

Tiger Conservation Plan, Buffer Zone

Part A: The Existing Situation

Chapter-1

Introduction of the Area

1.1 Name, location, Constitution & Extent:

1.1.1. Name:

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, *chaur*s (grasslands) and *sal* forests encourages a vast diversity of insect, bird and animal life to thrive. This tiger reserve, long referred to as the 'land of roar trumpet and song. These attributes to the roar of tigers, the trumpet of elephant and the melodious song of birds.

The Corbett and Rajaji National Park between them hold India's northwestern-most population of tigers, and one of the world's most significant population of Asiatic Elephants. In this exquisite tiger land, birdwatchers can seek out almost 685 species of birds. Every nook and cranny of this emerald wonderland is special. This forest of flowing rivers, blue waters and *sal*-dappled glades was christened after the famous Colonel 'Gentlemen' Jim Corbett.

Corbett is not a destination. It is an idea. An idea that Uttarakhand can guarantee prosperity for its people, even as it protects its water, its forests and wildlife, its soul. The benefits of forests such as Corbett include flood control, water contribution, soil fertility, air purification, sequestration of carbon and outdoor recreation. The sustainable tourism has enormous potential to enhance the state's per capita income and subsequently increase collection of revenue for the State.

Corbett National Park was the first National Park of the Asian mainland and third throughout the world after Yellowstone National Park and Kruger National Park. It was the launching site for the post-independent India's most prestigious conservation project i.e. Project Tiger. Corbett can be categorized as one of the India's most crucial gharial breeding site. It also happens to be one of the last surviving stretches of untouched sub-Himalayan wilderness.

Earlier, the Corbett National Park, the Sona Nadi Sanctuary and the surrounding Reserve Forest were collectively referred as Corbett Tiger Reserve. Subsequently under

Tiger Conservation Plan, Buffer Zone

the provisions of Wildlife Protection act 1972 (as amended 2006), the Government of Uttarakhand, following the recommendation of the National Tiger Conservation Authority, notified the Protected area as Corbett Tiger Reserve, on 26th February 2010. Hence the total area of the reserve is 1288.31 sq.km, which is divided as follows:

Core-critical Tiger Habitat - **821.99 sq.km**

Buffer zone - **466.32 sq.km**

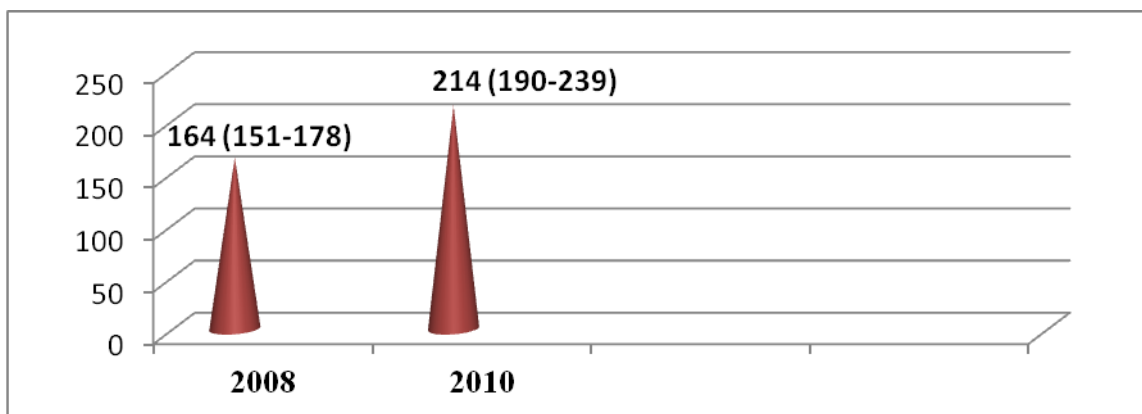
The Corbett Tiger Reserve is a part of the greater Corbett landscape. The other areas of the landscape are the forest areas of Ramnagar Forest Division, Terai West Forest Division and Lansdowne Forest Division. The Corbett Tiger Reserve is the source population of tigers for Corbett landscape, if not the greater Tarai Arc 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) 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 Corbett having tiger presence in 1428 sq.km. with an estimated population of 164 (151-178). The landscape is characterized by having the ability of sustaining high density tiger population e.g. Corbett National Park sustains 19.6 tigers per 100 sq.km. Thus with good management and protection, Corbett Tiger Reserve can serve an important role in tiger conservation. (Ref: Status of Tigers, Co-Predators & Prey in India -2008 & 2010. NTCA/WII). The 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). The comparative statement of tiger

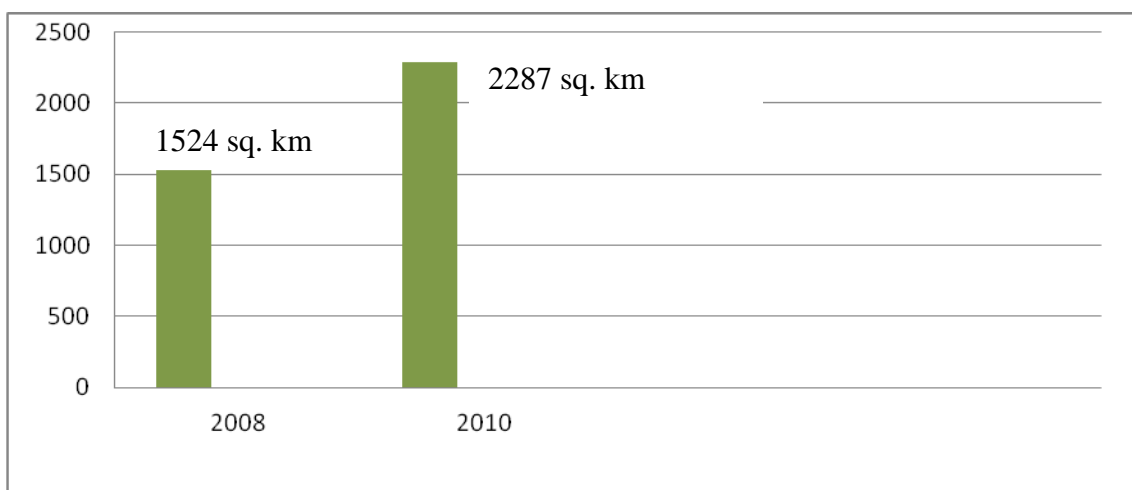
Tiger Conservation Plan, Buffer Zone

estimation vis-à-vis tiger occupancy has been given in the following graphical representation.

Tiger Abundance (2008 / 2010)



Occupied Area (2008 / 2010)

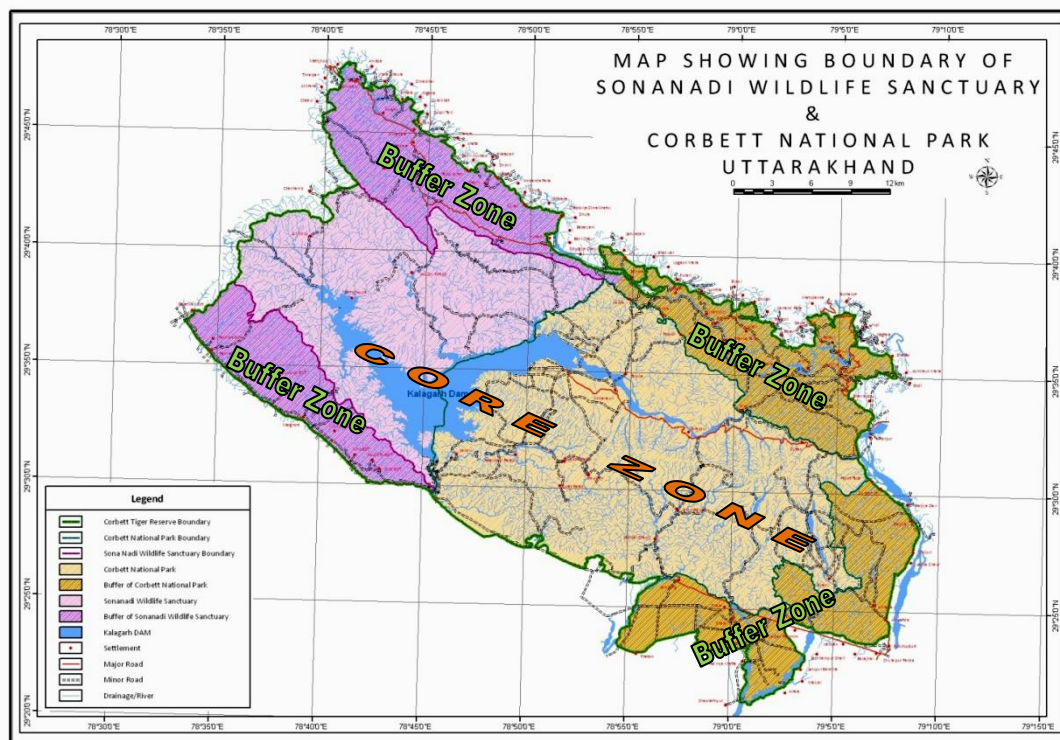


Tiger is not only a flag bearer of wildlife conservation but also an umbrella species for majority of eco-regions in the Indian sub-continent. Its role as a top predator is vital in regulating and perpetuating ecological processes and systems (Terborgh J. 1991, Sunquist et al. 1999). The tiger needs 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 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 the Royal Bengal Tiger. If tiger still has a chance of survival in this part of the country

Tiger Conservation Plan, Buffer Zone

(which surely it has) Corbett will be the flag bearer in the conservation efforts of the country through better management practices and strong protection. (Status of Tigers, Co-Predators & Prey in India -2008, NTCA/WII).

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



Adjoining landscape: 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. According to the tiger estimation report released by WII/NTCA in 2010, the tiger occupancy of Corbett Landscape has been increased from 1524 Sq. Km of 2008 to 2287 Sq. Km.

1.1.2. Location:

The Corbett Tiger Reserve situated at the foot hills of the Himalayas in the Civil District of Nainital, Pauri Garhwal and Almora District comprising of total area of 1288.31 sq km. Core area Corbett National Park and Sonanadi 821.99 sq km. and Buffer

Tiger Conservation Plan, Buffer Zone

zone 466.32 sq km. The Tiger Reserve lies between the latitudes **29° 25' N to 29° 40'N** & longitudes **78° 5' E to 79° 5' E**.

The headquarters of the Tiger Reserve is situated at Ramnagar, district Nainital Uttarakhand. It is about 260 km. from New Delhi and 242 km. from Dehradun. The headquarters of Kalagarh Division of CTR is at Lansdowne.

1.1.3. Constitution:

The Corbett National Park, 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. CNP and Sonanadi Sanctuary together formed the Core-Critical Tiger Habitat of this Tiger Reserve and the reserve forests as buffer zone of CTR.

