden.
- Send the biometric details of suspect(s) to the NTCA for alerting other Field Directors/States/Wildlife Crime Control Bureau, and for establishing possible linkage with other crimes elsewhere.

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- Closely monitor/supervise the investigation, liaise with Police Department, Tiger Cell of the State (if available), Wildlife Crime Control Bureau and other investigation agencies.
- Prepare a '**Final Report**' and submit to the Chief Wildlife Warden under intimation to the NTCA. Since all tiger deaths are treated as 'Poaching Cases' by the NTCA unless proven otherwise, justification for categorizing a tiger death as 'Natural' should be provided alongwith evidences.
- All cases of poaching / seizure should be dealt in the courts of law having jurisdiction.
- Monitor the case ongoing in the court of law till its final disposal by the Court.
- After the Court's order, analyze the case for corrective actions (if needed) for further appeal.
- If the decision of the Court is satisfactory, close the case and report to the Chief Wildlife Warden under intimation to the NTCA.

(iv) Role of Forensic Science in Wildlife Crime:

A Hindi version on the above subject has been issued by the Office of Chief Wildlife Warden, Uttarakhand which is given as **Annexure-12/1**.

12.4.1. Checklist for complaint (charge sheet) (Ref: advisory issued by NTCA):

- Check the complaint/charge sheet whether relevant sections of the Wildlife (Protection) Act, 1972 and other Acts have been invoked viz. Section 2, 9, 50 etc. of Wildlife (Protection) Act
- Statements under Section 50 (8) of the Wildlife (Protection) Act, 1972 of witnesses and confession statements of suspect(s), (besides relevant sections of other laws)
- Site plan of the crime scene
- Status of site of the said offence ó protected area/tiger reserve/forest division/other area, along with a copy of Government notification (in case of tiger reserve/protected area/reserved forest/protected forest)
- Post Mortem report

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- Expert identification report from institutions like Wildlife Institute of India, Dehradun or Zoological Survey of India or reputed institution having domain expertise as animal article if seized
- Copy of the specimen seal affixed on the materials sealed
- CD of photographs/video recording done during investigation
- Copy of ownership papers of house/seized vehicle, identity proofs/cards etc.
- Copy of relevant section of the Wildlife (Protection) Act, 1972, and/or any other Act
- Annexure containing list of documents and witnesses
- Forensic report of visceral contents, ballistic report (if applicable)

12.4.2. Note on actions needed for anti-poaching/tiger protection (Ref: advisory issued by NTCA):

- In-depth thorough investigation on EACH CASE with a final report (should not be left un-resolved/ open ended).
- Investigation must examine forward/ backward linkages, trans border ramifications, cracking poacher-carrier-trader-consumer nexus/network.
- Close monitoring with the help of information technology/informer network on suspects/history sheeters.
- Examine Post Mortem (PM) and viscera reports.
- Intensive patrolling besides other anti-poaching operations should be done in sensitive areas.
- Ensure multi-disciplinary approach and cooperation in case of investigation and intelligence sharing. Wildlife authorities should enter into MoU with IB/LIU for intelligence sharing, MoU with Paramilitary forces like ITBP, CRPF, SSB etc. for joint patrolling in sensitive border areas, through the State Government and NTCA.
- Review of each case of mortality regularly at the highest appropriate level.
- Ensure review and coordination meeting with Judicial, Police and Revenue Officials on monthly basis.

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- Each Tiger Reserve must have a highly trained team of officers/ Rangers for investigations of tiger related crime with an modern & scientific tools of forensic science. The State Forest Department, through the National Tiger Conservation Authority should organize training of such selected elite 'Investigating Teams', if required.
- After complete investigation, proper prosecution of cases in the appropriate courts of law should be ensured through regular monitoring of pending cases at the highest authority at the appropriate level.
- Prepare State/Reserve level of database/history sheet/dossier of each convicted criminals and suspects, while apprising the NTCA periodically
- Ensure that each Tiger Reserve has a Security Plan in place as per the guidelines issued by the NTCA
- Ensure appropriate resources to deal with poaching threats and investigation
- Since tiger is a highly endangered species falling in Schedule-I of the Wildlife (Protection) Act, 1972, weekly monitoring of tiger offence cases ongoing in courts of law should be done for expediting the same by the Field Director/Wildlife Warden/Conservator/Chief Conservator of Forests having jurisdiction
- The Chief Wildlife Warden of the State should also review the progress of each tiger case ongoing in various courts of law every fortnight. The Principal Chief Conservator of Forests (HOFF) of the State should also review the same on a monthly basis, while apprising the NTCA.

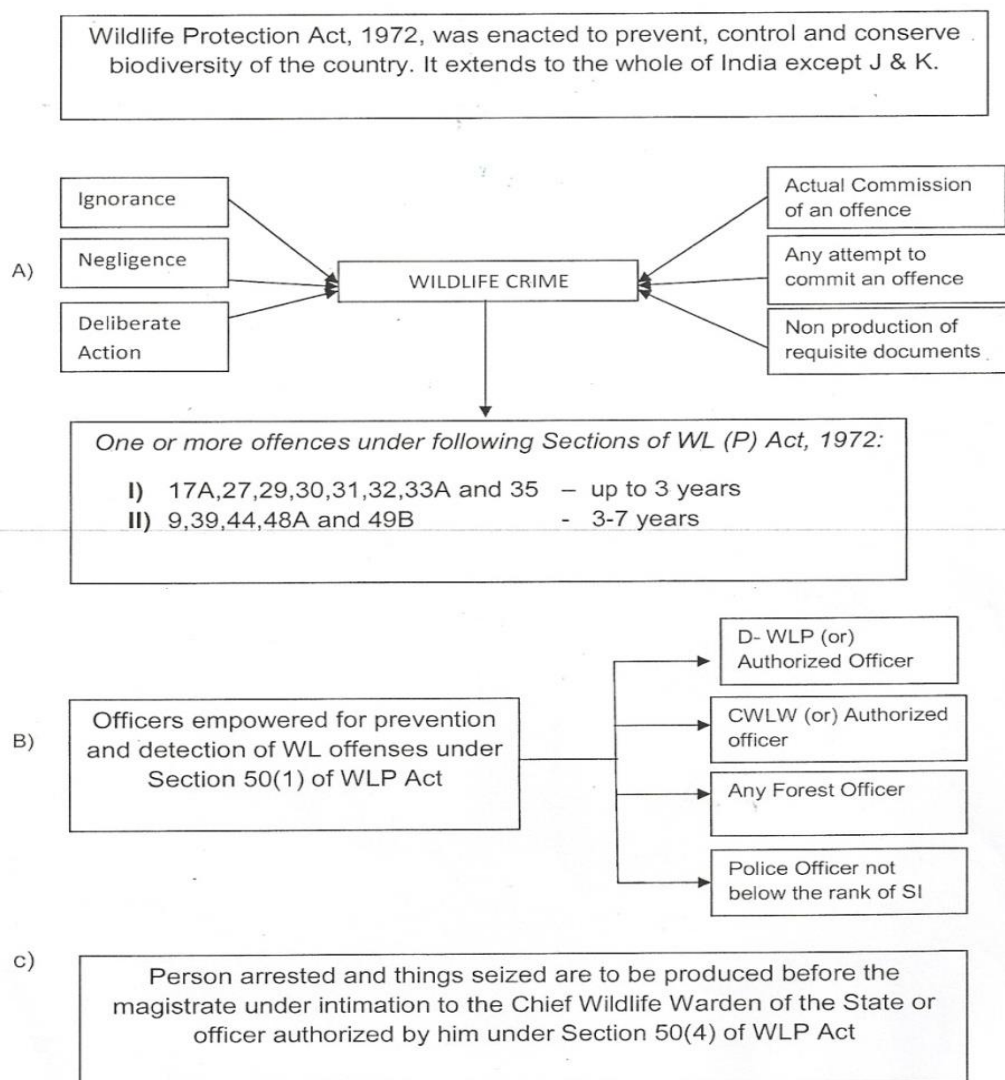
12.4.3. www.tigernet.nic.in:

It is the directory of tigers and wildlife mortality. It is the official database of the NTCA of which every Field Director and Chief Wildlife Warden is a mandatory member. All deaths of Tigers and all other schedule one animal has to be reported to this site which maintains a countrywide data on such mortality. Apart from the mortality the site also required to be updated about any kind of seizures and arrest of wildlife criminals. The Field Director will continue the practice of reporting the above information to tigernet.

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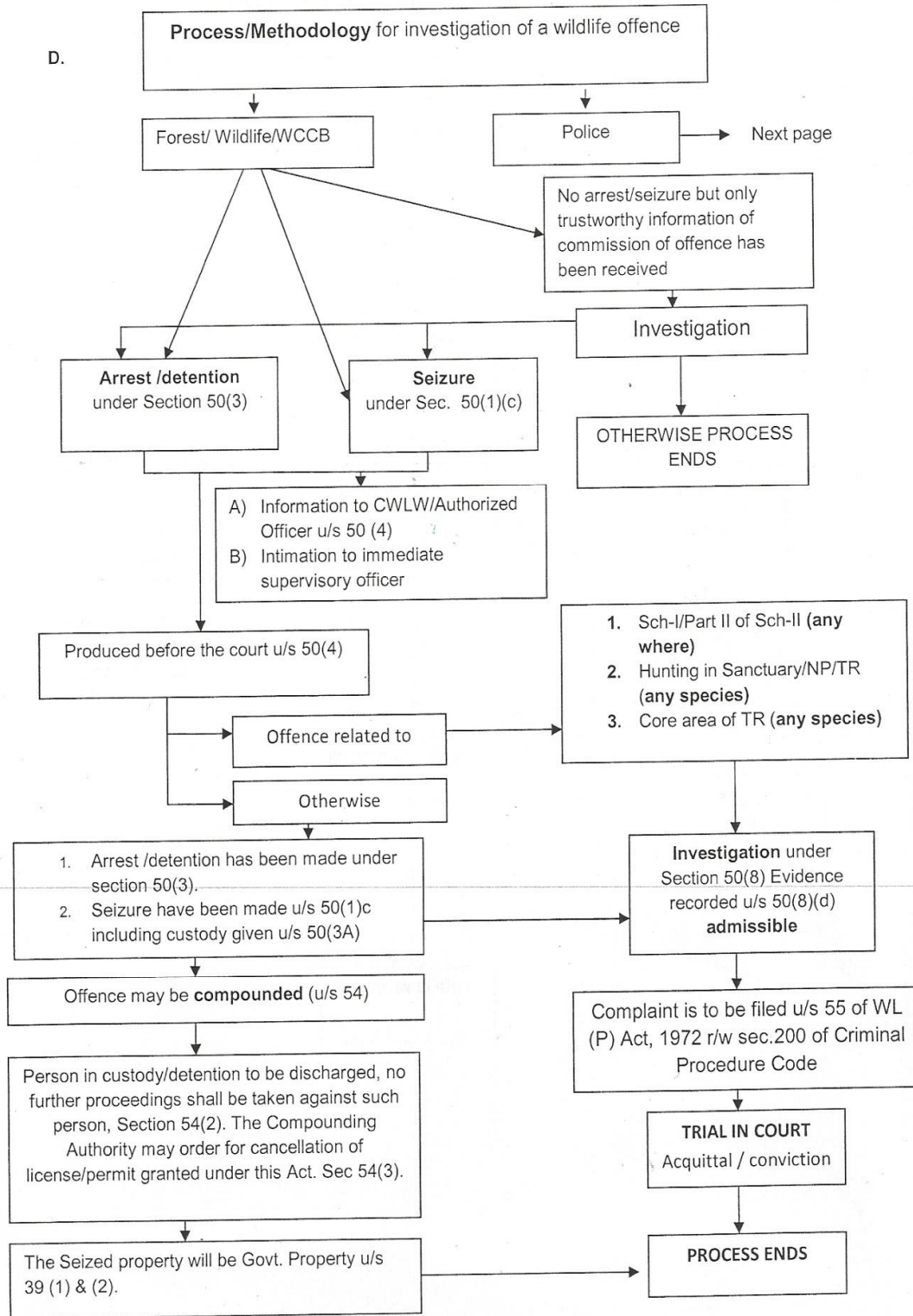
12.5. Wildlife crime investigation:

The following 'flow-chart' has been issued by the Wildlife Crime Control Bureau, MoEF, Government of India. The following procedure will be followed by the investigation officer and efforts will be made to issue the same in Hindi language.



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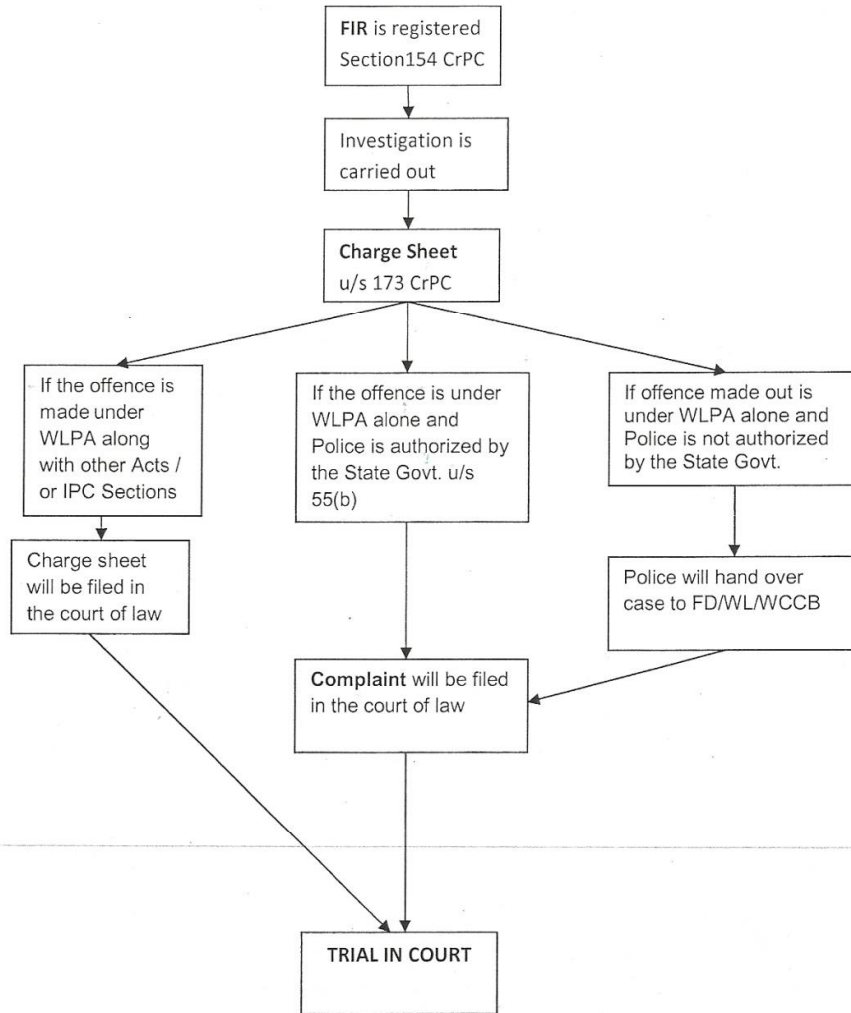
D.



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Police Investigation Process / Methodology

Wildlife Offences are cognizable as per Part II of Schedule – I of the Criminal Procedure Code



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DOCUMENTS TO BE ATTACHED WITH THE COMPLAINT








1. Forwarding/Covering letter addressed to the concerned magistrate praying for taking complaints u/s 55 of WL(P)Act, 1972, r/w Section 200 of Indian Criminal Code 1973.
2. Sequential order of incidence preferably in chronological order along with the violation of relevant sections and section 51 under which sentence of the accused is prayed upon.
3. POR/FIR if any along with the information sent to the court
4. List of accused.
5. List of witness.
6. Site memo
7. Arrest memo
8. Medical report
9. Intimation to relatives
10. Seizure Memo
11. Statement of accused (u/s 161 of Cr P C)
12. Statement of Witness (u/s 50(8) of WLPA)
13. Gazette Notification of R.F/NP/Sanctuary
14. PM Report/Expert Opinion
15. Wildlife Census Report (if any)
16. Appointment letter of I.O.
17. Posting order of staff.
18. Log book of vehicle (if used)
19. Any other relevant document having bearing on the incidence.

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12.5.1. Collection of Tissue/skin/blood/scat samples.

The following protocol has been issued by the Wildlife Institute of India, which has been followed by the Corbett Tiger Reserve management and care will be taken to adhere the mandate diligently.