The break-up of the area of the CTR is as follows –

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

1.1.4. Extent (Area Statement & legal Status):

The Tiger Reserve lies between the latitudes 29° 25' N to 29° 40'N & longitudes 78° 5' E to 79° 5' E. The boundaries of the CTR are as follows –

Boundary of Buffer Zone:

- 1. Eastern Boundary: From** the junction of Kotdwar-Ramnagar forest motor road with Parwatiya shuva Lakhanpur, going up along the left Bank of Ramnagar-Ranikhet motor road up to Mohan barrier. Mohan Barriers to Durgadevi, Marchula left side of Ramganga River to left side of Devta Nadi to Champapani. Phooltal C.N. 1 to 11, Malani C.N. 19, Dhulva East C.N. 7 to 13, Dumanda East C.N. 1 to 6, Jameria East Block C.N. 1 to 6 and Era Block C.N. 1 to 3.
- 2. Western Boundary :** Gujjar sot to Bandargarh and Khansur block C.N. 8, 7, 6, 5, 3, 1 and 23 Kugad block C.N. 1 and Bijoragad block C.N. 1, 8 to Sendhikhal. Khansur block C.N. 1 to 23, Kugad block C.N. 1 to 14.

Tiger Conservation Plan, Buffer Zone

- 3. Northern Boundary :** Sendhikhal Bijoragad block C.N. 8,7,6,5 to Haldgaddi block C.N. 21, 22, 19, 18, 17, 16, 15, 14, 13 to Rathwadhab. Rathwadhab to Khadrasi Right side of Mandal River. Karia Block – Pillor No. 43, 44 to 1-15. Mandal Block – Pillar No. 1 to 18 and 17 and 20 to 127. Khadrasi to east Mandal Block C.N. 2, 3a, 3b, 4,5,6,7(a),7(b),11,12 and Kalakhand block 4,1,2 to pillar no 152 to 160 Champapani. Bijoragad block C.N. 1 to 8, Haldgaddi block C.N. 1 to 23, Adnala block C.N. 1 to 5, Mandal block C.N. 1 to 8, Kartiya block C.N. 1 to 2, East Mandal block C.N. 1 to 12, Kalakhand block C.N. 1 to 4, Jameria West block C.N. 2 Champapani.
- 4. Southern Boundary :** Ramnagr-Ranikhet P.W.D motor road Pillor No. 503 to Pillor No. 521 to South ward Saweldeh river. Right side of the river, Plot No. 1 (70) upto Plot No. 1(70) to Dhela C.N. 6 to Jaspur Block C.N. 46,47,48,49 up to Phika Nala Laldhang Pillor No. 554. From Pillor No. 554 along the road on the left hand side, from Lakarghat (Kalagarh) Kalagarh Block C.N. 8 to Nalkatta Block C.N. 7, 5, 3 to Kalushahid Block C.N. 16,14,10,9,4 to Dhaulkhand Block C.N.14,6 and Pakhrao Block C.N. 8,3 to Gujjar Sot. Pakharo Block C.N. 1 to 8, Dhaulkahand Block C.N. 1 to 14, Kalushahi Block C.N. 1 to 16, Nalkatta Block C.N. 1 to 8, Kalagarh West C.N. 7 and 8, Dhela Bhavar Block C.N.1 to 6, Jaspur North Block C.N. 46 to 48. Phika D Saweldeh Bhavar C.N. 1 to 58 and N-1 to N-6, Saweldeh hill 1 and 3 to 5.

The legal status of the Protected Area is that of a Tiger Reserve under Section 38v of the Wildlife Protection Act. 1972 (as amended 2006). Corbett National Park and Sonanadi Sanctuary are the core-critical tiger habitat and the rest is the buffer area.

Block/Compartment wise area statement of Buffer Area of Corbett Tiger reserve is as follows:

Division	Block/Compartment	Area (in Ha.)
Ramnagar Tiger Reserve Division	Dhulwa-E Comptt. No. 7 to 13	2309.60
	Sawaldeh Hill Comptt. No. 1 & 3 to 5	1384.12
	Phoolta Comptt. No. 1 to 11	3555.20
	Malani Comptt. No. 19	667.30
	Dhela Bhabar 1 to 6	1894.40
	Sawaldeh Bhabar Comptt. No. 1 to 58 & N-1 to N-6	2517.80
	Jaspur North 46 to 49	1465.30
	Pheeka – D	26.30

Tiger Conservation Plan, Buffer Zone

Kalagarh Tiger Reserve Division	Kalagarh West Comptt. No. 7 &8	469.00
	Nalkatta Comptt. No. 1 to 10	1651.90
	Mandal Comptt. No. 1 to 8	1562.90
	Mandal East Comptt. No. 1 to 12	1848.30
	Kartiya Comptt. No. 1 &2	261.80
	Kailakhand Comptt. No. 1 to 4	772.50
	Domunda East Comptt. No. 1 to 6	1835.00
	Domunda West Comptt. No. 1 to 6	2525.60
	Jameria Comptt. No. 1 to 6	1459.60
	Eda Comptt. No. 1 to 3	783.90
	Lohachaur Comptt. No. 8 (part) & 11 to 17	931.90
	Adnala Comptt. No. 1 to 5	740.60
	Hald-Gaddi Comptt. No. 1 to 23	4345.70
	Mandal 9 to 10	332.70
	Khansoor Comptt. No. 1 to 23	3454.00
	Bijogarh Comptt. No. 1 to 8	1560.90
	Kugaddha Comptt. No. 1 to 14	1301.50
	Kaalu-Shaheed Comptt. No. 1 to 16	2652.30
	Dhaultkhand Comptt. No. 1 to 14	2801.20
	Pankhro Comptt. No. 1 to 8	1520.40
Total	46631.82 <i>or 466.32sq.km.</i>	

Range wise buffer area of RTRD:

Name of District	Sub-Division	Name of Range	Name of Forest Block	Compartment	Area in ha.
Nainital	Bijrani	Sarapduli	Dhulwa (E)	11 to 13	1167.10
			Dhulwa (E)	7 to 10	1142.50
Total buffer area of Sarapduli Range					2309.60
Nainital	Bijrani	Bijrani	Phultal	Phultal 1-6 and Malani 19	2486.00
			Phultal	7 to 11	1736.50
			Sawaldeh Hill	Sawaldeh 1 and 3 to 5 and middle of Dhela-Ramnagar motor road	1384.12
Total buffer area of Bijrani Range					5606.62
Nainital	Kalagarh	Dhela	Dhela	1 to 4	1172.70
			Dhela	5 to 6	721.70
			Sawaldeh (Bhabar)	Sawaldeh Plot 21-24, 25-51 and C.N. 3-4 and N-4 to N-6 and Plot 55-57	1001.25
			Sawaldeh (Bhabar)	Sawaldeh compound and C.N-5 and Plot 10-20 and N-3 part	749.40
			Sawaldeh (Bhabar)	Sawaldeh Plot 1-9 and 15-17 and 52-58 and N-2, N-3 (Part) and Forest Guard chauki	767.15
			Pheeka – D class		26.30

Tiger Conservation Plan, Buffer Zone

Total Area of Dhela Range (Buffer)					4438.50
Nainital	Kalagarh	Jhirna	Jaspur	46-47	704.40
			Jaspur	48-49	760.90
Total buffer area of Jhirna Range					1465.30
Pauri Garhwal	Kalagarh	Kalagarh	Kalagarh (West)	7-8	469.00
			Nalkatt	1-10	1651.90
Total Area of Kalagarh Range (Buffer)					2120.90
Grand total					15940.90

Range wise buffer area of KTRD:

Name of District	Sub-Division	Name of Range	Name of Forest Block	Compartment	Area in ha.
Pauri Garhwal	Sonanadi	Sonanadi	Kalushaheed	1 to 16	2652.30
			Dhaulkhanda	1 to 14	2801.20
			Pakhrow	1 to 8	1520.40
Total Area of Sonanadi Range (Buffer)					6973.90
Pauri Garhwal	Sonanadi	Palain	Bijoragarh	1 to 8	1560.90
			Khansur	1 to 23	3454.00
			Kugadda	1 to 14	1301.50
Total Area of Palain Range (Buffer)					6316.40
Pauri Garhwal	Sonanadi	Adnala	Haldgaddi	1 to 23	4345.10
			Adnala	1 to 5	740.60
			Mandal	9 to 10	332.70
Total Area of Adnala Range (Buffer)					5418.40
Pauri Garhwal	Mandal	Mandal	Domunda West	1 to 6	2525.60
			Domunda East	1 to 6	1835.00
			Jameria West	1 to 6	1459.60
Almora			Kalakhand	1 to 4	772.50
			Eda	1 to 3	783.90
			Lohachaur	8(part) & 11 to 17	931.80
Total Area of Mandal Range (Buffer)					8308.40
	Mandal	Maidavan	Mandal	1 to 8	1562.90
			Mandal East	1 to 12	1848.30
			Kartia	1 to 2	261.80
Total Area of Maidavan Range (Buffer)					3673.00
Grand Total					30690.10

Tiger Conservation Plan, Buffer Zone

1.1.5. 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. The notifications have been given in **Annexure-1/1**

1.2. 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 – Amdanda, Dhangarhi, Durgadevi, Khara-gate, Kalagarh and Rathuadhav. The entry to the buffer area can be possible from any of the above mentioned entrance gates. 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 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. The cart road/kandi road is the main road along the southern boundary. It is usually open throughout the year.

1.3. Statement of Significance:

Tiger is not only a flag bearer of 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). 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 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 the National Animal- Tiger. If tiger still has a chance of survival in this part of the country, Corbett will be the flag bearer in the conservation efforts of the country through better management practices and strong protection.

Corbett National Park was one of nine protected areas of India where "Project Tiger" was launched on 1st April, 1973. After its inclusion in Project Tiger, Tiger

Tiger Conservation Plan, Buffer Zone

Conservation became the focus of conservation activities in the Reserve. Tiger being situated at the apex of food chain, its conservation leads to the conservation of other flora and fauna. The result of the efforts put in for conservation between the year 1974 and 2011 can be visualised by the comparative study of population estimates of important species during this period.

Year	Tiger Number
2001	137
2003	143
2005	141
2008	164 (Range 151-178) (population of 1524 sq. km of Corbett Landscape which includes CTR)
2010	214 (Range 190-239) (population of 2288 sq. km of Corbett Landscape which includes CTR)

This comparative study reveals that Corbett has been successful in achieving the objectives of its establishment. Today Corbett not only holds a thriving and viable population of Tigers but is a custodian of the floral and faunal diversity of Terai-Bhabar landscape. Corbett has 49 species of mammals, 36 species of aquatic fauna and around 685 species of birds. The people of this area and the staff of Corbett Tiger Reserve have played a key role in the protection of this natural heritage. The local people even after huge loss of life and property are supportive to the cause of conservation. At the same time the staff of Tiger Reserve is dedicated to protection in the remote and inaccessible areas.

Tourism in the TR is the 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, the most important tiger population within this landscape is Corbett having tiger presence in 2287 sq.km with an estimated population of 214 (190-239). The landscape is characterized by having the ability of sustaining 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 – 9.4 tigers per 100 sq. km, which is highest in the world. Thus with 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. Though

Tiger Conservation Plan, Buffer Zone

the earlier area covered was 1524 sq. km, in 2010 report the area was increased to 2287 sq. km. This also indicated the increase of tiger habitat in the Corbett Landscape.