COLLECTION OF TISSUE/SKIN/BLOOD/SCAT SAMPLES

1. For collection of meat/skin piece/scat	
<p>a. Use a screw capped small vial</p> <p>Note: Do not use more than 100 ml/gram capacity</p>	 <p>→ Vial</p>
<p>b1. Fill approximately half of the vial with Silica Gel (5-8 mess size) OR b2. 2/3rd volume of the container with 70% or absolute Ethanol (ethyl alcohol which is chemically C₂H₅OH)</p> <p>Note: 70% ethanol can be prepared by mixing of 75 ml ethanol with 25 ml of distilled/mineral or Bislary water. In ethanol sample can be stored on room temperature for many days.</p>	 <p>→ Cap → Silica Gel or Ethanol</p>
<p>c. Place a circular paper piece over the Silica Gel (do not put anything for ethanol)</p>	 <p>→ Filter paper → Silica Gel</p> <p>Only in case of Silica gel</p>
<p>d. Place small meat (10-20 gms)/skin piece (3x3 cms)/fresh scat (15-20 gms.) over the filter paper (or directly dip the sample in ethanol) and make airtight with the cap. Please write the species and place, date of collection of the sample on the vial.</p> <p>Note: In case of ethanol preservation cap should be sealed properly to avoid the leakage.</p>	 <p>→ Meat/skin piece/sca → Filter paper → Silica Gel</p>
	 <p>→ Details of sample, viz., species/date & place of collection of sample</p>
2. For collection of blood	
<p>a. Vacutainer tubes (blood may be collected as usual for routine purposes) and stored at 4°C (lower compartment of refrigerator) until handover to the lab.</p>	
<p>b. On glass slides (Make thick smear of blood on slide)</p>	

Send vials/vacutainer tubes/slides by courier (sample in silicagel) and by hand (sample in ethanol) to:

The Director,
Wildlife Institute of India,
Post Box No. 18, Chandrabani,
Dehradun, Uttarakhand – 248 001
EAPBX : +91-0135-2640111 to 115
FAX No. : +91-0135-2640117

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12.6. Tackling Human-Tiger/leopard Conflict:

There have been several instances of human-tiger conflict during the recent past. The most infamous being the Man eater of Sunderkhal which was eliminated on 28th Jan 2010 after it had killed 6 persons near the villages of Sunderkhal and Devichaurd. Stray incidents had occurred which was due to callous approach of villagers towards warning sign of tigers. However small being the incident, the locals did not lost any opportunity to show their belligerent behaviour towards tiger/leopard. They force to capture the innocent tiger and put him in the Nainital zoo. A leopard was burnt to death by irate public at village Namdhar, adjoining to Kalagarh Division. It has become necessary to save the trouble animal by taking certain measures. In this context, apart from eliciting people's support for protection of tiger by involving them in employment generating activities like- ecotourism and quick disbursement of ex-gratia for loss of human life, cattle and loss of crop, the following urgent measures are suggested:

12.6.1. Awareness generation and involvement of people:

Modern practices in wildlife conservation call for involvement of all stakeholders in the planning and implementation of conflict mitigation measures to muster greater support and cooperation from people. The overall aim should focus on a participatory approach, ensuring support of local communities and other stakeholders for conservation and management of wildlife. Awareness programmes should target the people sharing space with tiger/ leopards, in human dominated landscapes and the buffer areas which often used for collection of fire wood and fodder by the villagers.

Sensitizing the media about the nuances of the problem of human-wildlife conflict in general and tiger/leopard depredation in particular should be an essential part of the awareness strategy. Media should contribute to diffusing the tense situation surrounding conflict with objective reporting aimed at highlighting the measures to mitigate conflict; Reporting mainly aggressive encounters with such animals can erode local people's tolerance and worsen the situation by forcing the Forest Department to unnecessarily trap the wild animal due to public pressure.

12.6.2. Salient points for awareness campaign:

1. Tiger/leopard are not usually inclined to attack people; on the contrary, they avoid people.

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2. Wild carnivores may attack in self-defence, and, therefore, it is advisable to avoid provoking them.
3. Mere sighting of a leopard in the vicinity of human habitations does not necessarily mean that the animal has strayed from a forest and needs to be captured.
4. Arbitrary removal of tiger/leopards could lead to increased conflict. The space vacated by a captured animal will soon be occupied by another leopard.
5. The focus should be on long term solutions. These include better sanitation measures including proper garbage disposal in villages and towns so that feral pig and dog populations are kept under check, and do not attract wild carnivores. Providing proper toilet facilities in rural areas would go a long way in reducing incidences of accidental encounters with leopards.
6. Farmers should be made aware that livestock sheds should be strong, robust and depredation proof.

12.6.3. Teamwork in tackling conflict:

Efforts should be made to involve all departments, wings and agencies of the government to use a well coordinated mitigation approach which is scientific, field-tested and practical, and *inter-alia*, capable of dealing with emergencies related to attacks by tiger/ leopards.

In this regard, it is vital to involve the Police and Revenue Departments as they are crucial for maintaining law and order in the face of extreme public reactions. In all instances of wild carnivores like tiger/leopard straying into a human dominated landscape, the district authorities need to ensure law and order by imposing Section 144 of the Cr.PC., This is essential to avoid agitated/excited local people surrounding the animal spot which hampers capture operation, leading to serious injuries on people and staff. Further, the local people should be adequately alerted by district authorities for avoiding the area being traversed by the straying carnivore.

Proper training of police and local administrative staff, and constitution of a Primary Response (PR) Team, along with awareness campaigns are essential ingredients of a successful conflict mitigation strategy.

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12.6.4. Primary response team:

These teams may comprise of paid or volunteer members from the local communities, who are trained to respond immediately to a conflict situation. Their primary aim should be to control the crowd and secure the area until the next level of help arrives. In the hills, where the terrain is difficult, and where houses are scattered in a forest landscape, an Emergency Response (ER) team may take time to reach the conflict site. The establishment of a Primary Response (PR) team is important to ensure crowd control before the ER team reaches the spot.

The ER team is required to ensure unobtrusive close monitoring of the animal with least disturbance, for tracking its movement. In addition, at places which are not waterlogged, camera traps should be set up (fixed to a post or a tree) for establishing the identity of the animal. The rapid rescue team also requires due capacity building and 'hands on' field training involving the WII. Since it may not be always possible for experts from the WII to provide assistance, it is also advised that some outside experts (local senior veterinary doctor including the doctor of Nainital Zoo and experts from Pant Nagar University) may be involved in the ongoing operations.

12.6.5. Establishment of emergency response mechanism:

- Immediate response is crucial to manage all conflict situations. A trained Emergency Response (ER) team consisting of an officer not below the rank of Assistant Conservator of Forests, one qualified veterinarian, and a minimum of five trained support staff will be formed in the identified conflict area.
- Each Forest Division of Corbett Tiger Reserve will have a well trained operational ER team.
- Each ER team should be equipped with chemical capture equipment, drugs, appropriate cages, etc. and should wear specially designed uniforms so that they are easily identifiable during the operation. They should also have specially designed baffle boards for protection.

The ER will be equipped with following articles:-

- (i) A customised rescue van with built in rails for accommodating a trap cage, with space for equipments, attendants and staff.
- (ii) A tranquilization kit with drugs for chemical immobilization.

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- (iii) 2 mobile phones for continued communication with the authorities.
 - (iv) 4 wireless handsets.
 - (v) 2 GPS sets.
 - (vi) 1 long ranging night vision for seeing objects in the dark.
 - (vii) A digital camera.
 - (viii) 4 trap cages (2 for tiger and 2 for leopard).
 - (ix) 1 mini-tractor for transporting the cage in rugged terrain.
 - (x) 2 search lights.
 - (xi) 2 portable tents
 - (xii) 2 folding chairs with table.
 - (xiii) Hammock to carry the tranquilizing animal.
 - (xiv) Rope and net.
 - (xv) 2 sets of trap camera
- The protocol for Emergency Response should be periodically rehearsed and reviewed to incorporate corrective measures to make it more efficient.
 - Establishing such well advertised ER teams that respond effectively and quickly to conflict situations will help diffuse the usual public outrage and retaliation that invariably follows such conflicts. It will also harness the goodwill of local communities. In the long term, the efficient working of the ER teams will prevent escalation and spread of conflict. It will also prevent the situation from going out of control with people taking the law in their own hands.

12.6.6. Management of crowd:

- Crowd management is crucial to any successful animal rescue operation. The ER team, more often than not, is obstructed and hindered in its activities by furious mobs, making it difficult to discharge its responsibilities.
- Support and cooperation of the police and civil administration should be ensured in advance to facilitate effective crowd control and to discourage formation of crowds.

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- The area should be cordoned off with barricades, and the public alerted through a public address system. Regular updates should be made available to the administration and local public.
- There should be an ambulance kept ready to take care of any medical emergencies.

12.6.7. Management of the animal:

The objective should be to give the animal enough space and opportunity to return to its habitat, and situation-specific rescue measures should be followed. The best method of dealing with a wild cat, in the absence of attacks on humans, is not to intervene.

12.6.8. Following steps are prescribed to deal with different situations:

A. Unconfined or Open Area:

1. Open situations could mean a barren land, grassland, street, thicket, crop field with standing crop or woodland, with the stray animal being either up on a tree or on the ground.
2. If the animal is in an open area surrounded by people, all attempts should be made to keep the crowd and local people from approaching near the animal, and the animal should be allowed to escape under the cover of darkness.
3. Drug immobilization should be avoided in situations where the animal is in the open, even if the target presents itself in an appropriate position, since a darted animal in the open can retaliate injuring people. Drug immobilization should also be avoided during intense summer.
4. To trap the animal, a suitably designed light-weight trap that minimizes injury to the animal, should be used. The caution outlined below will be followed while designing trap cages.

B. Care and caution in designing trap cages:

Trap cages should be completely enclosed (new designs use fibre glass) with holes for ventilation.

1. Iron rods should not be used (thick chain link is preferable) anywhere in the trap cage as tiger/leopards struggle to escape by pulling at the bars which results in canines being broken.

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2. Old rusty, iron cages should be discarded.
3. There should be a gap of 1.5 inches between the cage floor and the lower edge of the trap door to prevent tails getting slammed.
4. Trap cages should be well ventilated.
5. Trap cages should be at least 6 feet in length for leopards and 8 feet for tigers with the trap door activation system being at the opposite end of the trap door. The height of cage should be around 4-4.5 feet and width -- 3.5 feet. Cages made of fiber glass (currently being used in Maharashtra) are lightweight and can be carried by 4 people. Collapsible cages should also be designed and physically tested in the field to assess their effectiveness.
6. Some Do's and Don't's for holding leopards in trap cages:
 - (a) Trap cages should not be used for long term captivity (no more than one week). The distressed animal will be sent to Nainital Zoo for necessary treatment where trained veterinary doctor is available. The animal intended to be released in future will be confined to a secluded place of the zoo to ensure least human interference.
 - (b) Water should be made available at least two times a day- either through a pipe which can be inserted in a hole at the side of the trap cage or by placing a steel bowl of water inside.
 - (c) Trap cage should not have any artificial padding (no rubber etc) as the animal have a tendency to rip off and eat it while struggling to escape. These synthetic materials could get lodged in the stomach of the animal and result in their death.

C. Semi-confined:

1. If the animal is confined in a dry well or trench, a ladder let down into the well will allow the animal to escape in the night.
2. Here too, the public must be kept away from the site, and the rescue team should monitor the situation until the animal escapes.

D. Animal Confined in a Closed Area:

1. If the animal is confined in a closed area, for example in a house, garage, under a culvert, or caught in a snare, etc., the surrounding entrance and exits should be made secure to ensure no injury to the public.

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2. If the area is adjoining a forested area, the animal should be allowed to escape in the night, but if it is in a high human density area it should be tranquilized.

12.6.9. Capture and handling of the trapped animal:

Captured animal should not be put on display after capture. Such unintended forced close contact with humans may alter the behaviour of captured animals with highly adverse consequences following their release. Ideally, such leopards should be kept in covered cages. Only healthy fit individuals should be returned to the wild.

Following advice will be scrupulously followed while handling captured or trapped wild animals.

1. All captured animals, irrespective of the method used to capture (chemical/trapping), should be chemically restrained for evaluation of its condition for prognosis and suitability for release.
2. While confined, the animal can be micro-chipped, scanned (if already micro-chipped), treated, and various morphometric parameters recorded.
3. If the animal is to be released back in the wild in a few days, it should be housed in a suitable transit facility with minimum exposure to humans.
4. If the animal is to be placed in captivity, the life time care facility to house the animal should meet the standards prescribed by the Central Zoo Authority.
5. If an animal kept in captivity is intended to be released, thorough investigation of its fitness, and evaluation of its response to humans should be conducted before releasing it into the wild.
6. If the animal has been kept for more than a month in captivity, it should not be released back into the wild.
7. If the animal is injured beyond recovery or permanently disabled, euthanasia is recommended as the best option. Even if the exceptional decision for euthanasia has been arrived at, the animal must be chemically restrained.
8. NSAIDs (Non-Steroid. Anti Inflammatory Drugs) should never be used for treatment of the animal as these are contraindicated in felids. Long acting antibiotics should be used for sustained therapeutic effects even after release.

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12.6.10. Release or translocation of captured tigers/leopards:

The decision to capture an animal should be the last option. It is very important that human intervention is restricted to the minimum to avoid future conflict. If the captured animal is to be released, it should be in the immediate vicinity of capture, i.e., within animal's home range.

Leopards are highly adaptable animals, and exhibit amazing homing instincts'. A translocated leopard trying to navigate to its home territory through a dense human landscape may lead to increased incidences of conflicts rather than reducing the same. Therefore, it is best to avoid translocation. Same is the case with tigers. However to ensure longevity of a tiger who accidentally killed a man and the management has to take care to release the animal in such a habitat that will ensure food security and absence of internecine fight with a resident tiger. Any attempt to release the trouble animal again into its home territory will irate locals who may doubt the intention of the forest officials and may tried to eliminate the tiger/leopard.

However No animal captured after a deliberate attack on a human should be released into the wild.

12.6.11. Transportation of captured animal:

Captured animals often get injured or stressed during transportation. Stress could be detrimental to the health of the animal, which coupled with excessive exposure to humans may adversely alter its behaviour towards humans after release.

The animal once captured should be kept and transported in a stress free environment, insulated from the public. It is important that humans are not allowed to come close to the caged animal, and that the cage is also completely covered with tarpaulin or other appropriate material.

Tranquilized/captured animals must be transported in the trap itself (if suitable) or in a separate transportation cage. Care should be taken to avoid crowded places, and the animal's health condition frequently checked during transit.

12.6.12. Monitoring of translocated leopards:

The success of translocation or release of leopard has to be measured and evaluated against appropriate post-release monitoring protocols. Translocation very often leads to the transfer of conflict to another unaffected site. Individual identity of all

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the released animals should be monitored by marking them with microchips and ear tags or colour coded collars before release. Radio collars should be put on a sub-set of released animals to monitor post-release movements and survival. Scientists and experts must be involved in such radio-tracking programmes.

12.6.13. Avoidable "rescue" of leopards:

A cub without its mother usually does not need "rescue" as the mother leaves the cubs when she goes hunting. Equally, cubs released without its mother have poor survival probabilities. If cubs are found alone, a watch must be kept for their mother without disturbing them. Cubs are not to be "released", but only require "reuniting" with their mother. Reuniting should be attempted immediately in the night in the same area, from where they were picked up. A suitable camera trap placed overnight near the 'reunion site' would facilitate the confirmation of the reunion.

Cubs that are hand-reared in captivity have a negligible possibility of future release back to the wild. Lifetime care is the only suitable option for such cubs, since their release in the wild even after a long term rehabilitation process may only worsen the already existing conflict situation.

12.6.14. Helping rural people better protect their livestock:

i. Confidence building measure:

- The present practice of vaccination camps for livestock will be continued in collaboration with the Animal Husbandry Department.
- Possibility of initiating state sponsored insurance schemes for livestock also needs to be explored.

ii. Expeditious and effective delivery of ex-gratia:

Since the present rate of ex-gratia for loss of human life and cattle, injury to human being, crop depredation etc., is inadequate, effort should be made to enhance the amount at least twice of the prevailing rate. Following are some of the suggestions which needs to be addressed immediately.

1. Rate of ex-gratia should be doubled by the State Government.
2. A corpus should be formed for immediate disbursement of ex-gratia. This will take care of non-availability of State Fund.

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3. NGOs, Corporate Houses and individuals will be encouraged to donate to the corpus through the Tiger Conservation Foundation óCTR.
4. All field staff including the daily wage earners under 'Operation Lord' and 'TPF' is to be covered under suitable insurance scheme.
5. Cattle and crop insurance will be encouraged through revenue officials.
6. EDCs will be mobilized to aware people to avoid unwanted human-wildlife conflict.
7. Immediate response to loss of life, livestock, and property caused by animals will help calm people. This will prevent violent reactions towards the problem animal in particular and wildlife in general.
8. Payment of ex-gratia should be made fast and hassle free. The possibility of initiating self financed insurance schemes should be explored.
9. In case of attack on humans, it is recommended that senior level officers immediately visit the site. A vehicle should be provided to take the victim to the nearest medical facility. The ex-gratia payment should be made immediately.
10. In case of attacks on livestock, ex-gratia amount should be provided within a week. The complaint should be made at the Gram Panchayat office, and the Forest Guard should visit the site immediately. The protocol should be verified by Forest Guard and representative of Gram Panchayat. Extra travel and phone allowance should be provided to the Forest Guard to enable him to effectively discharge this responsibility without delay. Veterinary certificate and photographic evidence should not be made compulsory requirements for disbursement of ex-gratia amount. The amount should be dispatched through a bank demand draft.
11. The use of a 'sms' based updating system to inform the victim or his relatives about the status of his/her claim, and also to receive complaints should be explored.
12. It is extremely important that the animal is allowed to feed off the livestock it has killed. After inspection by the forest Guard and the representative of Gram Panchayat, the carcass should be taken to a nearby secluded area, the same evening. If a tiger/leopard is deprived of its kill, it will make more kills, inflicting more losses on the farmers. Also, it is possible that after being deprived of its kills repeatedly, the animal may become desperate, increasing the intensity of conflict. This aspect

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also needs to be explained to the villagers. In this regard, the existing EDCs will have valuable role to play.

13. Bi-yearly meetings should be held where local MLA, EDC heads, revenue, veterinary, health and forest department officials should discuss the problem of human-wildlife conflict, and how effectively it is being managed. Such meetings could also review the existing practice and options of mitigation with a view to making these more effective and people friendly. The above exercise should involve trained wildlife biologists and other experts.

(iii) Collection of information on leopard conflict:

- Management of a species should be based on systematic long term data. Information on conflict incidences should be collected systematically in an appropriate format to aid decision-making.
- Long term research, focused on estimating the population and abundance of tigers/ leopards in high conflict areas, should be taken up on priority.
- Identification of conflict prone areas, with data on conflict intensity, nature of conflict, and trends, must be collected for better preparation and pre-emption.
- Trap cameras should be deployed to ascertain the identity of the animal and a repository of cattle lifters will be maintained which will be of great help to identify the trend of human-wildlife conflict. This will also reduce fake claims of ex-gratia by the villagers.

(iv) Dealing with man-eater tigers/ leopards:

Attacks by man-eating leopards are deliberate with an intention to kill, and usually result in death, e.g., child being lifted from the precincts of the house, and attacks on people sleeping inside the house. In such cases, every attempt must be made to identify the correct animal, and trap the animal as per the guidance outlined. After ascertaining that the tiger/leopard is deliberately killing human being for its sustenance then only it will be considered by the Chief Wildlife Warden for eliminating the troubled animal. Effort should be made to trap the animal and send to Nainital Zoo. Animals trapped after deliberate attacks on humans should never be released back into the wild.

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12.6.15. Protocol to be followed in case of conflict:

In case leopard attacks are reported against human beings or cattle, the following protocols will be followed.

1. Ascertain the authenticity of the information.
2. Gearing up the rapid response team and inform SDM to help control public.
3. Inform Chief Wildlife Warden.
4. Emergency Response team under local SDO will rush to the spot with rescue equipments. The local Range Officer will keep ready tractor and trap.
5. 108 ambulance may be called on incase of injury inflicted to human being.
6. A separate forest team will accompany the victim to hospital and arrange all expense for treatment.
7. The location of the animal will be ascertained.
8. Identify compassionate volunteers among the villagers and solicits their help.
9. The animal will be provided a safe passage to its natural habitat.
10. In case the animal is unable to move out, then it will be tried to trapped in a cage.
11. Suitable bait will be put in the trap cage. Care should be taken that under no circumstances dog will be used as a bait. Care should be taken that the live bait remains safe from the trouble animal.
12. Absolute patience will be required by the team while doing rescue operation.
13. Rescue van should be used for transporting the animal and immediate first-aid should be administrated inside the van.
14. The Doctor of Corbett Tiger Reserve should be porent during the rescue operation. He should carry all the medications as well as the tranquilising equipments and drugs.
15. In case of casualty, the forest staff will offer all assistance including money for post mortem and cremation. Care will be taken that the sentiment of villagers should not be hurt.
16. As far as possible, a team will be constituted to patrol the area which remain under shadow of a man-eater.

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17. In the event of shooting a man-eater, the protocol of NTCA should be followed meticulously.
18. In case of a tiger found incapacitate inside forest, absolute care will be taken to observe the animal. Trap camera will be put up to take continuous pictures and effort will be made to approach the animal on elephant back. Binocular is a must to ascertain the kind of injury. Based upon two successful operations in the recent past, the veterinary doctor will administered right doses of antibiotics, pain-killers and multivitamins. Regular monitoring of such animals will carried out by field staff and movement will be recorded. It will be imperative that if such animal found in the tourism zone, the area will be keep out of reach by the tourists.

12.6.16. Financial assistance to tackle human-wildlife conflict:

It is prescribed that a proposal pertaining to above should be sent to NTCA for needful assistance from this end. Additional financial assistance can also be procured from CAMPA. Corbett Tiger Reserve has been allotted two high-end rescue mini truck which will be used for the above purpose. Apart from the above, the WCT also donated two mini rapid response vans which has been put to use in Kalagarh Division as well in the Ramnagar part of Corbett Tiger Reserve.

12.7. Guidelines for declaration of big cats as man-eaters:

The NTCA, Government of India, has issued the following guideline to deal with man-eaters.

Guidelines:

Both tiger and panther are included in schedule of the Wildlife (Protection) Act. 1972 and have been given full protection against hunting section 9(1). They can be hunted only they become dangerous to human life of if they are so disables or diseased as to be beyond recovery. Under section 11(1) (a), only the Chief Wildlife Warden has been given the authority to permit any person to hunt such animal and before doing so, he has to state in writing the reasons therefore. Tiger and panthers turned man eaters on the past and continue to do so even now in spite of several theories being propounded about the non-existence of man-eaters, it is a stark reality that tigers and panthers turned man eaters and action has to be taken to remove the menace to human life. It is not intended to give here the various reasons and circumstances that turn these animals into and it is necessary to lay down some guidelines to help the Chief Wildlife Wardens in

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deciding the circumstances and the stage at which an animal could be declared a man-eater. The following guidelines are indicated:

It is necessary to differentiate between man-killing and man-eating. There are several circumstances under which human beings are attacked accidentally by tigers and panthers and may as a result die, but these cases are to be considered only as accidental killings. Such circumstances include-

1. Approach by man to an area when a tigress is sheltering her cubs.
2. Approach accidentally to a sleeping tiger/tigress especially by grass cutters, wood collectors etc.
3. A bent-in posture by man, when a tiger takes him to be an animal and attacks in such cases, the tiger/tigress does not eat the dead person in the first case, but in may start eating the dead body if the tiger/tigress comes across such accidents more than once. If the tigress is with cubs and is confined to a limited area with shortage of natural prey, she is more prone to eat the dead body. The mere fact that the dead body has been eaten does not prove that the animal is a man-eater. Similarly the fact that a particular animal has killed more than one human being also does not prove it to be a man-eater. The circumstances under which the animal killed the human being has to be examined in detail to arrive at any conclusion.

If a tiger panther begins to seek out, stalk and wait for human beings and has after killing a person, eaten the dead body, it is established beyond doubt that the animal has turned into a man-eater. It is not necessary in such cases to wait till several human lives are lost. It may be difficult to establish such cases after the first case, but after the second case of human kill it can easily be decided if the animal has turned into a man-eater.

The place where the human kills take place should also work as a guide. In certain areas where forests are disturbed due to intensive working, grazing or fire. Tigresses tend to move to adjoining sugarcane fields to litter. Labour and farmers working in the sugarcane fields get killed by such tigresses, and their dead body is eaten by them. As given in Para (1), Such animals are not to be considered man-eaters, but in case, a tiger starts living in such sugarcane fields he is more likely to turn into a man eater. A male tiger killing a human being near a village or in sugarcane field will in all probability be a man-eater.

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This evidence should not be used against panthers. Which usually live close to villages and move in the night in search of dogs, unless the panther has began to lie in wait for human beings.

Even if enough evidence has not come forth to establish an animal as a man-eater, but there are definite grounds to suspect after one human kill that the animal has the tendency to turn into a menace, steps should be taken to trap it. Trapping of panthers will not be difficult, but may not be so in the case of tigers. Efforts to tranquilize such animal should start immediately.

Where it is established that the animal is a man-eater, it has to be declared so without delay and steps should be taken to destroy the animal. Effort to trap and tranquilize the animal should, however, continue along with the steps taken to destroy it. But in no case efforts to destroy it should slacken for the sake of trapping or tranquillizing to succeed.

When a tiger has been declared a man-eater, only experienced and senior forest officers should be authorized to destroy it. In no case permits should be given to others. There is such a heavy demand from shikaris and others to get a permit to destroy man-killing tigers that they bring heavy pressure, both political and otherwise on the authorities to declare a tiger as a man-eater. To remove the chances of such pressures working against innocent tigers, it is necessary to eliminate chances of outsiders from getting any permit for their destruction. This also ensures destruction of only the genuine man-eater.

In the case of panthers, operating in hilly tracts, it may be necessary to take the help of experienced shikaris, as young and experienced persons are needed to operate in these hilly areas. On account of complete ban on hunting of tigers and panthers and also due to the rise in the price of arms and ammunitions, it is difficult to find a young forest officer, with adequate experience who can be authorized to destroy the man-eater. Unlike the case of a man-eating tiger, where age does not work as a handicap and where middle aged forest officers can eliminate the animal in the plains, the man-eating panther needs an agile and young shikari who can travel over miles and miles of difficult hilly terrier on foot.

No authority other than the Chief Wildlife Warden is legally competent to permit any one to hunt such animals. Cases have, however, occurred where civil

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authorities have unofficially authorized and encouraged hunting of such animal by shikaris, experienced and otherwise leading to a free-for-all in the area of operation. Such irresponsible action on the part of any authority should be severely dealt with by the Government, as it leads not only to the destruction of several innocent animals, but may create more man-eaters through injury causes by these shikaris.

Normally no reward should be announced or given for the destruction of man-eaters. Where it is necessary to engage a *shikari* who cannot himself take care of the financial burden involved in the operation, all assistance and material help should be provide to him by the Government.

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Chapter-13

Organization, administration & budget

The Wild Life (Protection) Act, 1972 envisaged that under section 38U the State Government may constitute a Tiger Steering Committee for ensuring coordination, monitoring, protection and conservation of tiger, co-predators and prey animals. Since the applicability of this committee is wider than that of the geographical area of Corbett Tiger Reserve, it obviously has a greater stake than that of the Corbett Tiger Foundation. Moreover the Chairman of the Tiger Steering Committee is the Chief Minister of the State whereas the Chairman of the Tiger Conservation foundation is the Minister of Forests and Environment of the State. Thus the Tiger Steering Committee will guide the Governing body of the Foundation to achieve the above mentioned purpose. These bodies have their overall responsibility towards the entire Corbett Tiger Reserve which constituted of the Core Area as well as the Buffer Area. The state wide implication of the Steering Committee will help to ensure the safety of the tigers, co-predators and prey animals of the neighbouring areas. That will indirectly benefit the whole ecosystem of the Corbett Tiger Reserve.

13.1. Tiger Steering Committee:

The Section 38U of the Wild Life (Protection) Act, 1972 provides for Constitution of a Steering Committee—

- (1) The State Government may constitute a Steering Committee for ensuring Co-ordination, monitoring, protection and conservation of tiger, co-predators and prey animals within the tiger range States.
- (2) The Steering Committee shall consist of:-
 - (a) The Chief Ministerô Chairperson;
 - (b) Minister in-charge of Wild Lifeô Vice-Chairperson;
 - (c) Such number of official members not exceeding five including at least two Field Directors of tiger reserve or Director of National Park and one from the state Government's Departments dealing with tribal affairs;

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- (d) three experts or professionals having qualifications and experience in conservation of wild life of which at least one shall be from the field of tribal development;
- (e) two members from the State's Tribal Advisory Council;
- (f) one representative each from State Government's Departments dealing with Panchayati Raj and Social Justice and Empowerment;
- (g) Chief Wild Life Warden of the State shall be the Member- Secretary, ex officio, to be notified by the State Government, in the Official Gazette.

The Government of Uttarakhand has notified the constitution of Steering Committee under section 38U of Wildlife Protection Act. 1972 amended upto 2006. The notification has been given as Annexure-11/3.

13.2. Tiger Conservation Foundation:

As per section 38 X of Wildlife (Protection) Act, 1972 as amended up to 2006, Tiger conservation foundation for the reserve has been established in order to facilitate and support management for conservation of tiger and biodiversity and, to take initiatives in eco-development. The tiger conservation foundation has been registered under society act. 1860 as "**Tiger Conservation Foundation for CTR**".

The State notification, and the society registration certificate has been attached **Annexure 13/1**. Guidelines for regulation of Tiger Conservation Foundation have been issued by GOI notification No. S.O. 1008 (E) dated 22/6/2007, which has been given as **Annexure-13/2**.

13.2.1. The tiger foundation works on following objectives:

- (g) to facilitate ecological, economic, social and cultural development of the tiger reserve.
- (h) to promote eco-tourism with the involvement of local stake-holder communities and provide support to safeguard the natural environment in the tiger reserve.
- (i) to facilitate creation of and/or maintenance of such assets as may be necessary for fulfilling the above said objectives.
- (j) to solicit technical, financial, social, legal and other support required for the activities of the foundation for achieving the above said objectives.

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- (k) to augment and mobilize financial resources including recycling of entry and such other fees received, in the tiger reserve to foster stake-holder development and ecotourism.
- (l) to support research, environmental education and training in the above related fields.

The State Government has allowed 20% of the collection from various tourism activities to be deposited in the accounts of the Tiger Conservation Foundation which will be enhanced to hundred percent as per the decision taken in the Governing Body meeting. The governing Body had approved the following action plan.

13.2.2. Action Plan:

1. The action plan for the foundation is based on the objectives as envisaged in the Wildlife Protection Act.
2. Stake-holders: The success of the management of the tiger reserve is largely dependent on the welfare of the stake-holders and their consequent contribution. Following are the stake-holders who held major stake for safe guarding tiger and other biodiversity.
 - a. Villagers of adjoining villages through EDCs of Corbett Tiger Reserve
 - b. Gujjars residing on the buffer area
 - c. Front-line staff
 - d. Nature Guides

Activities detailed in the section 38X of WPA, 1972, are to be followed which will be subjected to annual revision. All EDCs will prepare site specific micro-plans with the help of Corbett Tiger Reserve /divisional officials. The effort will be to increase the living standard of the villagers through various activities thus reducing their dependency on forest resources and safeguard the natural environment in the tiger reserve. This will also help to create sense of belongingness among the villagers towards the Tiger Reserve.

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Following are the activities will be undertaken through Foundation (Approved by the Governing Body.)

Sl. No.	Activities	Proposed Expenditure
1.	The EDCs will be motivated to create Ecotourism facilities in their villages. This will promote through ecodevelopment of the area.	Rs. 50 lakh to 32 EDCs
2.	Facilitating maintenance of assets like FRHs, Museums, library, interpretation centre, approach gates/barriers etc. which are frequently used by tourists.	Rs. 10 lakh
3.	Supporting short term and long term research activities by engaging research scholars from various universities and institutes like WII, BSI, ZSI etc.	Rs. 5 lakh
4.	Supporting environmental education and awareness programme among school children of the fringe area. Foundation may sponsor scholarships for meritorious students.	Rs. 5 lakh
5.	Provision of humanitarian assistance in cases of human-wildlife conflict in the 5 km stretch around Corbett Tiger Reserve. This will be additional benefit to departmental support.	Rs. 10 lakh
6.	Staff welfare activities. Like soft loan for emergency, insurance, annual health check up, entertainment, uniform to non-permanent frontline staff, etc.	Rs. 10 lakh
7.	Under the provision of supporting requirements for conservation of tiger and biodiversity (Sec. 38X WPA) <ol style="list-style-type: none"> 1. Reimbursement of salary for non-permanent staff and other vital needs. 2. Official expenditure under various heads (NTCA is not allocating any fund for this purpose) 	Rs. 40 lakh
8.	Any unforeseen expenditure	Rs. 5 Lakh

The foundation will spend 75% of its financial resources on different activities while 25% of the fund may be maintained as fixed deposit.

A proposal will be sent to the Government for enhancing the prevailing contribution of 20% of the collection to 100%. This will facilitate more benefit to the stake holders as well as for the cause of eco-development and tiger conservation.

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13.2.3. Management of on-line reservation of tourist facilities:

The available dedicated web site is proposed to be used to generate fund through advertisements.

13.2.4. Collection of additional fund:

Rs. 25 is proposed to be collected from each tourist which will generate approximately Rs.50 lakh from two lakh visitors. 50% may be allocated to the EDCs, 25% for improvement of tourist facilities and 25% will be invested in income generated instruments. Financial donations will be solicited from Corporate Houses, Public Enterprises, individuals, NGOs etc. This will enrich the financial condition of the foundation.

13.2.5. Management of canteens and nature shops:

There are four canteens and two nature shops available in Corbett Tiger Reserve. These facilities, if managed through foundation, can generate substantial income which can be used for welfare activities for the staff, EDCs and consequently strengthen the financial condition of the foundation. The details about the management have been discussed in the later paragraphs of this chapter.