The Corbett Tiger Reserve is known for the Land of Tiger along with a number of other species of mammals & herbivores. The entire Tiger Reserve is a compact forest area suitable to provide an ideal heaven for tiger & its associates.

As per section 38V 4(ii) of the Wildlife Protection Amendment Act – 2006, each tiger reserve is required to create a Buffer or Peripheral area consisting of areas peripheral to critical tiger habitat or core area, where a lesser degree of habitat protection is required to ensure the integrity of the critical tiger habitat with adequate dispersal of tiger. This area will promote the co-existence between wildlife and human activity and due recognition of the livelihood, developmental, social and cultural rights of local people. The Buffer Area of a Tiger reserve usually has following functions –

1. To provide habitat supplement to the spill over population of tiger and its prey from the core area, conserved with the active cooperation of stakeholder communities.
2. To provide site-specific, need based, participatory eco-development inputs to local stakeholders for rationalizing their resource dependency on the Tiger Reserve and strengthen their livelihood, so as to elicit their support for conservation of the area.
3. Mainstreaming wildlife concerns in various production sectors in the area.

The ongoing study and analysis of available research data on tiger ecology indicate that the minimum population of tigresses in breeding age, which are needed to maintain a viable population of 80-100 tigers (in and around core areas) require an inviolate space of 800-1000 sq km. 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 area/habitat. Therefore, buffer areas with forest connectivity are imperative for tiger dynamics, since such areas foster sub adults, young adults, transients and old members of the population. The young adults periodically replace the resident ageing males and females from the source population area.

The buffer area absorbs the "shock" of poaching pressure on populations of tiger and other wild animals. In case of severe habitat depletion in buffer areas, the source population would get targeted and eventually decimate.

Tiger Conservation Plan, Buffer Zone

Further, the Park consists of some of the finest quality moist Bhabhar Dun & Moist Silwalik Sal Forest. The area is interspersed by beautiful hills & valleys along with small Rivers & *Nalas*. The rich plant diversity provides ideal habitats for different species of wild life of the National Park.

The clear felling of large tracts of sal and miscellaneous trees for Ramganga Dam Project changed the typical characteristics of the landscape & also induced irrevocable changes in the species composition. *Patera (Typha eliphantina)* grass had almost disappeared and the area dominated by Ber (*Zizyphus spp*). Vast grassland was immersed in the place of the denuded forest which remains submerged about 4 months in a year by the back water of the Dam.

Corbett Tiger Reserve has highly significant role in the conservation of tiger. It is one of the few well established source populations of tiger of India. The rich biodiversity is represented by high abundance of prey population, vast stretch of grassland, extensive network of natural streams along with river Ramganga, Sonanadi and Palen with verdant sal and its associate forests. These natural endowments support the enviable population of tiger in the country. Not only tigers but also elephants enhance the significance of the Tiger Reserve as one of the richest ecosystem of our country.

The Corbett Tiger Reserve is also significant due to various degrees of challenges. Protection being the measure issue of Corbett Tiger Reserve, a 'Protection Plan' has been designed to patrol in the sensitive areas as well as to gather intelligence to thwart the nefarious activities of potential poachers. The other significance lies in the fact that the southern boundary of core area shares boundary with villages of Uttar Pradesh and it is a challenge to stop villagers from entering in to the core area and exposed themselves to possible attack by elephants and tigers. The porous boundary is always expected to be used by poachers to harm wildlife in general and tiger and elephant in particular.

Degradation of habitat due to prolific growth of lantana and other weeds threatens the food availability for the herbivores.

Man-animal conflict relates to killing and injuring human beings, crop raiding, killing of cattle etc., are posing major constraints to contain the agony of fringe population which may translate into revenge killing of tigers and elephants.

Tiger Conservation Plan, Buffer Zone

Forest fire, flood, undue pressure of tourists, chocking of corridors, construction activities in the fringe areas of the Tiger Reserve are some of the other significant issues facing by the management.

1.4. 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.

1.4.1. 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.

Tiger Conservation Plan, Buffer Zone

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 Sheeshamkhata 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 Sheeshamkhata 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

Tiger Conservation Plan, Buffer Zone

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 vallyes 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.

1.5. Hydrology & water sources:

CTR 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 CTR 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 CTR and the major perennial source of water. It flows almost parallel to the northern boundary before entering Corbett National Park near Gairal. The banks of these rivers and streams have many types of grassland and some good patches of reverain miscellaneous forest. Kosi river is another perennial water source for the wildlife of CTR though it runs outside and along the eastern boundary of the TR. From Mohan to Ramnagar the river runs very close to CTR and is regularly visited by the wild animals of the TR.

The buffer area 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*. Some artificial borings are also available which are being used for drinking water as well as for supplying water for the waterholes. The list of waterholes and borings have been given in **Annexure-1/2**.

The Palain, Mandal, Ramganga rivers which travel through parts of the in the Buffer, contains water all year around. Apart from these, there are some perineal water sources like streams, nallahs and ponds besides numerous seasonal water courses 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

Tiger Conservation Plan, Buffer Zone

summer months water is fed using water tankers or collecting water of a small stream. On the eastern side of the buffer area Kosi River is an important perennial water source though it is outside the TR. The list of waterholes has been given in Annexure-2/1.

1.6. 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 decidous	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 Park now under submergence in Ramganga reservoir (4,220.20 hectares) consisted of forest

Tiger Conservation Plan, Buffer Zone

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 buffer area belong to this type. 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 (*Emblica 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 (*Debregeia 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.

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

Tiger Conservation Plan, Buffer Zone

species. Tendu (*Diospyros melonoxylon*), Bhilawa (*Semecarpus anacardium*), Kathbhilawa (*Buchanania lanzan*) etc. with some Kura (*Hollarhena antidysenterica*), and Kathber (*Zixyphus 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.

A large part of the area, specially that on the southern exposed slopes in Gaujera and Kanda blocks, carries a form transitional to the Dry Siwalik Sal forests (5B/C1a). The conditions here are drier, the soil is shallower and more sandy and having very less moisture. The crop has a higher proportion of Bankuli, Tendu, Bhilawa, Kathbhilawa, Bauhinia spp. etc with more bamboo and more grass.

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

This type of forest has limited distribution in the buffer of the Tiger Reserve 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.

Tiger Conservation Plan, Buffer Zone

(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.

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*, *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*, *Dhaura* 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

Tiger Conservation Plan, Buffer Zone

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 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.

Based on topography and geology, the following are the principal type of forest vegetation that occurs in the buffer area of Corbett Tiger Reserve:

- (i) The dry Deciduous Forests on Bhabar Flats consisting of xerophytic species like Ber and Kathber (*Zizyphus mauritians*) Kurha (*Holarrhona antidysenterica*) Bel (*Aegle marmelos*) Chilla (*Casaeria tomentosa*), Dhak (*Butea monosperma*) etc. with occasional Semal (*Salmalia malabarica*). Jhingan (*Lannca coromandalica*), Kharpat

Tiger Conservation Plan, Buffer Zone

(*Gauga pinnata*), Khair Rohini (*Mallotus philippensis*) etc. Bamboo is entirely absent. Sal, usually mature to over-mature and scattered singly or in group is confined to Dhara compartment-6, Shisham (*Dalbergia sissoo*) is confined to the bank of "sots" (*streams*).

- (ii) The forests on Swilik Sand Rocks Forests over this rugged occur mostly in the southern tract with sprinklings of 'sal' but mainly Bakli (*Anogeissus latifolia*), Khair (*Acacia Catechu*), Tendu (*Diospyros melaoxlon*), Jhingan (*Lannea coromandelica*), ect. on the southern slope while on the northern and other slopes sal (*Shorea robusta*), Bakuli(*Anogeiesus latifolia*), Khair (*Acacia catechu*), Chir (*Pinus roxburghii*), Pula (*Kydia calycina*) etc. occur.
- (iii) Siwalik Conglomerates Forest these occur on the flat country of the Patlidoon and the gentle tarraces of Dhulwa West block and steep broken areas with a northern aspect of Gaujpani Block. The flat country forests consist of pure good quality sal of fairly high density. The forests on broken steep areas have predominance of sal and are well stocked.
- (iv) The hill Sal Forests on Nahan San Stone These occur over a large area of hilly country with varying aspects and altitudes and cut-up deep ravines. All classes and qualities of crops varying from almost pure sal (*Shorea robusta*) to dry xerohpytic species of Bakli (*Anegessus latifolia*) etc. exist. On the whole, the typically south and west aspects are stocked with sal of much proper quality than the north and west aspect.
- (v) Reverain Foersts Most of the island on the Ramganga river carry a good crop of Shisham (*Dalbergia sissoo*). Younger age classes predominate and there are very few trees over 40 cm. Diameter. Occasional Semal (*Bombax cieba*).

1.6.1. 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 buffer area has small patches of grassland unlike in the core area where large tracts of grassland are found. These grasslands are characterized 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

Tiger Conservation Plan, Buffer Zone

grazing and naturally attracting the predator the tiger. Hog deer are also primarily found in the grasslands of Dhela .

The flat anthropogenic grasslands are dominated by *Vetiveria zizanioides*, *Saccharum benghalense*, and *Dichanthium annulatum*. Most important being Dhikala chaur which supports 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.

1.6.2. 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 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. The list of plantations of non-endemic species has been given as **Annexure-1/3**.

1.6.3. 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.

Floral diversity of CTR is very rich 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% is constituted by 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 the other associates are 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*)

Tiger Conservation Plan, Buffer Zone

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 (51 spp), *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* is profusely growing, thus inhibiting the regeneration of Sal and other herbaceous plants. Extensive growth of *Cannabis sativa* is also found in the grassland. The CTR comes under the biotic province 07A (Gangetic plain-Upper Gangetic Plains).

1.7. Wild Fauna, Habitats and Tropic Niches:

The Corbett Tiger Reserve is popularly known as the 'land of Roar, Trumpet and Song'. These are represented by Tiger, Elephant and Birds, respectively. CTR 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. There are 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 in CTR.

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

Tiger Conservation Plan, Buffer Zone

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

1.7.1. 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 CTR has 40 such species among which 4 are critical, 10 are endangered and 26 are vulnerable.

List of Critical, Endangered and Vulnerable Species of CTR

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 heliacal*(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)

Tiger Conservation Plan, Buffer Zone

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 chelynooides* (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)
36. *Puntius chola* (Vulnerable)
37. *Puntius conchoniis* (Vulnerable)
38. *Garra gotyla gotyla* (Vulnerable)
39. *Mystus vittatus* (Vulnerable)
40. *Bagarius bagarius* (Vulnerable)

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

Leopards are found mostly in the hilly areas of the Park. Some nocturnal cats found here are Leopard Cat, Jungle Cat, rusty spotted cat and Fishing Cat. Sloth Bear is found in the lower regions of the Park while the Himalayan Black Bear is seen in the higher hills only. Also seen on the rocky hillsides is Goral or Goat antelopes. Monkeys

Tiger Conservation Plan, Buffer Zone

are well distributed throughout the Park and warning the whole jungle with alarm calls from tree top perches, when they see either Tiger or Leopard.