13.3. Co-ordination with line departments:

Given the present situation, no tiger reserve should be managed in isolation. Coordination and good working relationship is essential for protection of tiger and its habitat. It is also beneficial to dovetail various community development programmes run by different departments- be it agriculture, horticulture, animal husbandry, tourism, Swajal, etc, in the fringe villages of Corbett Tiger Reserve. Regular interaction with District Collectors, Superintendent of Police and District Judge will create deterrent to prospective and habitual offenders of various wildlife crimes. Emphasis on such meeting has been pointed out in other chapters. The Deputy Director should organise regular district level meetings along with interaction with DFOs of neighbouring Forest Divisions including forest divisions of Uttar Pradesh. The Field Director will take meetings with the respective Commissioners and DIGs (Kumaon and Garhwal). A regular briefing will be addressed to the Chief Wildlife Warden. The Range Officers will be encouraged to have meeting with their counterparts in the Police and Revenue Departments. Biannual workshops will be organised with WCCB, ITBP and senior forest Officers of Uttar Pradesh.

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13.4. Administrative Setup & Staff Deployment:

The administrative setup of Corbett Tiger Reserve is peculiar. Earlier the Director used to look after Dhikala Range and Research Range directly. The faraway Binsar Wildlife Sanctuary and Askot Wildlife Sanctuary were also under his jurisdiction (Now-a-days both the aforesaid wildlife sanctuaries are not under the jurisdiction of the Director, Corbett Tiger Reserve). The Director post was at the level of Deputy Conservator of Forests. Later the post was upgraded to Conservator of Forests but he continued to carry out the the functions of the DDO. The Kalagarh Forest Division is also under his jurisdiction.

Till 2009-2010, the Drawing and Disbursing Officer of Ramnagar Tiger Reserve Division was the Director. The function of the Deputy Director was not clear. The powers of a Drawing and Disbursing officer given to the Deputy Director in 1992 was lying in abeyance and the Ramnagar Tiger Reserve Division created by Govt. of UP in 1994 (vide GO No. 2129/14-1-94-30(5)/80 TC, dated 25.6.94 as part of the reorganisation of the Forest Circles and Forest Divisions within the forest department of UP) is yet to be operationalised under a DCF rank officer. The Director is looking after the Division as well as the Circle. A reorganization proposal is under consideration now for separation of the offices of Director and Deputy-Director.

Presently, the Tiger Reserve is headed by an officer of the rank of Chief Conservator of Forests as Director.

13.4.1. DFO Ramnagar Tiger Reserve Division:

It is the need of the hour that the Deputy Director, Corbett Tiger Reserve should be made Divisional Forest Officer, Ramnagar Tiger Reserve Division. Presently for all practical and legal purposes the Deputy Director's is the DFO of the area under his jurisdiction which is the area of National Park and its buffer area. He is also working as the DDO for the staff working in the same area. Further the most sensitive southern region of the National Tiger Reserve is under the jurisdiction of the DFO, RTRD which make him more responsible for the specialized protection of the area. The benefit of such arrangement will be of the regular inspection by the Director of Corbett Tiger Reserve, besides a clear separation of authority and responsibility between the Director and the Deputy Director including under various statutes, Acts, rules and regulations. Given the importance given to the area by notifying the National Park, Sanctuary and

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the respective Reserve Forests as Corbett Tiger Reserve, a dedicated DFO is needed to look after the RTRD exclusively. The DFO, Kalagarh is working independently in his jurisdiction. So it will be beneficial for the management that the Deputy Director should be made DFO, Ramnagar Tiger Reserve Division with a separate office from the Field Director. Both the DFOs will remain under control of the Field Director. A detailed proposal has been forwarded to the department for operationalization of RTRD along with the following suggestions.

Existing post	Proposed post
Director, CTR	Field Director, CTR
Deputy Director, CTR	Deputy Director & DFO, * RTRD.
DFO, Kalagarh	Deputy Director & DFO, **STRD
SDO, Bijrani, Kalagarh, Sonanadi & Adnala	SDO & Assistant Director of the respective Sub-Divisions.

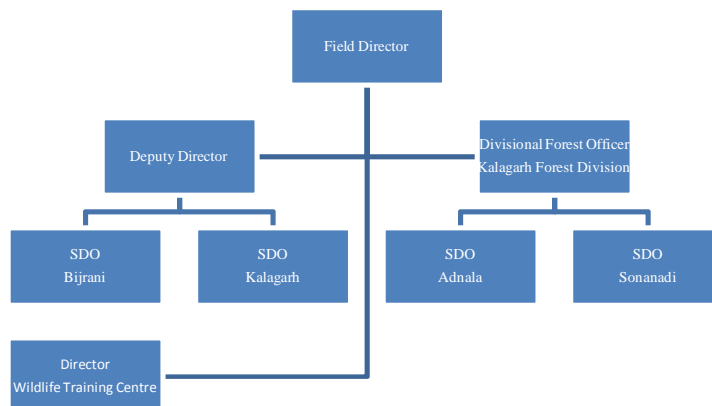
* RTRD- Ramganga Tiger Reserve Division

** STRD- Sonanadi Tiger Reserve Division

13.4.2. Staff Deployment:

The restructuring of staff pattern had sanctioned 19 ranges of which 11 territorial Ranges, one Research Range, 4 eco-tourism ranges, one Range officer for Wildlife Training Centre, Kalagarh, and two protection ranges. Corbett Tiger Reserve is struggling with vacancies in all levels of field staff. Recently the management had inducted some 35 forest guards and fourteen forest guards had got promotion to the post of Foresters. Endeavour should be made on the part of the department with active cooperation from the State Government to fulfil the vacant posts as well as decide the promotions at various levels as soon as possible. It is the need of the hour to boost the sagging spirit of the staff. The following flow chart shows the top hierarchy of Corbett Tiger Reserve. It is also proposed to create an additional range in Kalagarh Tiger Reserve Division by adding Nalkhatta block and Kalagarh block to existing Sonanadi range and splitting it into two ranges.

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Following are the tables which show the staff deployment throughout the Reserve.

Table -1. Ranges of Corbett Tiger Reserve:

Name of Ranges	Officiating Posts
Ramnagar Tiger Reserve	
1. Jhirna	Range Officer
2. Dhela	D.Range Officer
3.Kalagarh	D.Range Officer
4. Dhikala	D.Range Officer
5.Sarpduli	D.Range Officer
6.Bijrani	D.Range Officer
7. Research	D.Range Officer
8. Training Centre	D.Range Officer
9. Ecotourism (I)	D.Range Officer
10. Ecotourism (II)	Vacant
11. Ecotourism (III)	Vacant
12. Protection Range	Vacant
Kalagarh Tiger Reserve	
1.Palain	D.Range Officer
2.Sonanadi	D.Range Officer
3.Maidavan	D.Range Officer
4.Adnala	D.Range Officer
5.Mandal	D.Range Officer
6.Ecotourism	Vacant
7.Protection Range	Vacant

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Table-2. Forest Guard & Foresters in Core area of Corbett Tiger Reserve:

Name of Division	Name of Range	Nos. of Beats	Core Area		Total Forester and Forest Guard
		Core	Nos. of Forest Guards	Nos. of Foresters	
Ramnagar Tiger Reserve Ramnagar	Dhikala	3	4	5	9
	Sarpduli	5	9	6	15
	Bijrani	3	3	3	6
	Dhela	2	2	1	3
	Jhirna	2	6	4	10
	Kalagarh	7	10	2	12
Kalagarh Tiger Reserve, Lansdowne	Sonanadi	4	3	2	5
	Palain	3	3	1	4
	Mandal	0	0	0	0
	Adnala	4	4	2	6
	Maidavan	3	3	1	4
Grand Total		36	47	27	74

Table-3. Forest Guard & Foresters outside Core/ Buffer area of Corbett Tiger Reserve:

Sl. No.	Name of Range	Foresters	Forest Guards	Total
1	Research Range	6	6	12
2	Ecotourism Range	1	2	3
3	Wildlife Training Centre, Kalagarh	1	2	3
4	Headquarters	3	5	8
Grand Total		11	15	26

Table-4. The overall status of staff in Corbett Tiger Reserve:

Sl. No.	Post	Sanctioned post	Working	Vacancy
1	Range Officer	19	2	17
2	Deputy Range officer	15	15	0
3	Foresters	65	78	+13
4	Forest Guards	226	119	107
Grand Total		325	214	111

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The number of Forest Guards Chowkis and Anti-poaching Chowkis have been given as **Annexure- 13/3** and **Annexure-13/4** respectively.

13.4.3. STPF:

Government of Uttarakhand has also given permission for the creation of STPF (Special Tiger Protection Force) as per NTCA guidelines. The proposed strength of STPF is as follows ó

- ACF - 1
- Range Officer - 3
- Tiger Protection Guards - 108

The process constitution of STPF through a MoU is pending with the State Government. It should be executed at the earliest.

13.4.4. Operation Lord and Tiger Protection Force:

Besides the regular staff deployed in protection; about 200 labourers (working as Operation Lord) and 65 ex-servicemen (named TPF), are also posted at different stations to further strengthen the protection apparatus.

13.4.5. Reorganisation of beats:

The creation of new beats and determination of their headquarters as per the reorganized structure has not been done and will be accomplished at the earliest. The proposal for the same has been sent to the Chief Wildlife Warden.

13.4.6. Annual Inspection:

Deputy Director, Corbett Tiger Reserve & DFO, Kalagarh will continue to do inspection of Sub-divisions and Ranges under his jurisdiction. The SDOs of Corbett Tiger Reserve will do inspection of Ranges under their respective jurisdictions at least two months before the inspection of the Deputy Director and DFO. The Director, will continue to inspect the office of the DFO, Kalagarh as before. It is prescribed that the Director, should inspect the Office of the Deputy Director, which was not happening in Corbett Tiger Reserve. Since regular inspection and follow up action is imperative for effective management of office as well as the overall working in the fields, care will be taken to ensure effective 'Annual Inspection regime' of the tiger Reserve.

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13.4.7. Other allied activities:

- (i) The 'building register' will be upgraded to maintain every details about all kinds of buildings including the Machans.. The Deputy Director will bi-annually inspect the register and inform to the Director. Care will be taken to retain the antique value of old buildings and furniture while resorting to any repair/maintenance works.
- (ii) Periodic checks of the store should be done regularly by the respective SDOs. Care should be taken to disposed off clutters after fulfilling all the necessary rules and regulations. Old vehicles (Cycles, motor cycles, tractores, Jeeps etc.) should be written off so that new vehicles will be allotted by Corbett Tiger Reserve. SDOs are responsible to expedite the matter following all the necessary rules and regulations.
- (iii) An exclusive register will be maintained to record every detail of vehicles with the name of the divers. The respective SDOs will ensure one stop register of all vehicles under their jurisdiction.
- (iv) The stocks of C-1 and C-17 will be disposed off according to the prevailing rules and regulations. Either the C-1 stock should be used for departmental work or to be given to the Uttarakhand Forest Development Corporation. As per the prevailing order the timber of C-1 stock can be used for departmental works. Every care will be taken to follow the prescribed procedure to minimise wastage and prevent pilfeage. Whenever wood is being transported, proper challans will be issued. The date, time, quantity of wood being taken out will be meticulously checked and entered at the gates. The SDOs will verify the quantity to be transported into and out of the C1 stock. When ever any fallen tree is under the risk of being stolen, the same will be promptly recovered and entered in the C1 stock. Proper legible 'Property mark' should be put on the wood as well in the root stock.

Timbers of the C-17 stock should be transferred to C-1 promptly after disposal of the H-2 case. The SDOs and the DFOs will inspect the stock regularly during their field inspections.

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13.5. Welfare of Staff:

Given the arduous and strenuous nature of the service, the field staff should be given special amenities. Since it is impossible for the staff to be living with their families, it is further necessary to assist them for the education of their children. Following is the check list of welfare measures which should be carried out depending upon the availability of budget and assistance from the Corbett Tiger Conservation Foundation.

1. Housing: Forest colonies are available at Ramnagar and Kalagarh. The dwelling units requires measure repair and at least 20 more units should be constructed in the coming five years.

2. Field Equipments: The front line staff should be equipped with all necessary equipments for their camp life and as well as to discharge their duty. Equipments like water filters, water bottles, measuring tapes, compass, pedometers, field forms and diaries, small axe, fire arms, tiger tracers, plaster of paris, GPS, high beam torches , search lights, solar light for camps, solar rechargers, etc shall be provided as and when needed.

3. Uniforms and protective gears: Timely supply of good quality uniforms as per provisions shall be ensured every year along with other items such as caps, belts, boots, hunter shoes, winter wears, raincoats etc. Protective gears like wooden canes, helmets etc, should also be provided.

4. Incentives and awards: There have been discussions for payment of nutrition allowance to various categories of wildlife staff, but no provisions to that effect have been made. At present Project Tiger allowance is paid to all staff. Apart from monetary incentives, incentives or awards for meritorious work should be given for motivation. Nominations for excellent work to various awards like Rajiv Gandhi wildlife award, Amrita devi Vishnoi award etc. should be made for deserving personnel.

5. Health checkups / Insurance: Regular health camps should be organised for health checkups of staff. Some hospitals could be contracted for complete check-up and treatment of staff and their immediate family. This will ensure better health and will in turn result into better output from staff & will have great value. Possibilities of comprehensive insurance for staff & field assistantants living in interior areas should be

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explored with insurance companies. The Corbett Tiger Conservation Foundation should take up this welfare measure.

6. Management of Canteens and Nature Shops: In compliance to the 'Comprehensive Guideline of NTCA' the privately operated canteens and nature shops will be managed by the Tiger Conservation Foundation. It will be beneficial to run these eateries through Corbett Tiger Reserve - Staff welfare Association of which all the field staff are members or any Govt. run entity like KMVN. The staff welfare society or govt. run entity will manage all the canteens and nature shops available in the Corbett Tiger Reserve. The present practice of running these tourist facilities through tender has caused un-necessary burden on the Tiger Reserve as well as on the staff. The prevailing cost of food is unaffordable for most of tourists as well as the patrolling staff. This is due to competition for bidding highest rate for the canteens which eventually leads to escalation of cost of food and other eatable materials. In the event of managing the facility through 'tiger conservation foundation' will bring discipline in the tourist zone as well as afford reasonable rate for quality food. Certain portion of the profit can be shared between the operating agency as well as the Foundation. Ultimately the foundation can spend the money for the overall management of the Tiger Reserve including village development schemes. A self-descriptive proposal should be send to the State Government through the Governing Body of the Foundation to put the above concept into reality. It is pertinent to mention that such type of arrangement has already been running successfully in Kanha Tiger Reserve.

7. Child Education: Meritorious children of staff will be encouraged. The students who scores more than 80% in the class X, XI & XII will be given all reading material free of cost. The parents can avail soft loan for higher education of their children from the Tiger Foundation. Necessary provision will be made in the said tiger conservation foundation of Corbett Tiger Reserve. All children of the staff are eligible for free guided tour organised by the Corbett Tiger Reserve administration once a year.

8. Rotational Posting: A transparent rotational transfer policy will be followed to shift forest guards and foresters from forest beats of interior areas (difficult postings) to peripheral areas. This practice will be continued to ward off monotony of the work in the core areas, where the basic modern amenities are unavailable. People manning ecotourism will be regularly shifted into other protection works, so that they will be exposed to hard life of tiger protection. But at the same time the willing staff will be

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encouraged to stay in the core areas and they should be given all support from the management. Foresters and forest guards will be given opportunity to learn about the business of court cases who will be given chance to be posted at the headquarters. Care will be taken to ward off the chances of becoming these resourceful persons as indispensable.

13.6. Forest Guard Chowkis and Anti Poaching Chowkis:

All forest guard and anti-poaching towers will be regularly evaluated for maintenance which includes the source of light and drinking water facilities. High quality water storage tanks (preferably 500 liters) with water filters will be provided in those chowkis where fetching of water is a major problem for the staff. All ranges will maintain a roster system to supply drinking water through tankers to all those chowkis who do not have safe drinking water sources.

13.7. Forest Rest Houses of the core areas:

Some of the strategic forest rest houses of core areas remain neglected. Paterpani is the case in point. Ironically, all rest houses are renovated with the fund available only for those which had potential to generate revenue out of tourism activity. Of late no fund was available for upkeepment of rest houses like Paterpani, Jamunaguad, and Gucchupani. These rest houses need major renovation and that should be done as soon as possible.

13.8. Fund raising Strategies:

With the formation of the Corbett Tiger Conservation Foundation, it has been indicated that the Tiger Reserve should not depend solely upon the Central and State Budget. It has to explore other National and international funding sources if not from NGOs, Private Agencies and Public Sectors. The foundation has started collecting twenty percent of revenue accruing from eco-tourism. The Executive Committee of the Foundation can hire professionals for exploring above mentioned source of funding for the Tiger Reserve.

While Central Sponsored Schemes like Project Tiger, 13th Finance Commission, 12th Five Year Plan, etc, and State Plan of Uttarakhand being the source of funding for the Corbett Tiger Reserve, following sources can be tapped for added financial grants..

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1. Contribution from the Hotels and Resorts, who are getting massive business due to the Tiger Reserve
2. Renowned NGOs and Media Houses can contribute for staff welfare activities.
3. National and International Donor Agencies can support research based projects.
4. Well structured, justifiable APO for NTCA & State Government
5. Additional fund from CAMPA
6. Donations by corporate houses and individuals to Tiger Conservation Foundation.
7. Increasing the revenue share (generating from eco-tourism activities) from the prevailing 20% to 100% for the foundation.
8. Earning from online booking.
9. Soliciting donations from corporate houses.
10. The web site can be used to post advertisements from reputed firms, corporate houses, government agencies etc.
11. Photographs of natural landscape and wildlife will be sold through foundation by executing an MoU with competent persons.
12. Motivating resorts to contribute for Conservation Foundation.
13. Management of Canteens and nature shops by Staff Welfare Society through foundation.
14. Detail of fund raising strategy shall be finalized in the forth coming meeting of the Governing Body of the Foundation.
15. 25% of the fund will be maintained as fixed deposit.
16. Rs. 25 is proposed to be collected from each tourist, which will generate approximately Rs. 50 lakh from two lakh visitors. 50% may be allocated to the EDCs, 25% for improvement of tourist facilities and 25% will be invested in income generated instruments.

13.9. Schedule of Operations:

The conservation plan suggests two types of activities:

1. One which are supposed to funded/implemented by the TR

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2. Another which are to be funded/implemented by outside agency especially The Tiger Conservation Foundation

For activities of category one the TR already prepares an annual plan of operations (APO). The APO is always based on the prescriptions of The Conservation Plan and gives details of schedule of operations.

For activities of second category, they need to be first cleared from the Governing Body of the Foundation. After that the Executive Body should make an Annual Plan of Operation based on the approved activities which should also elaborate the schedule of operations.

Following are the important operations which has to be accomplished within the time frame. Proper record should be maintained to monitor the progress and short comings.

Following are the important operations, which has to be accomplished within the time frame. Proper record should be maintained to monitor the progress and short comings.

	Jan	Feb	Mar	Apl	May	June	July	Aug	Sept	Oct	Nov	Dec
Protection												
Fire Line cutting & burning												
Fire Protection												
Road Repairs												
Water conservation work												
Water supply by tankers												
Lantana uprooting												
Weed uprooting												
Eco tourism												

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13.10. Activity Budget:

Schedule of Rates: The Corbett Tiger Reserve did not have its own 'Schedule of Rates'. Traditionally it follows the rates of the Western Circle, Nainital and the prevailing PWD rates. An exclusive 'Schedule of Rates' is pending since the inception of Corbett Tiger Reserve constituted into a 'circle' in 1994. As much of the works carried out in the Tiger Reserve is in the difficult terrain and of specialized nature, very often the rates of the other 'Circle' cannot fit into the requirements of the jobs carried out. Hence the scheduled rates have been issued for the Corbett Tiger Reserve -circleø

Collection of Revenue: Corbett Tiger Reserves generates substantial amount as revenue mostly from the ecotourism activities. Special care should be taken to ensure accurate accounting of the fund. The Deputy Director being the DDO, should regularly check the entries and due care should be taken to make available of receipts of payments to the tourists.

A comprehensive ten year Prospective Plan should be prepared which reflects each and every activity pertaining to professional management of the Tiger Reserve. Based upon the Prospective Plan, Annual Plan of Operation for Project Tiger will be prepared following the guide line prepared by the NTCA. Similarly, SSP will be prepared for CAMPA, APO for Elephant Project and State Plan. Budgetary demand for 13th Finance Commission and 12th Five Year Plan should be prepared and submitted within the timeframe. All EDCs will be required to prepare their respective microplans to receive funds from tiger conservation foundation and Project Tiger.

CORBETT TIGER RESERVE, UTTARAKHAND, RAMNAGAR (NAINITAL)

Sl.No.	Item	(Rs. in Lakhs)																			
		Year																			
		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		2018-19		2019-20		2020-21		2021-22	
Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.		
	A. NON-RECURRING																				
	1 Anti Poaching activities																				
1.1	Deployment of antipoaching squads	200 no.	84.24	200 no.	84.24	200	96.00	200	105.60	200	116.15	200	127.80	200	140.55	200	154.60	200	170.06	200	187.06
1.2	Organizing vehicular patrolling by constituting (Tiger Protection Force, comprising of field staff, labourers and police/SAF/ex-army personnel, with wireless handset and paraphernalia for apprehending offenders, apart from prescribing a patrolling calendar for the squad.	LS	72.74	LS	72.74	LS	80.00	LS	88.00	LS	96.80	LS	106.50	LS	117.15	LS	128.90	LS	141.79	LS	155.96
1.4	Procurement of arms and ammunition		-		-		-		-		-		-		-		-		-		-
1.4.1	Rifle	25 no.	16.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
1.4.2	Pump action gun	20 no.	5.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
1.4.3	Ammunition	1000	0.50	2000	1.00	2000	1.00	2000	1.00	2000	1.00	2000	1.50	2000	2.00	2000	2.50	2000	2.75	2000	3.02
1.5	Procurement of vehicles, boats																				
1.5.1	Camper	2	10.00	2 no	10.00	2 no	11.00	2 no	12.10	2 no	13.30	2 no	14.65	2 no	16.15	0	0.00	0	0.00	0	0.00
1.5.2	Gypsy	2	10.00	2 no.	10.00	2 no.	11.00	0	0	2 no.	13.20	0	0	0	0	0	0	0	0	0	0
1.5.3	Scorpio/Bolero	2	15.00	2 no.	15.00	0	0	0	0	2 no.	18.00	0	0.00	0	0	0	23.40	2 no.	25.74	2 no.	38.31
1.5.4	Tractor	2	7.00	2 no.	7.00	2 no.	8.00	0	0	2 no.	9.00	0	0	0	10.00	0	0	0	0	0	0
1.5.5	Motor Cycle	30	13.00	30 no.	13.00	30 no.	15.00	30	16.50	0	0	0	0	0	0	0	21.00	30	23.00	30	25.00
1.5.6	Boat	0	0	2 no.	20.00	2 no.	20.00	0	0	0	0	0	0	0	0	0	30.00	2 no.	33.00	2 no.	36.00
1.5.7	Purchase of Generator Set																				
1.5.8	Purchase of Deep freezer																				
1.6	Procurement of field gear, night vision device	LS	5.00	LS	5.00	LS	5.50	LS	6.05	LS	6.65	LS	7.35	LS	8.05	LS	8.85	LS	9.35	LS	10.28
1.7	Fornight long term joint patrols party (25x4=100@6500)	100 no.	6.50	100 no.	6.50	100	7.15	100	7.85	100	8.65	100	9.50	100	10.50	100	11.50	100	12.65	100	13.91
1.8	Special patrolling (4x12=48@6500)	50 no.	3.25	50 no.	3.25	50 no.	3.60	50	3.95	50	4.35	50	4.75	50	5.25	50	5.75	50	6.32	50	6.95

Sl.No.	Item	(Rs. In Lakhs)																							
		Year																							
		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		2018-19		2019-20		2020-21		2021-22					
Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.				
2	Strengthening of infrastructure within Tiger Reserves																								
2.1	Civil Works (staff quarters, family hostels, office improvement, patrolling camp, house keeping building, museum, culverts).																								
2.1.1	Staff Quarter	4 no.	20.00	4 no.	20.00	4 no.	22.00	4 no.	24.20	4 no.	26.65	4 no.	29.30	4 no.	32.20	4 no.	35.45	4 no.	38.99	4 no.	42.88				
2.1.2	Anti Poaching Camp	4 no.	20.00	3 no.	15.00	3 no.	16.50	3 no.	18.15	3 no.	20.00	3 no.	22.00	3 no.	24.20	3 no.	26.65	3 no.	29.31	3 no.	32.24				
2.1.3	Family hostel	6 no.	30.00	6no.	30.00	6no.	35.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2.2	Procurement of hardware, software/GIS	LS	5.00	LS	3.00	LS	3.30	LS	3.65	LS	4.00	LS	4.40	LS	4.85	LS	5.35	LS	5.88	LS	6.46				
2.3	Procurement of compass, range finder, GPS, camera traps	LS	5.00	LS	5.00	LS	5.50	LS	6.05	LS	6.65	LS	7.35	LS	8.05	LS	8.85	LS	9.73	LS	10.7				
2.4	Procurement of satellite imageries for management planning	LS	1.00	LS	1.00	LS	1.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2.5	Map digitization facility for management planning	LS	5.00	LS	5.00	LS	5.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2.6	Purchase of Satellite Phone	1	2.00	1 no.	2.00	1 no.	2.20	1 no.	2.45	1 no.	2.65	1 no.	2.95	1 no.	3.25	1 no.	3.55	1 no.	3.9	1 no.	4.29				
2.7	Construction of new water holes	10	5.00	10 no.	7.50	10 no.	8.25	7 no.	5.95	5 no.	5.00	5 no.	5.50	0	0	5 no.	6.10	5 no.	6.71	5 no.	7.38				
2.8	Construction of wooden watch	4	8.00	-	0.00	0	0	2 no.	10.00	0	0	2 no.	12.00	0	0	0	0	0	0	0	0	0			
3	Addressing man-animal conflict																								
3.1	Payment of compensation for cattle lifting, death of human beings and crop depredation due to wild animals	LS	20.00	LS	15.00	LS	16.50	LS	18.75	LS	20.60	LS	22.65	LS	24.90	LS	27.40	LS	30.14	LS	33.15				
3.2	Creation of crop protection structures.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
3.2.1	Solar Fencing	200 mt.	3.50	1000 mt	18.00	0	0.00	1000 mt	21.60	0	0	0	0	1000 mt	26.00	0	0	1000 mt	28.00	0	0	0			
3.2.2	Construction of stone wall	2 km	30.00	-	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
3.3	Procurement/deployment of traps, cages to catch problematic	LS	2.50	LS	10.00	0	0	LS	11.00	0	0	0	0	LS	10.00	0	0	LS	11.00	0	0	0			
3.4	Procurement of tranquilizing equipments, rescue vehicles and drugs.	LS	10.00	LS	10.00	LS	5.00	LS	5.00	LS	10.00	LS	6.00	LS	10.00	LS	5.00	LS	5.50	LS	6.05				
3.4.1	Rrescue vehicle	1	5.00	1 no.	6.00	1 no.	7.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
3.5	Veterinary Medicines	LS	2.00	LS	2.00	LS	2.20	LS	2.45	LS	2.65	LS	2.95	LS	3.25	LS	3.55	LS	3.90	LS	4.29				

Sl.No.	Item	(Rs. In Lakhs)																							
		Year																							
		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		2018-19		2019-20		2020-21		2021-22					
Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.				
3.6	Strengthening the EDCs	25	50.00	25	50.00	25	50.00	25	25.00	25	50.00	25	75.00	25	50.00	25	50.00	25	50.00	25	50.00	25	50.00		
4	Co-existence agenda in buffer/ fringe areas																								
4.1	Providing ecologically viable livelihood options to local stakeholders for reducing their dependency on forests.	LS	40.00	LS	40.00	LS	30.00	LS	35.00	LS	40.00	LS	45.00	LS	50.00	LS	50.00	LS	55.00	LS	60.00				
4.2	Conserving the forest area through restorative inputs involving local people for providing habitat supplement to wild animals moving out of core areas.	200 ha.	16.00	300 Ha	24.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
5	Rehabilitation package for traditional hunting tribes living around tiger reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6	Research and field equipments	LS	10.00	LS	6.95	LS	7.00	LS	8.00	LS	5.00	LS	6.00	LS	7.00	LS	8.00	LS	8.80	LS	9.68				
7	Staff development and capacity building																								
7.1	Capacity building/training	LS	10.00	LS	10.00	LS	10.00	LS	12.00	LS	15.00	LS	17.00	LS	18.00	LS	20.00	LS	22.00	LS	24.00				
7.2	Special incentives.	0	0.00	LS	32.00	LS	32.00	LS	32.00	LS	32.00	LS	32.00	LS	32.00	LS	32.00	LS	35.00	LS	38.00				
7.3	Specialized training in the use of GIS, Anti poaching operations.	10 no.	3.00	10 no.	3.00	10 no.	3.00	10 no.	3.00	10 no.	4.00	10 no.	4.00	10 no.	5.00	10 no.	5.00	10 no.	5.50	10 no.	6.05				
7.4	Specialized training in jurisprudence and wildlife forensics.	2 no.	1.00	2 no.	1.00	2 no.	1.00	2 no.	1.00	2 no.	1.00	2 no.	1.50	2 no.	1.75	2 no.	2.00	2 no.	2.20	2 no.	2.42				
7.5	Study tours for appraisal of good practices in other reserves.	2 no.	3.00	10 no.	10.00	10 no.	10.00	10 no.	10.00	10 no.	10.00	10 no.	12.00	10 no.	14.00	10 no.	16.00	10 no.	17.00	10 no.	18.00				
7.6	Dissemination workshops.	2 no.	1.00	2 no.	2.00	2 no.	2.00	2 no.	2.00	2 no.	2.00	2 no.	2.00	2 no.	3.00	2 no.	4.00	2 no.	4.40	2 no.	4.84				
7.7	Specialized training in park interpretation	4 no.	2.00	4 no.	2.00	4 no.	2.00	4 no.	2.00	4 no.	2.50	4 no.	3.00	4 no.	3.50	4 no.	4.00	4 no.	4.40	4 no.	4.84				
7.8	Specialized training in management planning	LS	2.00	LS	2.00	LS	2.00	LS	2.00	LS	2.00	LS	2.00	LS	3.00	LS	3.00	LS	3.30	LS	3.63				
8	Deciding inviolate spaces for wildlife and relocation of villagers from core or critical tiger habitats in Tiger Reserves within a timeframe and settlement of rights	0	0	LS	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Sl.No.	Item	(Rs. In Lakhs)																			
		Year																			
		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		2018-19		2019-20		2020-21		2021-22	
Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.		
9	Mainstreaming wildlife concerns in tiger bearing forests and fostering corridor conservation through restorative strategy involving locals to arrest fragmentation of habitats	LS	10.00	LS	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9.1	Redressing man-animal conflict	LS	5.00	LS	20.00	LS	20.00	LS	20.00	LS	20.00	LS	20.00	LS	20.00	LS	20.00	LS	22.00	LS	24.00
9.2	Capturing problematic/aberrant wild animals	LS	10.00	LS	15.00	LS	15.00	LS	15.00	LS	15.50	LS	16.00	LS	16.50	LS	17.00	LS	18.70	LS	20.57
9.3	Monitoring of wild animals	11 no.	5.00	11 no.	5.00	LS	5.50	LS	6.00	LS	6.50	LS	7.00	LS	7.50	LS	8.00	LS	8.80	LS	9.68
9.4	Anti poaching operations	0	0.00	LS	3.00	LS	3.30	LS	3.60	LS	4.00	LS	4.50	LS	5.00	LS	5.50	LS	6.05	LS	6.65
9.4.1	Interstate patrolling	12 no.	0.78	24 no.	1.56	24 no.	2.00	LS	2.50	LS	3.00	LS	3.50	LS	4.00	LS	4.50	LS	4.95	LS	5.44
9.5	Habitat improvement measures	100 ha	8.00	300 ha	24.00	300 ha	26.40	300 ha	29.00	LS	32.00	LS	35.00	LS	39.00	LS	43.00	LS	47.00	LS	51.00
10	Safeguards/Retrofitting measures in the interest of Wildlife	LS	2.00	LS	2.00	LS	2.00	LS	2.00	LS	2.20	LS	2.50	LS	2.75	LS	3.00	LS	3.30	LS	3.63
11	Provision of Project Allowance to staff (all categories) of Project Tiger	LS	25.50	LS	35.53	LS	39.10	LS	43.00	LS	47.30	LS	52.05	LS	57.25	LS	63.00	LS	69.00	LS	75.00
12	Staff welfare activities																				
12.1	Other welfare activities	LS	10.00	LS	15.00	LS	16.50	LS	18.15	LS	20.00	LS	22.00	LS	24.20	LS	26.65	LS	29.31	LS	32.24
12.2	Drinking water facility	300 no.	6.00	300 no.	3.00	300 no.	3.30	300 no.	3.70	300 no.	4.10	300 no.	4.50	300 no.	5.00	300 no.	5.50	300 no.	60.5	300 no.	6.65
13	Implementation of " M-STIPES	0	0	LS	27.05																
13	Fostering Eco-Tourism in Tiger Reserves	5 no.	25.00	5 no.	29.00	5 no.	31.90	5 no.	35.00	5 no.	38.50	5 no.	42.35	5 no.	46.60	5 no.	47.00	5 no.	51.00	5 no.	56.00
14	Publicity and extension	LS	10.00	LS	10.00	LS	11.00	LS	12.10	LS	13.30	LS	14.60	LS	16.10	LS	17.70	LS	19.47	5 no.	21.41
	Total Non-recurring		677.51		770.32		728.30		692.35		755.20		810.65		887.50		963.25		1145.40		1157.66
	RECURRING																				
1	Anti Poaching activities																				
1.1	Establishment and maintenance of existing patrolling camps/chowkis and deployment of camp laborers for patrolling	50 no.	30.00	50 no.	30.00	50 no.	33.00	50 no.	36.30	50 no.	39.90	50 no.	43.90	50 no.	48.30	50 no.	53.15	50 no.	58.46	50 no.	64.30
1.2	Establishing and maintenance of wireless network	LS	5.00	LS	10.00	LS	11.00	LS	12.10	LS	13.30	LS	14.60	LS	16.10	LS	17.70	LS	19.47	LS	21.41