The rich avifaunal diversity represents 6% of the world's avifauna, 52.2% of the Indian Avifauna and 49 species of the diurnal raptors. The avifaunal diversity is at its peak during winter.

1.7.2. Mammals:

Corbett Tiger Reserve is abundantly populated by Spotted Deer, Sambhar, Barking Deer, and to a lesser extent Hog Deer. The prey base of the tiger is further enriched by wild boar, Langoor (*Presbytis ectellus*) and Porcupines (*Hystrix indica*). Goral (*Nemorhaedus goral*) is found in steeper slopes. Besides tiger (*Panthera 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. 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.

Indian elephant (*Elephas maximus*) is wide spread in the Park 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.

1.7.3. Reptiles:

Indian Crocodile i.e. Magar (*crocodilus palustris*) are found in the river Ramganga. Gharials (*Gavialis gangeticus*) are also seen in Ramganga River. The Ghariyal 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 Ghariyal in Northern India (other populations are found in the

Tiger Conservation Plan, Buffer Zone

National Chambal WLS and Katarniyaghat WLS). This is of special significance as this population has adapted the congenial environment of a free flowing river.

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

1.7.4. Birds:

Corbett is very rich in avifauna. The check list produced by the Zoological Survey of India mentioned a total of 685 species which belongs to 294 genera and 75 families of which four species are Critical, three endangered, fourteen vulnerable and nineteen near threatened. Common birds are peacock, jungle fowl, partridges, kaleej, vulture, 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-1/4**.

1.7.5 Pisces:

The river Ramganga sustains a large variety of fishes. The Mahaseer (*Barbustor*) is the main species found throughout the length of the rivers. The other mentionable species are the Kalaimachi (*Barbus chilinodes*) Kalabasu (*Labeo calabasu*), chilwa (*Oxygaster bacaila*) and Goonch (*Bagarius bagarius*).

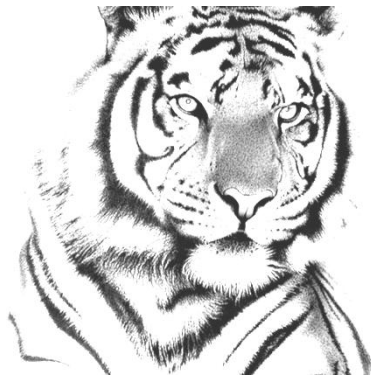
1.8. Major conspicuous changes in habitat since inception:

The present Buffer Area of the TR came in the administrative control of CTR only in 1991. Prior to becoming part of the TR, they were being managed as reserved forests in their respective forest divisions. These areas were being exploited for timber and other forest produce and planting of both indigenous as well as exotic plants was common. All those forestry activities were being carried out under the Working Plan prescriptions. After merger of these forests with CTR, regular forestry operations were replaced by intensive wildlife management activities. The first emphasis was ensuring and establishing proper protection set-up in the whole area. This was an enormous task requiring lots of resources and manpower. Building of new *chawki*'s, anti-poaching camps, creating an effective wireless network, strengthening of road network, providing

Tiger Conservation Plan, Buffer Zone

basic facilities to the staff etc., were taken up. Relocation of *laldhang* village on the periphery of the forest was another major achievement creating a huge inviolate space for the wildlife in the buffer area.

The spread of weed especially *lantana* was a big habitat related problem in the Buffer area as well. Certain good relocation sites like *dhara*, *jhirna*, *koti-rao* and *laldhang* were selected under the habitat restoration programme and were converted into beautiful grasslands. These areas today harbour a large population of herbivores, birds, reptiles and tigers. One major change has been the adoption of the policy of 'zero tolerance' to fire. Extraction of dead and fallen timber by Uttarakhand Forest Development Corporation has also stopped in almost all the forest areas excluding some parts of the buffer areas of Sonanadi Sanctuary of Kalagarh Forest Division.



..... 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

Status of Tiger & Co-predators

2.1. Distribution:

Tiger is the spirit of the Indian jungle. Even his distant roar, or an alarm call from some animal announcing his 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, Kashipur, Western part of 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). 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). The tiger occupancy area has significantly increased from 1524 Sq. Km. to 2287 Sq. Km.

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 can be best described by Smith (1993) that male 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

Tiger Conservation Plan, Buffer Zone

male-biased in mammals and usually the dispersing sex has a higher mortality rate than the philopatric sex.

2.1.1. Extension of Buffer area by including Landscape Divisions:

It is the need of the hour that the adjoining Forest Divisions should be notified as Buffer Zone of Corbett in order to ensure the overall survival of the dispersed population which has a direct linkage for the survival of the tigers in the core area. It is pertinent to mention that these forest divisions have considerable number of resident tigers. In this context directives has been issued from MoEF, Government of India, to notify Ramnagar, Tarai West and Lansdowne Forest Divisions as Buffer area of Corbett Tiger Reserve. Pending such notification, the NTCA had sanctioned Rs.75 lac for protection of tiger in forest divisions like Ramnagar, Tarai West, Tarai East, and Haldwani. The divisions in question should prepare a 'Buffer Plan' following the guidelines issued by the NTCA for protection of the tigers and overall development of protection force (like 'operation lords' and tiger protection force constituting non-permanent personnel and ex-army personnel of CTR) in the respective forest divisions.

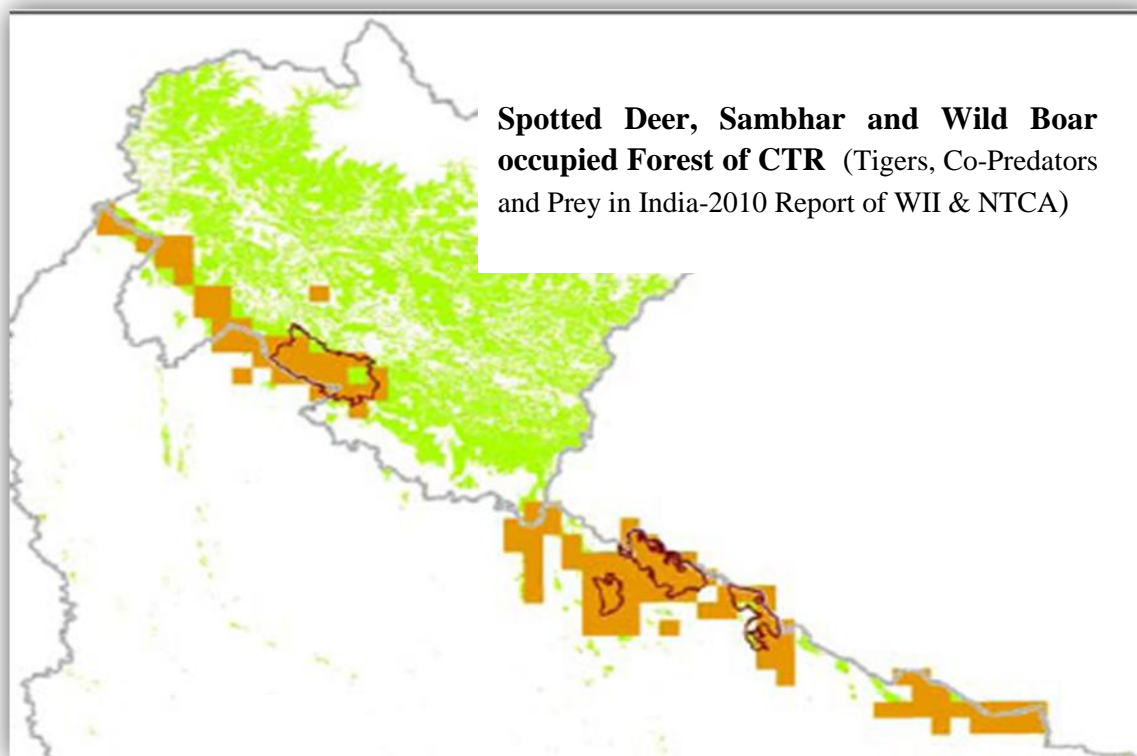
2.2. Abundance status:

As mentioned in the WII/NTCA report – 'Tigers, Co-Predators and Prey in India-2008' the Corbett National Park 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 tiger occupancy area has significantly increased from 1524 Sq. Km. to 2287 Sq. Km. The 2008 and 2010 report has been given in **Annexure-2/1**.

The annual tiger monitoring exercise which is known as Phase-iv has been given as a study report on 'Status of tigers in Corbett Tiger Reserve-2011/12'. The report has been given as **Annexure-2/2**.

Since occupancy of 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.

2.3. Prey- Predator Relationship:



The carrying capacity of tigers in a given area is primarily determined by the availability of prey base. A tiger requires a deer size mammal approximately once a week that means consuming almost 50 such type of animals in a year. Tigers consume about 10 percent of the available prey base, which 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 & 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 support a thriving population of Spotted Deer, while large forest patches are ideal habitat for Sambhar and Barking Deer. Some areas have shown a visible rise in prey population.

2.4. Assessment of threats:

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

Tiger Conservation Plan, Buffer Zone

2.4.1. Poaching:

The high density of tigers does attract poachers, but due to effective patrolling, the park remains safe from organized poaching.

2.4.2. 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 habitations. The Sunderkhal encroached habitation put a serious danger for animals particularly tigers. On the southern boundary, the motor road put hindrance for safe passage of animals to adjoining areas of Amargarh Forest Division. The Kalagarh Irrigation colony also blocks free movement of wildlife.

2.4.3. Man-animal conflict:

The buffer of CTR and the southern part of Core area is sensitive towards man-animal 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 for easily available cattle during rains, crop raiding by elephants, wild boars, deer and nilgai causes immense pressure on management to tackle the man-animal conflict. Though compensation for human loss and injury has been disburse promptly, inadequacy of fund delayed compensation for loss of cattle. 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 proactive role to contain the severity of man-animal conflict. The status of human and animal casualty along with damage to crops by wild animals and corresponding disbursement of compensation has been given as **Annexure-2/3**.

2.4.4. Presence of Gujjars:

There are Gujjars settlements inside the Sona Nadi 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. Delay in their translocation to Hardwar Division has caused the increase in their number of families from 181 in 2003 to about 256. Though the number of gujjar families residing in the buffer zone is much less than that of the core zone, the collateral damage caused

Tiger Conservation Plan, Buffer Zone

by the huge number of cattle of the core on the adjoining buffer areas cannot be denied. Earliest settlement of the Gujjars outside the reserve is the only option.

2.4.5. 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 carried out for the cattle belongs to the Gujjars.

2.4.6. Invasion of habitat by obnoxious weeds:

Many part of PA is invaded by many invasive weeds like Parthenium, Cida, Lantana, Ageratum, Solanum, Cannabis, Chrysanthemum, Cassia tora, Van Tulsi etc. These weeds are suppressing the growth of indigenous plant community including grass and subsequently has a bad effect the animal community & composition of the ecosystem.

2.4.7. 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 intrudes into the adjoining villages for water, where they face a threat of poaching.

List of tiger deaths has been given in the **Annexure-2/4**.

Chapter-3

History of Past Management & Present Practices

3.1. Conservation and Forest Management History:

The reserve forest of the Corbett Tiger Reserve were drawn from Ramnagar Forest Division, Terai West Forest Division and Kalagarh Forest Division. Ramnagar and Kalagarh Forest Divisions have a very long history of scientific forest management dating back to the British Period. The original Hailey National Park was also part of these two forest divisions in the beginning. It was during this period that these huge chunks of forest land were declared as Reserved Forests. Since the British period these forests were managed as per working plans. The working plan prescriptions laid emphasis on conversion of heterogeneous *Sal* forests into even aged crops. They served as a good source of revenue to the Government. Large scale exploitation of these forests took place during the British period and even after independence. In the working plans of both Ramnagar and Kalagarh Forest Divisions very little was written about wildlife management except some *shikar* regulations.

Terai West was a relatively new division created after independence and the focus of forestry in this division was on the conversion of low economic value mixed forests into high value industrial timber yielding forests. Both exotic and indigenous species were planted and huge tract of mixed forests were converted into plantation stands using mechanised plantation technique. These high yielding forests had very little wildlife value but at many places they served as corridors for connecting two wildlife habitats.

3.1.1. Habitat Management:

Ever-since the scientific management of TR came into being, there was emphasis on the holistic development of wild animals. It basically included the creation of grass land & its annual management, plantation, construction of water holes for lean period. Of late there has been an attempt to make use the whole eco-system of park 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.

Tiger Conservation Plan, Buffer Zone

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.

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 has invaded vast tract of CTR. About 49 species of exotic weed has been identified, but no proper study or mapping has been carried out.

A. Grassland Management:

New grassland was created from the vacated land available due to relocation of Laldhang village. Following measures were undertaken to develop the land into a grassland.

- Erection of electric fence
- Eradication of weed
- Uprooting of woody plants
- Rotational Control Burning

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

Tiger Conservation Plan, Buffer Zone

S.No.	Botanical Name	Local Name
8.	Heterogon contortus	Kumeria
9.	Eulaliopsis binata	Bhabhar
10.	Saccharum spontaneum	Kauns
11.	Thysanilaena marxima	Oons
12.	Saccharum munja	Mooni
13.	Capil pidium spp	Chunar
14.	Imperata cylindrica	Sirou
15.	Phragmitis Karka	Narkul
16.	Eragrostis ciliaris	Chriya chuna
17.	Sporobolus indicus	Chriya dana
18.	Sorghum halepense	Vanchari
19.	Dichantium annulatum	Nalli
20.	Neyraudia arundinacea	Naltura

(i) Weed Eradication :

Obnoxious weeds like Lantana, *Parthenium*, *Ageratum*, *Cassia tora*, etc., were removed. But the eradication process has not yielded desired result so far.

(ii) Fire Protection:

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

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.

(iii) Fire as a management tool:

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

Tiger Conservation Plan, Buffer Zone

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 can stop 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.

B. 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.

C. Grazing:

There are 181 Gujjar families waiting for resettlement at the core area (Sonanadi Sanctuary). The grazing pressure of cattle owned by Gujjars of core areas who often does collateral damage in the buffer areas and the cattle of the Gujjars of the buffer is a matter of serious concern. Details regarding regulation regarding grazing has been discussed in Chapter-7.

3.2. Protection of Tiger, its Prey and Habitat:

The forests of erstwhile Ramnagar Forest Division and Kalagarh Forest Division are rich Tiger habitats. The Buffer Forests on the Northern and Eastern side are connected with continuous forest stretch of Lansdowne and Ramnagar Forest Divisions respectively. These areas support a healthy population of migrating tigers. The area can support an even higher tiger density. The habitat is mostly *sal* and *riverain* forest intermingled with grassy blanks. *Sambhar*, *Barking Deer* and *wild pig* are the main prey species of forest areas while spotted Deer are common in the grassy blanks. The area has sufficient prey base. These buffer forests are also frequented by elephants. Further

Tiger Conservation Plan, Buffer Zone

the waterholes need to be regularly sanitized against snares. Same exercise should be continued to scan the probable sites along the agricultural fields and wildlife treks to keep these areas free from snares. Regular interaction with the villagers and Gujjars will be maintained to make them aware about the danger of killing tigers and leopards out of frustration of not getting adequate and timely compensation for their loss of cattle.

As far as protection is concerned, the southern boundary is most the sensitive zone of CTR. The biotic pressure is also highest on this part of the Reserve. The Eastern side is connected to a very few villages and is relatively less sensitive. The biotic pressure on forest resources is also less. But most of the privately owned resorts and hotels are located on this side causing many environmental and wildlife related problems. A huge encroachment on forest land named “Sunder-khal” is also situated on the eastern boundary which puts tremendous biotic pressure on adjoining forest area and is a man-animal conflict hot-spot. Kosi river also flows from the eastern side of the TR which is an important perennial water source for the wild animals. Construction between Kosi River and CTR has constricted the corridor for the animals for going to the river. Ramnagar-Ranikhet National Highway is another source of problem for the wild population because it is a major cause of death of wild animals in road accidents. There is an urgent need of guidelines for setting up of the resorts and hotels on the adjoining revenue land, declaration of the eco-sensitive zone, and notification of the ecotourism strategy by the State Government. These guidelines will streamline the pressure of tourism activities which till now have been non-directional and may be unsustainable.

There is also an urgent need to shift the Sunderkhlal encroachment habitation on the reserve forest of Ramnagar Division. That encroached village is seriously hampering the movement of tigers and other wild animals from Corbett Tiger Reserve to Ramnagar Forest Division. Following the declaration of the Union Minister (independent Charge) of Environment and Forests, Government of India, in May 2010, a proposal has been submitted to the Government of India by the Ramnagar Division through the Chief Wildlife Warden. Reclamation of the area in question, and restore it as a vital corridor for the Critically endangered wildlife will ensure mitigation of imminent serious man-animal conflict. The case in point is the loss of six lives by a man-eater tiger in 2010.

The Northern boundary is linked to the forest areas of Lansdown Forest Division and Almora Forest Division and is relatively safe as it has very few habitations and

Tiger Conservation Plan, Buffer Zone

accessibility is also not very good. Thus the Northern side is more or less safe from poaching and habitat destruction activities. For long term benefit of the gene pool of tiger, the Lansdowne Forest Division should be protected as in the case of the Corbett Tiger Reserve. Since this is a territorial division, wildlife protection has been accorded as low priority in comparison to protecting trees against illicit felling. The importance of putting the Division as the buffer area of Corbett Tiger Reserve can be judged by the suggestion given by Honourable Prime Minister of India to the Chief Minister of Uttarakhand to notify the Lansdowne Forest Division as the Buffer zone of Corbett Tiger Reserve. The division has the potential to provide the safest passage to the migrating population of Tiger and elephant to Rajaji National Park.

The buffer forest holds a good population of *Gujjars*, who have been living in the area for many generations. Their impact on the quality of habitat is bound to be negative as *Gujjars* are traditionally a cattle rearing community who utilize the forest resources to the fullest. Their style of living and their traditional profession, both depend extensively on forest resources. The *Gujjar* habitations are confined around *Dhela, Hathi-dangar, Pankhro, Kamla-van, Dhaulkhand, Kalu-shaeed, Khansoor, Mundiyanani*, etc. With the changing of time the *Gujjars* has been found to be facilitators for the wildlife body part traders. They have lost the innocence. Since they are living a quasi- nomadic life and are concentrated in the buffer area, strict vigilance should be adhered by the field staff as well as efforts should be undertaken to make them an integral part for the protection of the tiger as well its habitat.

Development of new grasslands at the village relocation sites has made new areas available for the ungulate population. In the last 10 years herbivore population has shown substantial rise especially in *Dhara, Jhirna* and *kothi-raw* area. Some small elephant herds have also settled around *lal-dhang* area.

3.3 Other Land Use–Villages, Agriculture, Developmental Programmes, and Tourism etc:

The whole area of the tiger reserve including the Buffer Zone is a compact forest area and very few villages are located inside the reserve and that too in KTRD part of the TR. These are 46 *chacks* located on revenue land. Many are abandoned by villagers and very few inhabit in the rest of chacks. Apart from the chacks, there are khattas like Amdanda, Ringoda and Neem Sot. Khattas are habitations on the reserve forests where poor people were allowed to stay who were engaged for plantation works. On the

Tiger Conservation Plan, Buffer Zone

periphery there are many villages especially on the Northern and Southern periphery. The villages along southern boundary lie both in UP and Uttarakhand. The villages are located in the Terai-Bhabar tract. Agriculture and cattle rearing is the main profession of the villagers. The land is fertile and modern style of farming has been adopted by the farmers. Most of the people have already shifted to *pucca* houses and the remaining few are also following suit. Use of LPG is becoming increasingly common but traditional style of cooking in a fireplace is also preferred. The cattle population is very high and most of the cattle are low milk producing traditional breeds. Stall feeding is not common except during night time. The list of villages which have a stake on the Corbett Tiger Reserve has been given in the Compendium of Annexure.

The villages on the Northern boundary are located on hilly slopes of Shiwalik. Terraced step-like agricultural fields can be seen everywhere. The fields along the hilly rivers are more flat and best areas for agriculture. The farming is mostly rain fed except for some villages where minor irrigation department has made channels by tapping the water of some nearby water course. Though there are many villages but the population density is low. Dependence on forest resources is high as compared to the villages on the Southern boundary. Traditional method of agriculture is followed.

All the villages along Southern boundary and many on the Northern boundary are well connected with roads. They have access to schools, hospitals, post-offices, dairy and nearby market place. Block level and village level schemes and programmes of both central and state government are being run in these villages. People of the area are very conscious of their rights.

Tourism is confined mainly to the Eastern and Southern boundary. 5 out of 4 entrance gates of the TR are on this side. Private resorts and hotels are also located along these areas. All the tourism related development and the livelihood benefits to the local community are confined to these areas only. Thus tourism and its benefits have not spread equally along the boundaries of the TR. Out of the five tourism zones only *Jhirna* and *Durga-devi* zones are entirely in the buffer area. Restriction on the number of tourist vehicles has been imposed to ensure least disturbance to the wildlife as well providing opportunity to watch the flagship animal of Corbett Tiger Reserve- tiger, to the tourists.

Tiger Conservation Plan, Buffer Zone

3.4. Research and Monitoring:

Research in the Corbett National park remains neglected. Though several studies had been done but did not translated into fruitful conclusion. 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.	Tropic of Research	Name of researcher	Name of institute
1	Grey headed fishing eagle	Rishad Noroji	WII, Dehradun
2	Ecological impact of press crime 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	Colarado state University
11	Mapping of national Park & wildlife sanctuaries	Amit kumar srivastav 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 Packer)	Raman kumar Gazzala shabuddin	Council for society development New Delhi. wildlife studies Banglore.
14	Impact of human induced disturbance of Flora biodiversity with in and in surrounding areas of CNP	Ku. Ruchira Bist	Kumaoun University
15	Survey of Crocodile	Subeer Maryo chaophin	Crocodile Conservation alliances Dehradun
16	Lantana Eradication	Pro. C.R. Babu	Center for

Tiger Conservation Plan, Buffer Zone

			environmental Management of degraded eco-system
17	Anti poaching activities and monitoring the population	A.Cristi Williemos	WWF Nepal programme

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

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 the remote sensing GIS technique. 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, Myammar, 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 student 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 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 Phytodiversity Assessment of Corbett Tiger Reserve by a multi disciplinary learn 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

Tiger Conservation Plan, Buffer Zone

biodiversity of CTR 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, MoEF, Government of India, has studied and recommended 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. Ornithology:

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

3.5. Nature Education and Interpretation:

Nature education and interpretation among the visitors is the most precious investment for the future of tiger and its habitat. . The tiger reserve has many places which can be used for these purposes. Land and basic infrastructure is available. Proper planning needs to be done. Nature education for the school-children adjoining to CTR is of paramount importance for long term investment in support of conservation.