Sl.No.	Item	(Rs. In Lakhs)																			
		Year																			
		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		2018-19		2019-20		2020-21		2021-22	
Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.		
1.3	Organising surprise raids jointly with the local police in railway stations, local trains, bus-stops, buses, catchers and cafeterias.	24 no.	1.20	24 no.	1.20	24 no.	1.35	24 no.	1.50	24 no.	1.65	24 no.	1.85	24 no.	2.00	24 no.	2.20	24 no.	2.42	24 no.	2.66
1.4	Ensuring special site-specific protection measures, during monsoon as 'Operation Monsoon'- considering the terrain and accessibility of Protected Areas.	LS	7.00	LS	14.00	LS	15.40	LS	16.95	LS	18.65	LS	20.50	LS	22.55	LS	24.80	LS	27.28	LS	30.00
1.5	Deployment of local work force for patrolling, surveillance of water holes, manning barriers.	55 no.	23.17	55 no.	23.17	55 no.	26.4	55 no.	29.05	55 no.	31.95	55 no.	35.15	55 no.	38.65	55 no.	42.50	55 no.	46.75	55 no.	51.42
1.6	Procurement/maintenance of elephant squads.	7 no.	14.00	7 no.	15.00	7 no.	16.50	7 no.	18.15	7 no.	19.95	7 no.	21.95	7 no.	24.15	7 no.	26.55	7 no.	29.20	7 no.	32.12
1.7	Rewards to informers	LS	5.00	LS	7.00	LS	7.70	LS	8.50	LS	9.35	LS	10.25	LS	11.30	LS	12.45	LS	13.69	LS	15.05
1.8	Legal support for defending court cases.	LS	2.00	LS	5.00	LS	5.50	LS	6.05	LS	6.65	LS	7.35	LS	8.10	LS	9.00	LS	9.90	LS	10.89
2	Strengthening of infrastructure within Tiger Reserves																				
2.1	Maintenance/creation/upgradation of road network.	LS	60.00	LS	120.00	LS	132.00	LS	145.20	LS	159.75	LS	175.75	LS	193.35	LS	212.70	LS	233.97	LS	257.36
2.2	Maintenance/creation of wireless tower	LS	1.00	LS	3.00	LS	3.30	LS	3.65	LS	4.00	LS	4.40	LS	4.85	LS	5.35	LS	5.88	LS	6.46
2.3	Maintenance/creation of fire watch tower	4 no.	5.00	24 no.	28.00	24 no.	24.00	24 no.	26.40	24 no.	29.05	24 no.	31.95	24 no.	35.15	24 no.	38.65	24 no.	42.51	24 no.	46.76
2.4	Maintenance/creation of bridges, dams, anicuts.	LS	7.00	LS	10.00	LS	11.00	LS	12.10	LS	13.35	LS	14.70	LS	16.20	LS	17.85	LS	19.63	LS	21.59
2.5	Maintenance/creation of fire lines/firebreaks	LS	20.00	LS	28.00	LS	30.80	LS	33.90	LS	37.30	LS	41.05	LS	45.15	LS	49.65	LS	54.61	LS	60.07
2.6	Maintenance/creation of earthen ponds	5 no.	10.00	5 no.	10.00	5 no.	11.00	5 no.	12.10	5 no.	13.35	5 no.	14.70	5 no.	16.20	5 no.	17.85	5 no.	19.63	5 no.	21.59
2.7	Maintenance of vehicles (Gypsy, Jeep, Truck, tractor)	LS	35.00	LS	50.00	LS	55.00	LS	60.50	LS	66.55	LS	73.20	LS	80.60	LS	88.65	LS	97.51	LS	107.26
2.8	Habitat improvement works	731 ha	25.69	731 ha	25.69	1000 ha	40.00	1000 ha	44.00	1000 ha	48.40	1000 ha	53.25	1000 ha	58.60	1000 ha	64.45	1000 ha	70.89	1000 ha	77.97
2.9	Maintenance of Arms	LS	1.00	LS	2.00	LS	2.20	LS	2.45	LS	2.70	LS	3.00	LS	3.30	LS	3.70	LS	4.07	LS	4.47
2.10	Maintenance of museums	3	30.00	3	30.00	3	30.00	3	5.00	3	5.50	3	6.05	3	6.65	3	7.35	3	8.08	3	8.88
2.11	Maintenance of staff Qrs.	30	30.00	30	30.00	30	33.00	30	36.30	30	39.95	30	43.95	30	48.35	30	53.20	30	58.52	30	64.37

Sl.No.	Item	(Rs. in Lakhs)																							
		Year																							
		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		2018-19		2019-20		2020-21		2021-22					
Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.				
2.12	House keeping buildings	5	5.00	5	5.00	5	5.50	5	6.00	5	6.50	5	7.00	5	7.50	5	8.00	5	8.80	5	9.68				
2.13	Improvement of Office Buildings	10	10.00	10	15.00	10	16.50	10	18.15	10	20.00	10	22.00	10	24.20	10	26.65	10	29.31	10	32.24				
3	Habitat improvement and water development																								
3.1	Weed eradication, removal of gregarious plant growth from grasslands, grass improvement, water retention structures and the like.	350 ha	28.00	550 ha.	44.00	550 ha.	48.40	550 ha.	53.25	550 ha.	58.60	64.50	70.95	78.05	85.85	94.43									
3.2	Annual maintenance of water holes	LS	10.00	LS	10.00	LS	11.00	LS	12.10	LS	13.35	LS	14.70	LS	16.20	LS	17.85	LS	19.63	LS	21.59				
3.3	Maintenance of existing plantation	50 hac.	2.50	95 hac.	3.00	LS	3.30	LS	3.65	LS	4.00	LS	4.40	LS	4.85	LS	5.35	LS	5.88	LS	6.46				
3.4	Soil & moisture conservation works	LS	15.00	LS	27.00	LS	29.70	LS	32.70	LS	36.00	LS	39.60	LS	43.60	LS	48.00	LS	52.00	LS	57.00				
3.5	Maintenance of Nursery	4 no.	3.00	4 no.	3.00	4 no.	3.30	4 no.	3.65	4 no.	4.00	4 no.	4.40	4 no.	4.85	4 no.	5.35	4 no.	5.88	4 no.	6.46				
4	Office Expenditure	LS	17.00	LS	20.00	LS	22.00	LS	24.20	LS	26.65	LS	29.30	LS	32.20	LS	35.45	LS	38.99	LS	42.88				
5	Publicity and extension	LS	10.00	LS	10.00	LS	11.00	LS	12.10	LS	13.35	LS	14.70	LS	16.20	LS	17.85	LS	19.63	LS	21.59				
6	Wildlife Week	LS	4.00	LS	4.00	LS	4.40	LS	4.85	LS	5.35	LS	5.90	LS	6.50	LS	7.15	LS	7.86	LS	8.64				
	Total Recurring		416.56		583.06		644.25		680.85		749.10		824.05		906.60		997.45		1096.30		1205.60				
	G. Total (Non-Recurring + Recurring)		#####		1353.38		1372.55		1373.20		#####		1634.70		#####		1960.70		2241.70		2363.26				

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Chapter-14

Monitoring & Evaluation

14.1. Criteria:

The works of Corbett Tiger Reserve & various other activities will be monitored as per departmental rules & guidelines being issued from time to time.

Apart from that, it will be binding to fulfill all the conditions laid down in the Tripartite MoU signed between the NTCA, Government of Uttarakhand and Director, Corbett Tiger Reserve.

**THE TRIPARTITE MEMORANDUM OF UNDERSTANDING
BETWEEN
THE MINISTRY OF ENVIRONMENT AND FORESTS
(NATIONAL TIGER CONSERVATION AUTHORITY)
GOVERNMENT OF UTTARAKHAND, AND FIELD DIRECTOR
CORBETT TIGER RESERVE**

ARTICLE I

Obligations of the Ministry of Environment and Forests (through the NTCA)

The Ministry of Environment and Forests has agreed and affirmed that:-

- (a) Funding support under Project Tiger shall be made available to the Tiger Reserve in two phases, on receipt of the Annual Plan of Operation with cost estimates of proposed field initiatives, based on tiger reserve specific Tiger Conservation Plan.
- (b) The first installment of the funding support under Project Tiger would be done by four weeks after receipt of the Annual Plan of Operation from respective State Governments, subject to the availability of funds and directives of the Ministry of Finance.
- (c) The second installment of the funding support under Project Tiger would be released by two weeks after receipt of Utilization Certificate pertaining to previous year from the States along with 60% Utilization Report of funding support released as first installment during the current financial year, and the

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Progress Report in the desired format from the Field Director, duly recommended by the Chief Wildlife Warden of the State.

- (d) Technical guidance in the form of advisory would be provided to the Field Director under intimation to the State Government in the Tiger Reserve, within the ambit of the provisions contained in the Wildlife (Protection) Act, 1972, with regard to conservation of tigers and their habitat.
- (e) An ecological auditing on the impact of investment made in the reserve shall be carried out as per prescribed criteria.

ARTICLE II

Obligations of the Government of Uttarakhand:

The State Government has agreed and affirmed that:-

- (1) The Tiger Conservation Plan, as required under section 38V of the Wildlife (Protection) Act, 1972, as amended in 2006, shall be prepared for the Tiger Reserve for which the funding support is being sought from NTCA, GOI, as per the prescribed guidelines within 6 months from August 2009.
- (2) The core or critical tiger habitat and the buffer or peripheral area shall be delineated and notified as required under the Wildlife (Protection) Act, 1972, as amended in 2006 within 6 months from August 2009.
- (3) The staff vacancies shall be filled up by state Govt. for ensuring effective implementation and field protection, after fixing area norms vis-à-vis the topography within 6 months from August 2009.
- (4) The money released under Project Tiger shall be made available to the tiger reserve within 2 weeks of its receipt in the State for implementing tiger conservation initiatives, as proposed in the Annual Plan of Operations, with due compliance of the normative guidelines and advisories of the said Authority.
- (5) The State Government shall post a motivated officer with proven track record, preferably trained in wildlife management, as the Field Director of the Tiger Reserve, with a minimum tenure of three years (extendable if the situation warrants).

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- (6) The State Government shall constitute a Steering Committee as required under section 38U of the Wildlife (Protection) Act, 1972, as amended in 2006, under the Chairmanship of the Chief Minister, for ensuring coordination, monitoring, protection and conservation of tiger, co-predators and prey animals, within one year from March 2009.
- (7) The State Government shall establish a reserve-specific Tiger Conservation Foundation, as autonomous òprofit centersö for the Tiger Reserve to facilitate and support its management for tiger conservation and eco-development, by involving local people, as per the guidelines issued, empowered to receive tourism gate collections, assistance from Government and other funds from Government and planning authority, to create a òdevelopment fundö, and deploy it for the benefit of the reserve, local people and the staff within 6 months from August 2009.
- (8) The State Government shall promote action for local intelligence gathering and protection of the tiger reserve, and this òSecurity Planö should form part of the Tiger Conservation Plan, with provisions for periodic òSecurity Auditö.
- (9) The State Government shall ensure capacity building of the frontline staff for effective enforcement, apart from staff development and staff welfare measures, based on a capacity building plan made part of the Tiger Conservation Plan.
- (10) The State Government shall regulate tourism as per carrying capacity computed for the reserve and develop forest and wildlife tourism policy for the State within one year from January 2009.
- (11) The State Government shall avail the enhanced relocation package for relocating the villages in the core / critical tiger habitats as per the revised guidelines of the Project Tiger and statutory provisions, in a time bound manner.
- (12) The State Government shall take steps for restoring the identified corridor linkages with the Tiger Reserve by mainstreaming tiger conservation in the landscape amongst the various production sectors, with the active involvement of territorial forest divisions, and revenue authorities, having scope for handholding by credible agencies outside the Government system.
- (13) The State Government shall ensure ecologically compatible land uses in areas linking one tiger reserve with the other, while ensuring that forestry operations

Tiger Conservation Plan, Core Zone

of regular forest divisions and those adjoining tiger reserves are not incompatible with the needs of tiger conservation.

- (14) The State Government shall certify that no ecologically unsustainable land use such as mining, industry and similar projects operate within the Tiger Reserve.
- (15) The State Government would ensure that the day-to-day tiger monitoring protocol is ensured in the Tiger Reserve as per advisories issued by the National Tiger Conservation Authority (Project Tiger), for facilitating forecasting of untoward happenings.
- (16) The State Government shall ensure active management of the buffer zone of the Tiger Reserve with central assistance for eliciting public support through mainstreaming of wildlife concerns, to benefit local people and wild animals, apart from addressing man-wildlife animal interface.
- (17) The State shall place in the public domain the Tiger Conservation Plan of the reserve and details of execution within 6 months from August 2009, in their official website www.corbettonline.uk.gov.in apart from making available the same in local language to promote public vigil.
- (18) The money released by the National Tiger Conservation Authority shall be made available to tiger reserves for taking up the works proposed in the Annual Plan of Operations (APO) immediately, with due compliance of the normative guidelines and advisories of the said Authority.
- (19) The Director/Officer In charge of the Tiger Reserve shall be empowered to spend the money provided by the National Tiger Conservation Authority for immediate execution of the schemes, as per the norms and procedures prescribed by NTCA and the State Government.
- (20) The State Government will ensure that the Accounts of the grants released by NTCA are audited by Statutory Audit of the State Government on annual basis and a certificate to this effect will be sent to NTCA annually latest by 31st May each year.

ARTICLE III

Obligations of the Field Director Corbett Tiger Reserve:

The Field Director Corbett Tiger Reserve has agreed and affirmed that:-

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- (1) A Security Plan would be drawn up for the Reserve, considering its strength weakness opportunity and threat which would form part of the Tiger Conservation Plan, to ensure intelligence based enforcement for protection of tiger, other wild animals and the habitat.
- (2) The day-to-day monitoring protocols for tiger and other wild animals would be duly followed, as prescribed by the National Tiger Conservation Authority, to ensure forecasting of untoward happenings in the habitat.
- (3) The Tiger Conservation Plan would be prepared within a time frame of six months, as per the guidelines issued by the NTCA with prescriptions for the core, buffer and adjoining areas.
- (4) A staff development plan should be prepared and submitted to the State Government for ensuring frontline field staff in the right age group with the capacity to perform field work in the Reserve.
- (5) Initiatives for mainstreaming tiger conservation in the buffer and outer landscapes should be taken up through sectoral integration of different district level schemes, to provide livelihood options to the fringe dwellers for reducing their dependency on the Tiger Reserve, with reciprocal commitments from beneficiaries to protect the tiger.
- (6) Timely redressal of man-wild animal conflicts would be ensured to prevent revenge killings of tiger and other wild animals.
- (7) A Tiger Conservation Foundation will be set up for the Reserve as a receptacle for gate receipts and other receipts from the State / Central Governments to undertake local actions.
- (8) The Annual Plan of Operation for funding support from NTCA shall have reference to the Tiger Conservation Plan.
- (9) The cost estimates worked out by the Field Director should be based on approved schedule of rates of the State Government.
- (10) The APO must indicate the location / area of proposed initiative / initiatives on a map, along with physical target, financial target and unit rate, with the basis of estimation.

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- (11) The progress report should invariably indicate the physical achievement (viz., quantity, number, area indicating location) and the objectives fulfilled on implementation of proposed activities.
- (12) A year-wise photo catalogue of physical targets shall be maintained to facilitate verification during supervisory visits.
- (13) During execution, details of estimate, man-days involved etc. shall be displayed near the work site.
- (14) Utilization Certificate showing unspent balance, if any, shall be furnished to National Tiger Conservation Authority annually after the close of the financial year so that the same is reached in this office by 31st May of each year. Complete Utilization Certificate shall be submitted immediately on completion of the work.
- (15) The accounts of the grants released by National Tiger Conservation Authority shall be maintained properly as per audit requirement and shall be open to inspection by the NTCA/Audit. A copy of these accounts shall also be released to NTCA. In case of construction / habitat improvement works, photocopies of the measurement books (for the work which was executed from NTCA's grant) shall also be sent to NTCA. Details of unspent amount, if any, shall be intimated to the Authority for adjustment as unspent balance or revalidation.
- (16) The funds will be used only for the purpose of which it was sanctioned. Diversion of funds will not be allowed without the prior approval of NTCA.
- (17) The records of all assets acquired out of the grant released herewith by the NTCA, shall be made available for scrutiny of audit. Such assets shall not be, without the prior approval of Govt. of India / National Tiger Conservation Authority be disposed off, encumbered or utilized for the purpose other than those for which the grant is sanctioned.
- (18) A statement showing the extracts of the assets created out of the grants released by NTCA shall be furnished to NTCA annually by 31st May of each year.
- (19) The Tiger Reserve Management should consult the Gram Sabha while deploying the local work force, as Members of the Sabha would be conversant with the geographical and other related information about the area.