The Platinum Jubilee year-2011b has conducted free tour for about 1300 school children to provide them opportunity to learn about the need of wild life conservation. Similarly exposure visits were also conducted for the senior citizens of fringe villages of the Tiger Reserve. Officers of various central and State government, defence, media,

Tiger Conservation Plan, Buffer Zone

etc. Were visited the park to apprise themselves about the various aspects of wildlife management, the challenges to protect animals, the role of intelligence and inter departmental cooperation. Those interactions will be beneficial to retard the tentacles of wildlife trade and even mitigation of man-animal conflict. Several national and state level workshops were also organised to address the various aspects of challenges related to wildlife management.

Corbett Tiger Reserve also offers excellent interpretation facility at a museum dedicated to the life of Jim Corbett at Kaladungi and the visitors can learn about various eco tourism activities at the village Choti Haldwani which is also famous for Jim Corbett. Visitors also benefited from the Dhangarhi museum which is at the entrance gate of the famous Dhikala Zone of the reserve.

3.6. Administration & Organization:

The Administration & Organizational setup of Corbett Tiger Reserve is as follows. The Corbett Tiger Reserve is headed by the Field Director under whose direction Deputy Director works. The DFO Kalagarh reports to the Director. The Director directly reports to Chief Wild Life Warden & is responsible for the overall affair of the Park.

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

1. Field Director
2. Deputy Director
3. DFO, Kalagarh
4. Director, Corbett Training Centre
5. Sub Divisional Officer, Kalagarh
6. Sub Divisional Officer, Bijrani
7. Sub Divisional Officer, Sonanadi
8. Sub Divisional Officer, Adnala
9. Range Officers:- Bijrani, Sarpduli, Dhikala, Kalagarh, Jhirna, Dhela, Research, Mohan, Palen, Maidaban, Ratuadhab and Sonanadi

Note: Detail of the organisation has been discussed in Chapter-15.

Chapter-4

Mainstreaming Strategy with various Production Sectors

The production sectors and mainstreaming strategy in the landscape:

Various production sectors of the landscape directly or indirectly affect the conservation value of a TR. Fortunately the buffer Forest of CTR is surrounded by the reserve forest of other forest divisions on the three sides. Only the Southern boundary and some parts of the Eastern boundary have adjoining human habitations. This scenario limits the impact of various production sectors on the PA. In the Corbett Landscape, forestry, agriculture, tourism and extraction of minor minerals are the only components of production sectors which have some bearing on the PA management. Apart from the production sectors, there are some places of religious worship on which local people as well as the staff has unflinching faith. These are small places and devotees occasionally visits the site depending on various festivals. Most of the religious places are in the buffer area. The list of religious places have been given in the **Annexure-4/1**.

The buffer forest of CTR has been suggested to be free of any commercial exploitation. Thus the role of forestry sector is limited to bona-fide use by the villagers. This impact has been taken care off in the proposed eco-development initiatives for the TR. Tourism is the second important component of production sectors which affects the wildlife management of CTR. This aspect has been addressed in the zone plan as well as the eco-development part of the CP. Tourism is the one area which is one of the most important deciding factor for the future of conservation at large.

4.1. Forestry:

The terai-bhabar tract of Uttarakhand has traditionally had some of the finest forest patches of this region. Natural stands of dense *Pure Sal* and *Mixed Sal* forests, riverine forests along rivers and grassy glades added to the natural beauty of the landscape besides providing a wide and unique variety of fauna. *Sal* and many of its associates are also considered as one of the strongest timber of the Indian peninsula. The forest was subjected to heavy exploitation during the British regime to meet the demand of first industrial revolution and to earn revenue. Till today commercial extraction of timber continues though with much reduced intensity and as per working plan prescription. But the fact is that even today the Corbett landscape, barring the Tiger Reserve, is one of the most important commercial timber producers of north India. In Kalagarh Forest Division, extraction of dead and dried timber was carried out by the

Tiger Conservation Plan, Buffer Zone

Uttarakhand Forest Development Corporation, under the prescription of the Management plans. The reserve forest of Kalagarh Forest Division, which was under such forestry operation is now notified as the buffer area of the Corbett Tiger Reserve. Since buffer area is an integral part of a protected area, extraction of timber will be carried out with utmost care. The detail procedure has been discussed in chapter-7. In this context, it is also pertinent to emphasize that the right of villagers to gather fuel wood and grass should be retained to earn the cooperation and good will of local people for protecting the tiger and its habitat.

4.2. Agriculture:

India's economy is said to be agriculture is primarily based on agriculture and the same holds true for this area as well. Agriculture is the main occupation of majority of population. Agricultural fields situated in the *Bhabar* tract are less productive than the once situated in the *Terai* tract. The area is primarily rain-fed but a good network of canals also exists. G.B.Pant Institute of Agriculture and Technology, Pantnagar has contributed a lot in bringing green revolution to this area and introducing modern methods of farming. Villagers are now following multi-crop pattern of farming and using modern seed and manure. Modern agricultural implements have also become common.

4.3. Integrated Development:

Ever since independence a lot of resources were deployed to make the *terai* and *bhabar* region habitable. Thus various institutions and departments of Central as well as State Governments have implemented various developmental programmes at the villages. Most of the villages are connected with roads, electricity, telephone and drinking water. After the formation of state of Uttarakhand the pace of development has further picked up. Rural health, animal husbandry, education, minor irrigation, social welfare and all other important departments have units working at the block level. BDC meetings and *Tehsil diwas* are organised at regular intervals. This gives the opportunity to the common man to get his problems redressed before the implementing agencies.

4.4. Tourism:

The tourism sector has witnessed sizable progress in the Corbett landscape. The tourism activity in the shape of resorts and hotels are concentrated around the Eastern and Southern parts of the Tiger Reserve, which may not be sustainable in the future. Since Ramnagar is the hub of all tourist activity, other areas such as Kotdwar, Lansdowne, and many areas of adjoining forest divisions has the potential to develop as alternate destinations for nature based tourism, but lots of planning and investment is

Tiger Conservation Plan, Buffer Zone

needed. Recently an Asian Development Bank funded scheme has already been under consideration, which will address the tourism infrastructure related issues of the Northern boundary. Hopefully this will help the conservation issues of CTR as it will address the livelihood issues of local populace. Details of the tourism activities has been given in the tourism plan (chapter-11).

4.5. Road and Rail Transport:

Corbett is well connected both with road and rail transport. Two important cities namely Ramnagar and Kotdwar are situated at the boundary of the TR and both of them are the terminal points of railways. These cities are directly connected to Delhi and Dehradun both through road and rails and regular transport service is available. Other areas on the periphery have good road connectivity. The internal stations of the buffer zone are connected through a network of fair-weather roads.

4.6. Industry:

Forest based industries are the dominant production sectors. The important industrial units are of plywood, pulp and paper, stone crusher and Ayurvedic medicinal products. Only Kashipur city has some different kinds industries. All these industries together provide employment to a large section of the population and are an important driving force of local economy.

4.7. Mining:

Although this area does not have any important mining pocket, but all the rivers flowing through the *bhabar* tract bring lots of minor minerals every year from their catchment areas. Most of these water courses are open for the picking of sand, boulder and gravel. The rivers of this area are an important source of building material for the local area as well as the cities situated downstream. These mining areas provide employment not only to the local population but also to the labourer of other states as well.

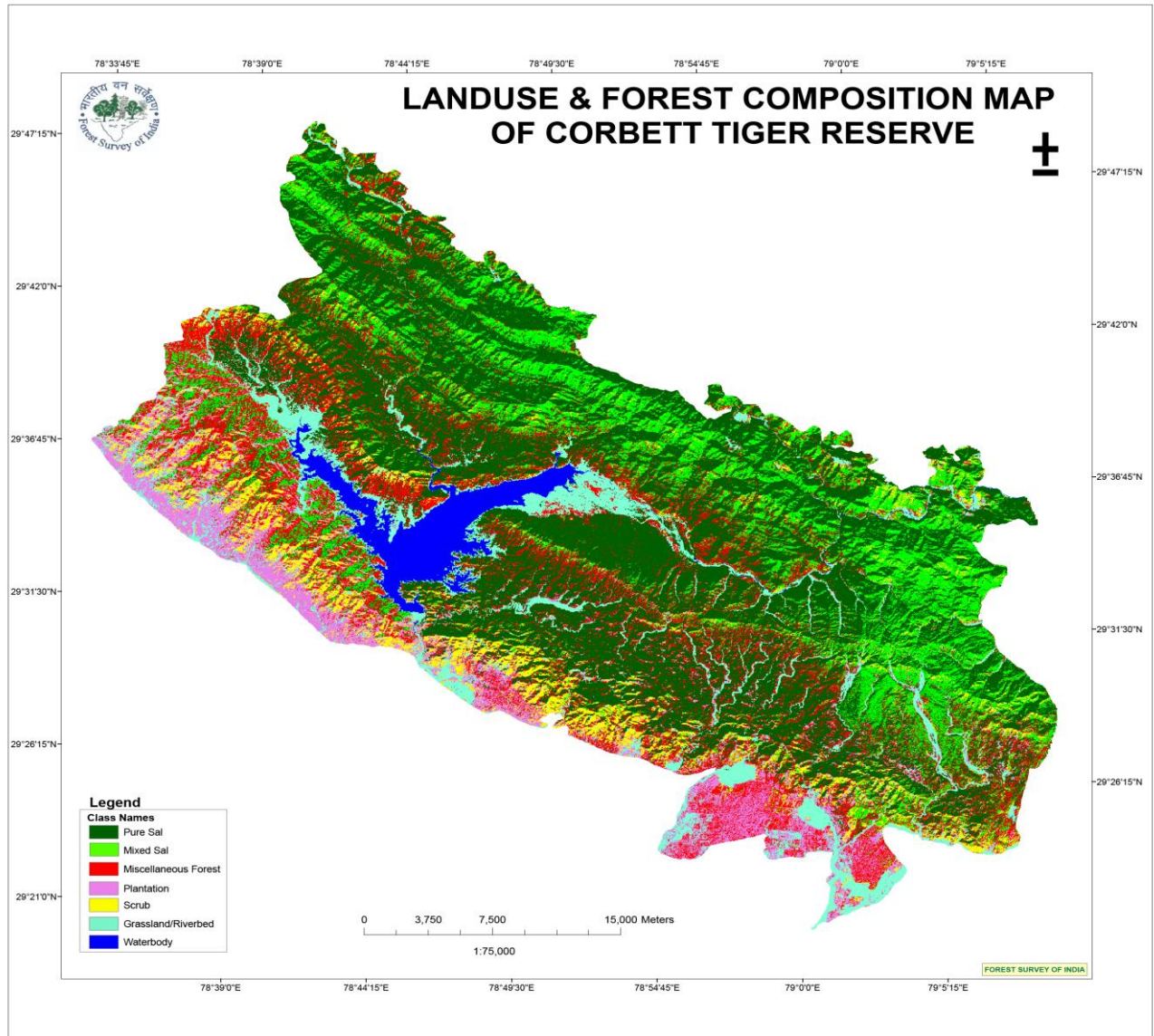
4.8. Irrigation Projects:

The Corbett landscape has a well developed canal network ever since the British period. In the post independence era saw many small and large irrigation projects in the landscape. The important reservoirs used for irrigation are – Kalagarh dam, Kosi, pili dam, tumeria reservoir etc. The Kalagarh multi-purpose project is situated in the core area.

Chapter-5

Land use patterns & Conservation-Management Issues

5.1. Land Use Classification:



The villages adjoining to the buffer area of the tiger reserve are mostly situated in the *bhabar* tract except for the few villages on the southern and northern boundary. Those on the southern boundary are located in the *terai* tract and the other on the northern boundary are in the hilly region. Major part of the landscape has forest cover. The populated areas are mostly plain to undulating and some areas have moderate slope. The *bhabar* and *terai* tracts are considered good for agriculture and were inhabited on a large scale after independence. The hilly areas can have different land use

Tiger Conservation Plan, Buffer Zone

classifications depending upon the soil depth and slope, but this constitutes a very small part of the land holding around the buffer area. Most of these hilly villages have very scant population density due to several socio-economic reasons. Agriculture though practiced but seldom profitable for reasons like traditional methods of farming, erratic rain conditions and crop raiding by wild animals. Wild boars have become a major source of crop damage in the recent past. Most of the villagers of the hilly region are waiting for relocation to a suitable area.

In the *bhabar* and *terai* areas agriculture is the main activity. The average land holding is small and the farming is mainly to sustain the family of the farmer. Modern agricultural practices are followed but the size of the land holding has its own limitations. Fruit orchards were very common previously but with the rise in land prices due to growing urbanisation the orchards are fast disappearing. The *terai* region saw a spurt in farm forestry in the eighties but the *bhabar* as well as the *hilly* region remained untouched from emerging trend. In the recent past *floriculture* has come as a new activity for the region. Cattle rearing are of traditional type with much dependence on the nearby forest resources and very little attention has been accorded to enhance the quality of the cattle. Stall feeding is limited to buffalos and some high yielding varieties of cow.

The forest areas in the landscape have very limited human impact and management interventions are confined to infrastructure maintenance and habitat restoration works. The land has therefore been utilized depending on the micro-climate of the area. Therefore it is not practical to classify the available land based upon the perceived rigid system of 'land use classification'.

5.2. Socio-economic profile of villages:

The villages have typical social-economic profile of foothill areas. The villages are heterogeneous in cast as well as religious constitution but every village has a dominant cast or religion. The villages close to the hills are inhabited by the *Garhwali* and the *kumaoni* communities while those away from the hills have mixed populations. Villages have access to basic infrastructure facilities like health, schooling, drinking water and electricity. The social milieu is generally peaceful and people of different cast and creed live in harmony. Villagers are generally religious minded but political activism at rural level has thrown some challenges for these traditionally peaceful areas.

Tiger Conservation Plan, Buffer Zone

Rising tourism activities is another major challenge for the socio-cultural traditions of these villages.

Traditionally the villagers are low income group people owing to small land holding, dependence on agriculture for sustenance and absence of alternate sources of income. But even at the village level, economic disparity is palpable as very few families have control of large land holdings and some families have their family members working in various jobs which support them. For the villagers agriculture is the main occupation. Some families still have large orchards of *litchi* and *mango*. Dairy system though not very developed but still adds to the family income in small way. Agriculture is of modern type and use of modern implements and hybrid seeds is common. Some specialised agricultural practices like tomato and soya farming has provided much needed cash to the rural economy. Some areas have irrigation facilities while the rest are rain-fed. Dairy farming is not very developed. Most of the cattle population constitutes of traditional cattle breed. Buffalos and cross bred cow species are the high yielding varieties but their number is very small. Traditional cattle heads are sent to the nearby forest area for grazing and dairy farming is mainly forest resource dependent. Stall feeding is not very common. Some families are running small poultry farms. Some areas are famous for cultivating of vegetables.

Besides agriculture and associated activities, tourism is another major driver of rural economy. Many families are directly or indirectly benefitted by tourism in and around the TR. Corbett has developed as a major nature based tourism destination and the nearby population is definitely benefiting from the spinoffs. Some families run their own resorts/hotels or restraints. Others are employed in the tourism infrastructure and another few are directly associated with the TR. Boom in tourism around Corbett has led to a rise in land prices and even a small holding is fetching decent price. Such land sales have become common and the villagers are switching to other activities after selling their land.

5.2.1. Socio-economic, demographic & education:

S N	Name of Village	Total Famili	Total Populatio	Educated		Economics Status			Cattle Populatio
				<i>Ma</i>	<i>Fema</i>	<i>H</i>	<i>M</i>	<i>LI</i>	
1-	Sawaldeh- East	147	766	58.	69.47	9	7	13	37
2-	Sawaldeh - West	304	1728	61.	46.05	2	8	29	75
3-	Manorathpur	46	209	81.	70.65	2	20	24	14

Tiger Conservation Plan, Buffer Zone

	Bansitila									
4-	Devipur-	84	490	I	85.	61.05	5	16	63	42
	Bansitila									
5-	Semalkhaliya	103	568		81.	79.95	3	9	91	35
6-	Lachchampur	114	467		88.	82.05	3	26	84	26
	Theri									
7-	Bhagatur	76	416		87.	72.50	26	01	49	28
	Tariyal									
8-	Lalupur	63	251		74.	58.00	00	18	45	16
	Bansitila									
9-	Dhela	203	1402		81.	64.73	12	63	12	1629
1	Gaujani	179	879		71.	47.00	15	57	10	41
1	Amdanda	101	513		77.	32.50	00	10	91	21
1	Chorpani	161	653		73.	53.05	42	61	58	17
1	Dhikuli	192	1098		84.	65	15	50	12	47
1	Ringora -	3	226		82	60	00	10	23	13
	Khatta									
1	Himmatpur-	6	286		96.	81.05	00	19	42	15
	Dhondiyal-									
	West									
1	Himmatpur-	8	323		89	69.05	00	27	57	15
	Dhondiyal-									
	East									
1	Kania	2	1058		97.	93.00	8	70	19	38
1	Fatehpur	9	568		54.	36.06	00	23	67	69
	Dhara									
1	Raninangal	7	575		57.	40	27	15	28	60
20	Kiratpur	153	1247		73.	34.57	9	65	59	85
21	Chajmalwala	140	732		48.	25.85	00	26	11	84
	Dhara									
2	Lalbagh	3	2		38.	27.85	00	00	38	2
2	Maloni	3	2		73	47.54	4	8	18	1
2	Bhikkawala	159	1085		77	76	11	11	30	7
2	Meerapur-	9	8		84	69	10	53	27	4
	North									
2	Meerapur-	110	8		85	71.50	5	75	30	3
	South									
2	Kuankhera	213	1046		36.	37	33	70	11	1008
2	Naibasti-	7	3		35	20.50	5	20	39	3
2	Boksa Colony	5	2		37	9	5	3	49	53
3	Sendhi	7	4		90	80	4	20	46	5
3	Biltia	6	3		79	66	2	40	23	3
3	Semalsera	6	3		77	64	2	42	21	2
3	Amlesa	5	2		88	64	-	28	22	3
3	Bintala	3	1		62	61	-	19	16	55
3	Dhikoliya	5	3		66	62	-	35	20	2
3	Bageda	5	3		78	70	2	32	23	4
3	Barai	7	5		69	62	3	48	20	8
3	Dabroo	5	2		49	46	2	20	28	5

Tiger Conservation Plan, Buffer Zone

3	Timalsain	6	3	81	79	4	30	26	2
4	Chandpur	4	1	88	82	2	20	27	3
4	Mehroora	8	2	35	31	5	52	30	1
4	Chapdait	5	1	30	25	4	30	24	1
4	Jukadiyan	4	1	48	38	3	26	20	1
4	Kartia	182	1238	72	64	6	75	10	7
4	KandaNala	7	4	35	31	2	32	38	4
4	Khadrasi	7	4	77	72	4	45	30	7
4	Tairiya	7	4	78	71	6	36	30	2
4	Paand	4	2	75	69	5	23	20	2
4	Lothiya Talla	4	3	40	33	-	26	11	4
5	Upgaon	5	3	90	85	4	25	26	3
5	Jameria	4	2	37	44	6	26	13	2
5	Sankar	2	1	87	86	3	16	10	1
5	Bandrar	5	2	76	75	2	20	35	94
5	Saarud	4	1	55	11	2	28	15	73
5	Achraun	3	2	62	55	2	10	25	251
5	Dharaas	4	3	33	30	3	16	26	1

The list of villages falls under 5 km beyond the boundary of the border of Kalagarh Forest Division of Corbett Tiger Reserve is given in the **Annexure- 5/1**.

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 endeavour, 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 kilometres 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 order dated 21-11-2012 is appended as **Annexure-5/2**.

There are 46 '*chacks*' in the buffer area of Kalagarh Forest Division of CTR most of which are abandoned revenue villages and runs the possibility of conversion of tourism facilities. That will cause irreparable damage to the tiger habitat. These areas are somewhat converted into forests and used by wildlife. These lands if acquired by the State Government by offering suitable compensation to the landlords that will cause mutual benefits for the wildlife as well as to the owners of the land. The list of the 46 '*chacks*'. The list of '*chacks*' has been given in the **Annexure-5/3**.

Tiger Conservation Plan, Buffer Zone

5.2.1. 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 foot hills of Himalayan mountain ranges. According to various sources, they came to Himachal Pradesh as part of the dowry of the king of Sirmaur, 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.

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.

5.2.2. Gujjar settlements of the Buffer area:

The 31 Gujjar families should also be translocated from the buffer area. Since the quality of forest is as rich as the core area, it will be beneficial for the Gujjars as well the wildlife that the Gujjars should be rehabilitate elsewhere. The proper rehabilitation will help them to get basic human facilities like education, health, good standard of living etc., which is not available inside the forest. A gujjar relocation plan (Buffer) will be prepared following the guidelines of the Moef/NTCA.