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- (20)
 1. The Ex-gratia for cattle lifting, crop depredation, injury and death of humans should be decided in consultation with the Zilla Parishad (ZP) or similar body prevalent in the state.
 2. The Tiger Reserve Management should coordinate with the concerned Gram Panchayat (GP) while implementing crop protection safeguards and other initiatives relating to man-wild animal conflicts
- (21) The Tiger Reserve Management should consult with Panchayati Raj Institutions for providing ecologically viable livelihood options to reduce villagers' dependence on forests. The Gram Sabha should be involved in restoring forest cover in the buffer areas in order to provide a supplementary habitat to animals moving out of core areas.
- (22) Zilla Parishad or similar body prevalent in the state should be involved in monitoring the payment and utilization of the ex-gratia package whether under option-I or option-II.
- (23) In case of option II, relocation/rehabilitation from the protected area/tiger reserve by the Forest Department should be done in consultation with the Gram Sabha.
- (24) Zilla Parishad or similar body prevalent in the state Chairperson should be a member of the District level Implementing Committee for ensuring convergence with other sectors.
- (25) Implementation and monitoring of district level schemes in the relocated village should be done through Gram Panchayat/Gram Sabha.
- (26) Gram Panchayat/Gram Sabha should be involved in identifying labour oriented works relating to the relocation process, ensuring that the relocated villagers get adequate remuneration for their labour.
- (27) In case of re-settlement on forest land, the new settlement should be eligible to access forest resources based on their traditional forest rights as certified by the Gram Sabha.
- (28) Recommendations of Gram Panchayat/Gram Sabha should be taken while deciding the site for fair price shops, schools, health centre etc. close to the relocated village.

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- (29) Gram Panchayat/Gram Sabha should be consulted in the identification of services, activities and personnel involved in ecotourism.
- (30) The Local Traditional Village Councils or the Gram Sabha under the PESA Ac, 1996, as the case may be, should be consulted on the rehabilitation/welfare package to ensure that such tribal people are provided with livelihood options as well as health care, education and housing facilities, vis-à-vis the statutory provisions contained in the Wild Life (Protection) Act, 1972 as amended in 2006.

Signed for and on behalf of National Tiger Conservation Authority	Signed for and on behalf of Government of Uttarakhand	Field Director Corbett Tiger Reserve, Uttarakhand
Name & Designation (With Stamp) Dated:	Name & Designation (With Stamp) Dated:	Name & Designation (With Stamp) Dated:

14.2. Process:

- 1) All works will be monitored on monthly basis as per departmental rules & requisite inspection will be done at various level like Director, Dy. Director, S.D.O., & Rangers.
- 2) A quarterly inspection will/ can be done by agencies appointed by department or Corbett administration.
- 3) National Institute like Wild Life Institute of India (WII), Forest Research Institute of India (FRI) etc. will be asked to visit the area once a year to facilitate the evaluation process.
- 4) Public representatives/ Minister concerned (Forest Minister) will be requested to visit the Tiger Reserve periodically for on the spot inspection & appraisal.
- 5) Similarly senior officers like Chief Wild Wildlife Warden/ Principal Chief Conservator of Forest will be requested for on the spot evaluation of various programme.

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- 6) Functionaries from Government of India (MOEF) will also be requested similarly.

14.3. Miscellaneous regulations:

1. Record of Compliance & Deviation Statements. (For Tri-Partite MoU):

A register has to be maintained at the level of the Deputy Director to monitor the progress of each and every obligations laid down on the part of the Tiger Reserve. However, he will also report to the Director regarding any delay on the part of the State Government and/or Central Government. The Director in turn should request the appropriate authority to expedite the compliance of the obligations on the part of the State/Central Government.

This book shall also include annually deferred targets. The reason of non-accomplishment should be mentioned with proper justification and planning should be made to fulfill the target in the following plan period.

Given to the unpredictability of situation peculiar to the wildlife management, some strategies should be designed which may not be mentioned in the prevailing Tiger Conservation Plan. In that case due approval should be taken from the CWLW before the so called deviation enforced on the field. Such deviations should be duly recorded in this book.

A similar record shall be maintained at each range level too. These records shall be updated timely and duly inspected from time to time. This book need to be referred at the time of revision of Tiger Conservation Plan especially on matter which relate to strategies in the field.

As per the obligations mentioned in the Tri-Partite MoU, photographs should be maintained showing different stages of progress of work. A photographic repository should be maintained in the Tiger Reserve headquarters.

2. Maintenance of Compartment Histories:

Compartment history is the backbone document for deciding strategies of management. Unfortunately, compartment histories were not updated in previous plan period. All compartment histories shall be prepared within 6 months.

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Compartment histories shall be prepared in three copies. The master copy should be maintained at the headquarters and each of the remaining two should be maintained by the office of the SDO and Range Officer respectively.

Range officer shall update compartment histories on annual basis. The updated CHs shall be submitted to office of tiger reserve every year. Endeavour should be made to keep the CHs in digital format.

'Annual documentation' shall include all important operations, events and attributes taken place or observed in the compartment. For systematic recording of various issues the 'control forms' (given in Chapter-7) will be used for easy monitoring and evaluation. Some of important attributes are given below:-

A. Operations related to habitat management :

1. Grassland
2. Meadow
3. Weed eradication
4. Soil moisture conservation
5. Creation or repair of water sources
6. Wetland
7. Waterhole
8. Micro habitat management etc.

B. Events :

1. Animal mortality
2. Outbreak of disease
3. Human-wildlife conflict
4. Fire incidences
5. Flood
6. Change in river courses
7. Siltation of water sources
8. Insect pest infection
9. Tree mortality

C. Protection :

1. Illegal grazing, lopping, felling, collection of NTFPs and girdling of trees
2. Poaching and attempt to poaching

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3. Trespass
4. Maintenance of camp sites and anti-poaching camps

D. Observations :

1. Fruiting of edible spp.
2. Flowering of Bamboo and grass
3. Animal signs / movements
4. New water sources / saltlicks
5. New micro habitat locations
6. Important change in vegetations
7. Any other useful information regarding management

Compartment histories should be duly checked by senior officers on annual basis. The frequency of checking by various level of officers is prescribed as below:-

Range Forest Officer	-	100%
ACFS	-	30%
Deputy Director	-	10%
Field Director	-	05%

3. Pocket Field Guide for Plan implementation:

The pocket field guide is being designed to be used and followed by the frontline staff for taking vital evidences of various factors attributed to wildlife. It is very handy for the staff and easy to carry.

4. Independent Study, Analysis and Reporting:

An independent study & analyses could be done by Non Government Organizations (NGOs) of national & international repute subject to clearance by the CWLW. This will help to facilitate transparency in the works and activity of Tiger Reserve. On the basis of evaluation the future planning may be amended for the better management of the national Tiger Reserve.

Similarly public representative will also be involved in monitoring process. They will be shown the works & other activities and yearly calendar / booklet will be issued after the expiry of financial year.

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5. Photo registration of tigers:

Pictures of individual tigers obtained by camera traps or by regular cameras should be maintained in the form of photo identity album. Records should be kept on the location, condition (breeding status, injury etc) and associated tigers wherever a tiger is sighted. This will provide crude data on ranging patterns, demography & mortality. The photos obtained from Forest Divisions like Ramanagar, Tarai West and Lansdowne will be collected and matched with the photo registry of Corbett Tiger Reserve. This will help avoid delicacy of data which may amounts to misinterpretation of the tiger population. This data will also provide fair information about the range of certain tigers across the Corbett Tiger Reserve and other Forest Divisions. The detail protocol of Photo registry has been given in the chapter-9.

6. Tiger pugmark & other signs:

Regular monitoring of tiger signs (pugmark tracings, plaster casts. etc) will be under taken in every beat at weekly interval with monthly compilation of data. With experience & exposure, the field staff will be able to identify resident tigers with the help of their pugmark. Sign surveys and individual tiger monitoring should be a regular task for very guard. On the basis of above, monthly data should be mapped & maintained to analyze trends.

14.4. MEE, MStrIPS and Phase-IV:

a. MEE is the assessment of how well protected areas are being managed. It (Management Effectiveness & Evaluation) has been the mandate of the National Tiger Conservation Authority to monitor various aspects of Tiger Reserve management to assist the manager to achieve the objectives for which the reserve constituted. The framework consists of six elements viz. context, outputs and outcomes; each of them has a precise focus of evaluation.

This frame work assesses the importance of each tiger reserve for conservation in the face of current threats to the species. For this, the resources used for the successful implementation of programme that meet management objectives are evaluated for measurable results of their effectiveness and relevance.

The major elements of the evaluation framework include parameters such as:

É Vulnerability of tiger populations within

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É Protected area design, management planning

É Suitability of these plans in the context of the major threats

(source: Stripes- bimonthly outreach journal of NTCA volume -2 ; Issue 5/ July-Aug 2011)

NTCA in collaboration with WII had evaluated Corbett Tiger Reserve in 2010. It had categorized its observation in three major headings- Strengths, Weaknesses and Actionable points. This is a valuable tool which will be used by the Corbett management to score better in future. The MEE report (source: Stripes- bimonthly outreach journal of NTCA volume -2; Issue 6/ Sept-Oct 2011) is as follows:-

MEE Report on Corbett Tiger Reserve:

Strengths | High profile, Significant patronage and huge tourism revenues. The reserve has a well developed and supported protection plan and force so it can afford to look at conservation planning beyond its immediate boundary. Its location within the Terai Arc landscape makes it a part of significant tiger conservation landscape which can support a large enough population which will be genetically viable for long-term conservation.

Weaknesses The Tiger Reserve and its buffer still face anthropogenic pressures from settlements and Gujjar deras. Human wildlife conflict is significant in and around the buffer. There is little or no involvement of stakeholder in the PA or in its tourism revenue. Staff strength needs to be upgraded. Too much time and manpower is involved in managing tourism and tourist facilities.

Actionable Points IA systematic plan is needed to address human-wildlife conflict in the buffer. There is great opportunity to divert a significant part of the tourist revenue towards community based eco-tourism. The Gujjar Deras (181 families) must be resettled from the core area and biotic pressures created by 21 villages and 15 Gujjar Deras in the buffer must be addressed.

b. MStrIPS -"Monitoring System for Tigers-Intensive Patrolling and Ecological Status" has been developed by NTCA in collaboration with WII and Zoological Society of London (ZSL) for Tiger Reserve managers to assess the status of protection, ecological and biotic pressures and when adaptive management is necessary. The M-StrIPES would inter-alia provide quantitative data/information which could be

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used in MEE process. It is a very effective but simple monitoring protocol dedicated to record and analysis data gathered during patrolling of the tiger reserve. Simple forms has been designed which can be easily filled up by the field staff. The programme though launched by the WII/NTCA, no fund has been allocated in the APO-2012. It will be implemented with the necessary help from the NTCA in Corbett Tiger Reserve.

c. Phase-IV is one of the best tool for continuous monitoring of tiger reserves and tiger source areas. It has already been started in Corbett Tiger Reserve with technical and expert assistance of WII. The result is encouraging. The report is appended as Annexure- 3/2.

14.5. Wildlife Crime Database:

The Wildlife Crime Control Bureau, New Delhi has issued a format to maintain an annual 'Wildlife Crime Database' which will be helpful for the tiger reserve management to keep track of wildlife criminals and their convictions. As the data will be maintained as national repository of wildlife crimes, it will also develop inter tiger reserve coordination to send the crime cases to logical end. Sharing of information among the tiger reserves will deter the potential trouble maker. The following format will be regularly update not only by the Corbett Tiger Reserve but by the forest divisions of the larger 'Corbett Landscape.' The Chief Wildlife Warden will be briefed about the information by the Director and Conservators of Western Circle and Shiwalik Circle. Exchange of information among the Corbett Tiger Reserve and other forest divisions will be mandatory.

The format given by WCCB has been given in the next page.

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Format of WCCB

Wildlife Crime Database for the Year			
Sl. No.	Date of Detection		
	Date	Month	Year
	Place of detection (District/Division and Range)		
	Case Detecting agency and agency to which case handed over for investigation		
	Crime No.(FIR/POR) in case of crime/ un-natural Death/seizure		
	In case of carcass/Mortality, cause of death whether natural or due to un-natural causes		
	Cause of un-natural Death		
	Common Name		Species
	Scientific Name		
	Description of Item (Live animals, carcasses & animal article etc.		
	Quantity And units		
	Weight. if applicable		
	Sections of law(s)violated		
	Name, age complete address of accused (including companies if any		
	Date of filing complaint in court		
	Trial Court And Case No.		
	Present Status of the case		
	Details of Conviction		

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FORM CP/CORBETT TIGER RESERVE – 1

Creation of New artificial waterhole

Sr. No.	Category	Year	Location	Cost	Performance
1	2	3	4	5	6

Note : Category : Masonry anicut, earthen bund, lined depression, bore well and pump, reservoir, spring fed, tanker fed, guzzler, aquifer, permanent or temporary.

Location : By compartment or by a named feature and name given if any

Performance : Successful, partially successful, failure (given reasons for the latter two)

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FORM CP/CORBETT TIGER RESERVE – 1.1

Maintenance of watershed: natural

Sr. No.	Category	Perennial or seasonal	Location	Year	Nature of work	Cost	Performance
1	2	3	4	5	6	7	8

- Note :**
- Category :** Spring, seep, natural depression, a flowing stretch, reservoir
 - Location :** By compartment or by a named feature and name given if any
 - Nature of work :** Desilting, provision of apron, any other category
 - Performance :** Successful, partially successful, failure (reasons for the last two)

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FORM CP/CORBETT TIGER RESERVE – 1.2

Maintenance of waterhole : artificial

Sr. No.	Category	Perennial or seasonal	Location	Year	Nature of work	Cost	Performance
1	2	3	4	5	6	7	8

Note : **Category** : Masonry anicut, earthen bund, lined depression, borewell and pump,, spring fed, tanker fed, guzzler, aquifer etc.

Location : By compartment or by a named feature and name given if any

Year : Year of maintenance, with year of establishment in parenthesis.

Nature of work : Desilting, grouting, repairing leaks, repair to mechanical parts, closing anicut openings, any other work.

Performance : Successful, partially successful, failure (reasons for the last two)

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FORM CP/CORBETT TIGER RESERVE – 2

Restoration of habitat : weed control, initial operation

Sr. No.	Location and name of site	Year	Extent of area (ha)	Species of weed	Operation	Total Cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9

Note : **Location** : By compartment, site name or land feature including the GPS location.
Operation : Uprooting, cutting, burning, harrowing by using a tractor
Remarks : Measure of success and or problem faced. Whether the location recorded in the beat map.

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FORM CP/CORBETT TIGER RESERVE – 2.1

Restoration of habitat: weed control, subsequent operation

Sr. No.	Location and name of site	Year	Extent of area (ha)	Complete or partial coverage	Species of weed	Operation	Total Cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9	10

Note : **Location** : By compartment, site name or land feature
Operation : Uprooting, cutting, burning, harrowing by using a tractor
Remarks : Percent cover of weed/s before operation, problems, if any

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FORM CP/CORBETT TIGER RESERVE – 2.2

Restoration of habitat: control of regeneration of woody species in grasslands

Sr. No.	Location and name of site	Year	Extent of area (ha)	Species controlled	Operation	Total Cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9

Note : **Location** : By compartment, site name, etc.

Species controlled : List of species.

Operation : Uprooting, cutting, burning etc. manual or mechanised methods.

Remarks : The measure of success, suitability of methods, problems encountered.

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FORM CP/CORBETT TIGER RESERVE – 2.3

Restoration of habitat: prescribed burning

Sr. No.	Location and name of site	Year	Extent of area (ha)	Area treated (ha)	Period	Total Cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9

Note : Location : By compartment or name of site.

Period : Date of starting operation and completion.

Remarks : Mention resultant structure e.g. a mosaic, % burnt, % intact,

Problems encountered in conducting the operation – e.g. fire escape, recurrent rains during winter and spring.

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FORM CP/CORBETT TIGER RESERVE – 2.4

Restoration of habitat : soil conservation measures – initial operations and subsequent maintenance

Sr. No.	Location and name of site	Year	Extent of area (ha)	Areas treated	Operations	Total Cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9

Note : **Location** : By compartment, name of site or landmarks.

Extent of area : Total area identified for such treatment. In case of streams or gullies, the length involved.

Area Treated : If liner feature then quote length; otherwise area.

Operation : Structures involved such as gully plugs, trench-cum-mound, terracing, spurs and bunds etc. quote quantity no. and cmt. of earthwork.

Remarks : Mention if initial work or maintenance.

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FORM CP/CORBETT TIGER RESERVE – 2.5

Restoration of habitat (planting in lantana eradication areas and area degraded by flood): planting, sowing – initial operation

Sr. No.	Location	Year	Extent of area (ha)	Species	Planting stock	Spacing	Operations	Total Cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9	10	11

- Note :** **Location** : By compartment or landmarks and describe the site factors e.g. vegetation cover, soil, perturbations etc.
- Planting Stock** : Kind and condition e.g. root shoot, naked root seedling, seedlings in polythene bags, age or average size.
- Operation** : Mention site preparation if any, crowbar holes, pits and pit size, trench, seed sowing (rate), protection measures.
- Remarks** : Mention operational problems if any.

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FORM CP/CORBETT TIGER RESERVE – 2.6

Restoration of habitat : response of planting, sowing and subsequent operation

Sr. No.	Location	Year	Extent of area (ha)	Species	Survival %	Casualty replacement	Operations	Total Cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9	10	11

Note : **Location** : By compartment, or landmarks.

Casualty replacement : Mention planting stock by species, number and kind (polythene bag, root shoot, rhizome etc.)

Operation : Planting, sowing technique, protection measures.

Remarks : Operational problems, protection problems, any other useful information.

Assess and mention survival percentage and growth before taking up casualty replacement.

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FORM CP/CORBETT TIGER RESERVE – 2.7

Restoration of habitat : are under protection/closure

Sr. No.	Location	Year	Extent of area (ha)	Description of site	Regulations or protection measures	Response	Remarks
1	2	3	4	5	6	7	8

Note : **Location** : By compartment or landmarks

Description of site : % tree, shrub, ground cover, main species, impact of factors causing perturbations.

Regulations and protection measures

: Social fencing, power or other kind of fencing, enforced protection by patrolling, fire protection etc.

Response

: To be recorded annually. Consider trend of regeneration, vegetation cover, change in structure and composition, wildlife use index.

Remarks

: State problems or any other useful information, including alternatives if area being used by people for specific purposes.

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FORM CP/CORBETT TIGER RESERVE – 3

Animals : new records

Sr. No.	Species	Location with GPS	Year	How discovered	Details of number, age, sex	Habitat description	Remarks
1	2	3	4	5	6	7	8

Note : Animals will include vertebrates and invertebrates.

- How discovered** : Sighting, dead specimen, reliability of sighting, captured specimen incontrovertible other evidence.
- Number, age, sex etc** : As applicable to vertebrates.
- Habitat description** : Broad habitat description such as vegetation, and elements such as water, large old tress, den tress, down log material. Use microhabitat descriptors only if relevant.
- Remarks** : Any other useful information including photographic evidence.

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FORM CP/CORBETT TIGER RESERVE – 3.1

Animals : Mortality other than that attributable to an offence

Sr. No.	Species	Location	Year	Sex and age	Number	How discovered	Cause of mortality	Remarks
1	2	3	4	5	6	7	8	9

Note : **Location** :

: By compartment, landmark, GPS coordinates etc.

How discovered

: Carcass, complete or partial. Skull or any other recognizable remains collected where only some remains of an animal are found.

Cause of mortality

: If known e.g. territorial fight, accident, possible disease (following postmortem results), old age, cause difficult to determine, predation etc.

Habitat description

: Broad habitat description such as vegetation, and elements such as water, large old tress, den tress, down log material. Use microhabitat descriptors only if relevant.

Remarks

: Any other useful information.

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FORM CP/CORBETT TIGER RESERVE – 3.2

Animals : Mortality attributed to poaching or an act of vandalism/retaliatory killing

Sr. No.	Species	Location	Cause of mortality, number, sex, age, direction of the body, state of decomposition, evidence of snares, poison, human foot print, any suspicious material, etc.	Remarks
1	2	3	4	5

- Note :** **Location** : By compartment landmark etc. and adjoin village and its distance from the site.
- Cause of mortality** : Whether the animal was intact or remains found, article or trophy to be recorded. Cause if known e.g. animal snared, shot or poisoned etc.
- Remarks** : Any other useful information, especially matters of illegal trade. Whether *panchnama* has been carried out or not.

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FORM CP/CORBETT TIGER RESERVE – 3.3

Animals : Predation on domestic livestock by wild carnivores

Sr. No.	Range	Month	Category of livestock killed	Location	Numbers	Ex-gratia paid (Rs.)	Carnivore involved	No. of cases undecided	Remarks
1	2	3	4	5	6	7	8	9	10

- Note :** **Category of livestock killed** : Buffalo, cow, bullock (adult, sub-adult, calf), camel, horse, donkey, sheep, goat, poultry etc.
- Location** : Comptt. no. or landmark where killed an the village of the owner.
- Carnivore involved** : Indicate species responsible for the kill if identity is confirmed.
- No. of cases undecided** : Either in progress or dropped.
- Remarks** : Record observations like – attended or unattended animal, killed in forest or waterhole or in the pen/shed, field and whether kill was in area closed to livestock trespass.

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FORM CP/CORBETT TIGER RESERVE – 3.4

Animals: killing of a human by wildlife or injury caused

Sr. No.	Range	Month	No. of incidents	No. of people killed, age and sex	Location, circumstances and species	No. of people injured, age and sex	Location circumstances and species	Ex-gratia (Rs.)
1	2	3	4	5	6	7	8	9

Note : **Location, circumstances and species** : Location by compt. no. and GPS coordinates. The village to which the person belongs and a description of the site and activity such as – open grassy patch, cutting grass; or collecting ‘curry patta’ etc. Mention species on proof.

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FORM CP/CORBETT TIGER RESERVE – 3.5

Animals: wildlife damage to private or public property

Sr. No.	Range	Month	The category of property	Extent of damage	Species involved and number	Remarks
1	2	3	4	5	6	7

Note : **Location**

: By Comptt. no., village survey no., name of village or landmark.

Category of property

: eg. agriculture field-wheat, huts in a village, any kind of vehicle.

Extent of damage

: Crop damage by area, estimated loss of produce and monetary loss. Similar yardsticks for other items like partial or total destruction of huts and belonging with estimated monetary loss.

Remarks

: Any relevant information or circumstances eg. a wild elephant was provoked by people.

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FORM CP/CORBETT TIGER RESERVE – 4

PLANTS/WEEDES: new records

Sr. No.	Family	Species	Year	Location	Habitat	Status	Remarks
1	2	3	4	5	6	7	8

- Note :** **Habitat** : Description by vegetation associates at various levels, % canopy closure if relevant, soil/site, microhabitat elements such as higher level of moisture, woody debris or humus etc.
- Status** : A broad idea on its frequency, national status eg. endangered, rare, endemic etc.
- Remarks** : Any specific information like probable cause of appearance (for example an indigenous weed *MOKOI* appears for first time in Lidkhalia , Bichubhoji, and Sherbhoj grassland of Dhikala Range, post flooding in 2010.), etc.

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FORM CP/CORBETT TIGER RESERVE – 4.1

Plants : disease and mortality

Sr. No.	Species	Location	Year	Particulars of disease, morbidity and mortality	Area affected	Remarks
1	2	3	4	5	6	7

Note : **Location** : By compartment or landmarks.

Particulars of disease : In case of trees, the mortality by diameter classes and number, symptoms, insect pest activity or any other external indicators if visible, none if not seen. No mortality but infestation detected, mention that as morbidity.

Area affected : In hectares.

Remarks : Any specific environmental condition, or site factors you may suspect as being related to the problem or any other useful information

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FORM CP/CORBETT TIGER RESERVE – 4.2

Plants : illegal and legal collection

Sr. No.	Year	Species	Location	Details of material	Quantity	Trade particulars	Remarks
1	2	3	4	5	6	7	8

- Note :** **Location** : By compartment or landmarks.
- Details of material** : To include timber, firewood, bamboo, NWPs. Plants collected could be of local significance or of trade significance on a national or international scale. Distinguish between legal and illegal activity in the remarks' column.
- Quantity** : In appropriation units.
- Trade particulars** : What is traded? Portions, partially processed or processed material and where area the major trade centers, known or suspected to be?
- Remarks** : Any other useful information.
Legal collection applies to PA, if permitted for research; to TUZ or to the buffer zone.

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FORM CP/CORBETT TIGER RESERVE – 5

Grazing of Gujjar livestock

Year

Sr. No.	Grazing unit no.	List of villages in the unit	Village-wise listed population of cattle	Capacity of the unit (cattle units) and number of cattle grazed.	Total cattle units grazed		Remarks
					Legal	Illegal	
1	2	3	4	5	6	7	8

Note : **Remarks** : (i) Mention number of cattle immunized against FMD, RP, anthrax as the case might be and the number of cattle without the prophylactic cover.

(ii) If grass is allowed to be cut for cattle being stall-fed, mention the Gujjars and number of such cattle.

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FORM CP/CORBETT TIGER RESERVE – 6

Programme of NGOs

Year

Sr. No.	Name of agency	HQ location	Number of scheme operated	Physical /financial targets		Area and location	Remarks
				Given	Achieved		
1	2	3	4	5	6	7	8

Note : Remarks : Success or adverse impacts, incompatibility with PA management objectives or failures should be mentioned. Detailed notes to go in the CORBETT TIGER RESERVE book. These programme and activities could be within the management area or those that are outside the management area but are capable of influencing the state of the management area either complementing the efforts or adversely impacting.

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FORM CP/CORBETT TIGER RESERVE – 7

Construction*/maintenance* of infrastructure : roads and bridges (*existing/new)

Year

Sr. No.	Name of the road / bridge	Nature of the road/bridge	Range	Location of road/bridge	Length covered (km)	Total cost and status
1.	2.	3.	4.	5.	6.	7.

Note : **Bridge type**

: Wooden trestle or masonry .

Status

: Work completed or ongoing. State also the agency responsibility; state whether operational or non-operational.

*

: Strike out which is not applicable. Use separate forms as required; for construction and for maintenance details.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 7.1

Construction*/maintenance* of infrastructure : buildings (*existing/new)

Year

Sr. No.	Range	Nature of the building	Location	Type of construction	Numbers	Total cost	Status
1	2	3	4	5	6	7	8

Note : **Nature of the building** : eg. residential (guard), office, store, chauki, watch tower, tourist facility, hide, barrier, patrolling camp (temporary or permanent) etc.

Location : By compartment or village or landmark as appropriate.

Type of Construction : Masonry (brick/stone), log or wooden, metal, local material etc.

Status : Completed or ongoing.

* : Strike out which is not applicable. Use separate forms as required; for construction and for maintenance details.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 7.2

Development*/maintenance* of infrastructure: communication (*existing/new)

Year

Sr. No.	Range	Type of facility	Location	Number	Cost	Advantage gained	Remarks
1	2	3	4	5	6	7	8

- Note :** **Type of facility** : Fixed satellite telephone stations and wireless stations
- Location** : Staff Hq. location, village, landmark etc.
- Advantage gained** : Area served, staff locations connected etc.
- Status** : Records status – complete, ongoing, functional, non-functional.
- * : Strike out that is not applicable. Use separate forms as required; for new facility and maintenance.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 7.3

Development*/maintenance* of infrastructure : vehicles (*existing/new)

Year

Sr. No.	Kind of vehicle	Number	Intended use	Cost	Remarks
1	2	3	4	5	6

- Note :** **Kind of vehicle** : Jeep, trailer, tractor, truck, minibus, tanker, motorcycle, bicycle, boat (paddle or motor), car, riding elephant, etc.
- Intended use** : Management support, patrolling/antipoaching, tourism etc.
- Remarks** : Any other useful information. Mention written off vehicles, retired or dead animals.
- *** : Strike out the inapplicable. Use separate forms as required to indicate acquisition, maintenance.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 7.4

Development of infrastructure : manpower recruitment*/existing manpower*

Year

Sr. No.	Category of post	Number	Status		Intended Deployment/deployed as	Remarks
			Recruited	Vacant		
1	2	3	4	5	6	7

Note : Status : Permanent, temporary, contractual.

Intended deployment : State purpose eg. conservation education, research, anti-poaching, etc. as applicable.

Remarks : Any other useful information. New recruits within the year should be mentioned. This will also include officers and staff obtained on transfer/deputation. Likewise changes due to personnel going out on transfer, deputation, retirement, removal, resignation, death should be reflected in this column.

* : Strike off that which is not applicable. Accordingly, use additional forms. One for recruitment and one for the existing manpower.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 7.5

Development infrastructure : construction of boundary pillars, boundary wall,

Fences, CPTs, EPTs, Solar Fencing, (*existing/new)

Year

Sr. No.	Category of construction	Range	Location	Length (meters)	Number (in case of boundary pillars)	Cost	Remarks
1	2	3	4	5	6	7	

Note : * : Strike out that is applicable. Use one form each for maintenance of existing fireline and creation of new.

Tiger Conservation Plan, Core Zone

FROM WM – 7.6

Development infrastructure : Firelines (*existing/new)

Year

Sr. No.	Range	Fireline category or width	Name of points connected	Length (meters)	Cost	Remarks
1	2	3	4	5	6	7

Note : * : Strike out that is applicable. Use one form each for maintenance of existing fireline and creation of new.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 8

Tourism

Name of complex :

Year

Total number of visitors all categories:

Total revenue earned:

Month	Number of Indian visitors	Number of Foreign visitors	Total number of Beds available in the tourist complex	Total number of beds occupied	Percentage of occupancy	Revenue (which includes entry fee)	Revenue from elephant ride	Revenue from conducted tour through canter

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 9

Outbreak of fires

Year

Sr. No.	Range	Location including GPS coordinates	Extent (ha)	Dates		Reasons	Estimated loss	Remarks
				Detected	Controlled			
1	2	3	4	5	6	7	8	9

Note : **Location** : By compartments, block and range

Reasons : Established or suspected

Estimated loss : according to the method prescribed by the departmental order.

Remarks : State particularly problems encountered in detection and suppression and any other useful information. State also whether the extent of fire has been mapped.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 10

Offence cases detected

Year

Sr. No.	Range	Category	Numbers	Number of cases decided		Number of cases under process	Remarks
				Successful	Failure		
1	2	3	4	5	6	7	8

Note : Category

: eg. illegal cutting of trees, illegal firewood, illegal NWP, poaching, encroachment, illegal cattle grazing etc.

Remarks

: Any other useful information. This should also include the number of cases pending decision with the department.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 11

Incentives and awards

Year

Sr. No.	Range	Number of recipients of incentives for detecting offences	Amount paid (Rs)	Kind of award	Number of recipients	Remarks
1	2	3	4	5	6	7

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 12

Research projects under implementation through PA manpower with or without collaboration with other agencies

Sr. No.	Title	Completed	Year				Financial outlay (Rs)	Expenditure incurred (Rs)	Remarks
			Ongoing	New	Status	6			
1	2	3	4	5	6	7	8	9	

- Note :**
- Completed** : State date of completion and the status of the project report.
 - Ongoing** : State since when the project is under operation and expected period of completion.
 - New** : State the date of commencement and duration.
 - Status** : State the progress towards achievement of objectives; or project which has been dropped or held in abeyance etc.
 - Remarks** : Any other relevant information. If the project is in collaboration with any other agency or is an contractual arrangement, state the situation and the name of the collaboration agency. If animal/plant specimen are being collected, state authority and where the collections are being housed.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 12.1

Research projects under implementation by other agencies

Year

Sr. No.	Title	Completed	Ongoing	New	Status	Financial outlay (Rs)	Expenditure incurred (Rs)	Remarks
1	2	3	4	5	6	7	8	9

Note : **Completed** :

: State date of completion and the status of the project report.

Ongoing

: State since when the project is under operation and expected period of completion.

New

: State the date of commencement and duration.

Status

: State the progress towards achievement of objectives; or project which has been dropped or held in abeyance etc.

Remarks

: Any other relevant information. State the name of the agency. If animal/plant species are being collected, state authority and where the collections are being housed.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 13

Survey and inventories

Year

Sr. No.	Title of survey, inventory activity	Completed	Ongoing	New	By PA	By other agency	Remarks
1	2	3	4	5	6	7	8

Note : **Completed** :

State date of completion of field work and the status of the report.

Ongoing :

State since when is it under operation and when is it expected to be completion.

New :

State the date of commencement and duration.

By PA personnel :

Will include collaboration or contractual arrangement. State the case as relevant.

Remarks :

If specimen of plants/animals are being collected, state where the collection is being housed and authority.
Any other useful information.

Tiger Conservation Plan, Core Zone

FORM CP/CORBETT TIGER RESERVE – 14

Progress of all strategies under the Zone and Theme plans

Year

Sr. No.	Zone/Theme plan	Nature of strategy	Target as per the schedule of operations/APOs*		Achievements		Location	Remarks
			Physical	Financial	Physical	Financial		
1	2	3	4	5	6	7	8	9

Note : **Zone/Theme plan** : Mention title

Nature of strategy

: eg. demarcation of boundary, creation of artificial water source, salt lick, maintenance of water sources (de-silting), cutting and burning of fireline, prescribed burning, weed control, immunization of cattle, maintenance of nature trails, setting up wayside exhibits, recruitment of staff, number of villages translocated, settled on new sites etc.

Location

: Comptt, block, Range and GPS coordinates.

Remarks

: State problems, failures and reasons thereof, shortfall and reason, deviations if any and reasons, non-implementation with reasons etc.

***APO**

: (Annual Plan of Operation). Under Col. 4 and 5, each column will have two figures. First the figure as per the schedule or operations in the plan and next to it in the same column the figure as per APO. If they differ it amounts to a deviation.