Gujjar Families in Buffer Zone : -

Name of Division	Name of Range	Gujjar Families (2001-02)	Gujjar Families July 2010
Ramnagar Tiger Reserve, Ramnagar	Jhirna	24	6
	Dhela	37	25
Total		61	31

Tiger Conservation Plan, Buffer Zone

Relocation of Laldhang Revenue Village:

The Laldhang revenue village, situated along the boundary of Jhirna Range was facing intense man-animal conflict which resulted into relocation of the village following consent of the villagers. It was made possible by the order No. 8-51/93 FC dated 18.03.1994 of MoEF, Government of India followed by the order of Government of UP, vide No. 2205/14-2-912-1992 dated 25.06.1998. The villagers were given 184.846 ha. of reserve forest land in exchange of same amount of personal holdings at Ampokhara and Manpur-Firozpur forest block of Tarai West Forest Division. Out of 113 registered land holders and 14 landless families, 84 registered land holders and 2 landless families were translocated in the designated place. There are 29 families are still residing in the Laldhang village along with 12 landless families. Out of 184.846 ha, 133.058 ha land has been handed over by the revenue department. The revenue department is yet to handover 51.788 ha of land to the CTR management and rehabilitate the families still residing in the area.

5.2.3. Eco-development Committees of Corbett Tiger Reserve:

Corbett Tiger Reserve has 62 Ecodevelopment Committees in as many villages. Most of the villages share their boundary with the tiger reserve. There is no denying the fact that the anthropogenic activity has the potential to affect the habitats of the wildlife. The EDCs will be encouraged to constitute their respective committees through the process of election and tiger reserve authority will help them to prepare microplans. Proceedings from 'Tiger Conservation Foundation' will be provided to EDCs based on the approved microplans. The under lining principle will enhance their income through ecotourism and other environment friendly activities to reduce their dependability on forests and keep the forest and wildlife safe from any adverse effects emanating from the villagers or outsiders. Confederation of EDCs will be constituted. The detail of which has been discussed in the Chapter-13.

Eco-Development Committees:

Sl. No.	Name of Division		Range		Name of EDC Village
1-	Ramnagar Tiger Reserve	(1)	Dhela	1.	<i>Sawaldeh - East</i>
				2.	<i>Sawaldeh - West</i>
				3.	<i>Manorathpur Bansitila</i>
				4.	<i>Devipur - Bansitila</i>

Tiger Conservation Plan, Buffer Zone

				5.	<i>Semalkhaliya</i>
				6.	<i>Lachchampur Theri</i>
				7.	<i>Bhagatur Tariyal</i>
				8.	<i>Lalupur Bansitila</i>
				9.	<i>Dhela</i>
		(2)	Bijrani	1.	<i>Gaujani</i>
				2.	<i>Amdanda</i>
				3.	<i>Chorpani</i>
				4.	<i>Dhikuli</i>
				5.	<i>Ringora - Khatta</i>
				6.	<i>Himmatpur- Dhondiyal- West</i>
				7.	<i>Himmatpur-Dhondiyal-East</i>
				8.	<i>Kania</i>
		(3)	Jhirna	1.	<i>Fatehpur Dhara</i>
				2.	<i>Raninangal</i>
				3.	<i>Kiratpur</i>
				4.	<i>Chajmalwala Dhara</i>
		(4)	Kalagarh	1.	<i>Lalbagh</i>
	All these 8 EDCs are in the territorial limit of Uttar Pradesh. These villages are traditionally depend upon CTR, for their loss of cattle and crop due to wildlife. Since Amangarh Range of Bijnore Forest Division has been notified as buffer of CTR, the neighbouring forest division will be sensitized to help villagers in the loss of crops and life caused by wildlife. A good working relationship has to be developed between CTR and the management of Amangarh Buffer.			2.	<i>Maloni</i>
				3.	<i>Bhikkawala</i>
				4.	<i>JvJeerapur -North</i>
				5.	<i>Meerapur - South</i>
				6.	<i>Kuankhera</i>
				7.	<i>Naibasti ,- Dhara</i>
				8.	<i>Boksa Colony</i>
2-	Kalagarh Tiger Reserve	(1)	Palain	1.	<i>Sendhi - Gunetha</i>
				2.	<i>Biltia</i>
				3.	<i>Semalsera</i>
				4.	<i>Amlesa</i>
				5.	<i>Bintala</i>
				6.	<i>Dhikoliya</i>
		(2)	Adnala	1.	<i>Bageda</i>
				2.	<i>Barai</i>
				3.	<i>Dabroo</i>
				4.	<i>Timalsain</i>
				5.	<i>Chandpur</i>
				6.	<i>Mehroora</i>
				7.	<i>Chapdait</i>
				8.	<i>Jukadiyan</i>

Tiger Conservation Plan, Buffer Zone

		(3)	Maindavan	1.	<i>Kartiya</i>
				2.	<i>Kanda Nala</i>
				3.	<i>Khadrasi</i>
				4.	<i>Tairiya</i>
				5.	<i>Paand</i>
				6.	<i>Lothiya Talla</i>
				<i>I.</i>	<i>Upgaon</i>
		(4)	Mandal	1.	<i>Jameria</i>
				2.	<i>Sankar</i>
				3.	<i>Bandrar</i>
				4.	<i>Saarud</i>
				5.	<i>Achraun</i>
				6.	<i>Dharaas</i>
		(5)	Sonanadi	1.	<i>Bhogpur</i>
				2.	<i>Veebhanwala</i>
				3.	<i>Ramjiwala</i>
				4.	<i>Baheri</i>
				5.	<i>Bhogpur - Boksa</i>
				6.	<i>Kuankhera</i>
Grand Total					62

Efforts will be made to have good coordination with EDCs which fall under the territorial jurisdiction of Amangarh Buffer area of U.P.

5.2.4. Status of habitations in and around Corbett Tiger Reserve:

1.	Amdanda Khatta	Located on the park boundary in the Kosi River Corridor that connects Corbett TR with Ramanagar FD.
2.	Ringoda	Located on the park boundary in the Kosi River Corridor that connects Corbett TR with Ramanagar FD.
3.	Tedha	Located in Ramnagar Forest Division, on the periphery of Corbett Tiger Reserve in the important connectivity across Kosi River.
4.	Kyiari	Located in Ramnagar Forest Division, on the periphery of Corbett Tiger Reserve in the important connectivity across Kosi River.
5.	Dikhuli, Garjia	Located on the park boundary in the Kosi River Corridor. Large scale construction of hotels has blocked movement of animals from Corbett to Ramanagar FD in this stretch of the corridor.
6.	Sundarkhal	Located in the crucial stretch of Kosi River Corridor that connects Corbett TR with Ramnagar FD. High human-tiger conflict zone. The habitation has come up in the encroached forest area.
7.	Chukam	Located in the Kosi River Corridor in Ramnagar FD. The village gets regularly affected by the floods of Kosi River.
8.	Mohan	A rapid pace of construction to cater to the need of tourism is rapidly spreading in this area that is located on the edge of Corbett TR.
9.	Bhakakot	This village is surrounded by forests on all sides and lies in close

Tiger Conservation Plan, Buffer Zone

		proximity to Corbett TR.
10.	Sankar	Located within the administrative boundary of Corbett Tiger Reserve, this place is now subjected to commercial tourism activities.
11.	Jameria	Located adjoining Sankar, within the administrative boundary of Corbett TR. Although, currently abandoned by villagers, possibility of this area being used for commercial tourism can not be ruled out.
12.	Baluli	Located adjoining Jameria, within the administrative boundary of Corbett TR. Although, currently abandoned by villagers, possibility of this area being used for commercial tourism can not be ruled out.
13.	Banghat	Located adjoining Baluli, within the administrative boundary of Corbett TR. Although, currently abandoned by villagers, possibility of this area being used for commercial tourism can not be ruled out.
14.	Jamun	Located adjoining Banghat, within the administrative boundary of Corbett TR. Most of Jamun is currently abandoned by villagers (except for couple of families), this area is being used for commercial tourism.
15.	Kalakhand	Located adjoining Jamun, within the administrative boundary of Corbett TR. Although, currently abandoned by villagers, some recent construction is going on in this area.
16.	Lohachaur	Located on the bank of Mandal River, within the administrative boundary of Corbett TR. Although, currently abandoned by villagers, some recent construction is going on in this area.
17.	Tedia	Located within the administrative boundary of Corbett Tiger Reserve. Villagers living in this area face difficulty due to access and wild animals.
18.	Pand	Located within the administrative boundary of Corbett Tiger Reserve. Villagers living in this area face difficulty due to access and wild animals.
19.	Kanda	Villagers of Kanda have abandoned this area and have shifted from this area. However, this area is currently being used for tourism by one private operator.
20.	Jhudungu	Located within the administrative boundary of Corbett TR and is currently being inhabited by villagers.
21.	Khetyun	Located within the administrative boundary of Corbett TR and is currently uninhabited.
22.	Khadrasi	Located within the administrative boundary of Corbett TR and is currently being inhabited by villagers.
23.	Ratuadhab	Located outside the tiger reserve, the Ratuadhab valley along the Mandal River offers potential site for eco tourism.
24.	Dabru	Located within the administrative boundary of Corbett Tiger Reserve. Villagers living in this area face difficulty due to access and wild animals.
25.	Neem Sot	Located within the administrative boundary of Corbett Tiger Reserve. Villagers living in this area face difficulty due to wild animals and are willing to relocate.
26.	Kalagarh	The township is located within core area of Corbett TR, adjoining UP border. As per Supreme Court order all the commercial establishments are to be removed from the area.

Tiger Conservation Plan, Buffer Zone

27.	Laldhang	Few families continue to inhabit Laldhang village.
28.	Dhela	The Dhela Sot provides access to animals from Corbett to move to Terai West FD. Establishment of resorts along Dhela Sot is affecting the movement of wild animals.
29.	Patrani	Located in the Terai West Forest Division, this area forms a crucial connectivity with Corbett Tiger Reserve

5.3. Resource dependence of villages:

As such there is no permanent settlements in the form of villages inside the Core area. However the Gujjars depends upon the forest for fodder. They also need poles and grass for their shelter. Since they are nomadic in nature, the pressure on forest shifted accordingly. But the huge number of cattle competes with wild animals in terms of water and fodder.

(i) Forest Resources:

The lifestyle of rural folk is heavily dependent on forest resources. Traditionally the hill people have been using the forest based products for their day to day livelihood needs like building construction, furniture, agricultural implements, livestock rearing etc. This trend continues even today. Grazing in the forest areas, free grant of forest produce including timber and right to the use of watercourse has been the traditional rights of the village folks since time immemorial and even the Britishers respected these rights when they started scientific forestry in the state and declared many of the forests as reserved forests. The concept of *panchaayti forests* is an evidence of the close association that the villagers share with forests. It is also reflected in the arts and culture of this region.

(ii) Agriculture:

The rural economy of the area as in others parts of the country is primarily agriculture based. It is the biggest source of rural employment and the best indulgence for the rural folk. But size of holdings, erratic rains and low yield has caused people to switch to other vocations and search for alternate sources of livelihood. With the development of new avenues of employment the dependence of villagers on agriculture is reducing.

(iii) Integrated Development:

The villagers need government help in many aspects of their lives. Thus their dependence on govt. schemes for integrated development is complete. Education,

Tiger Conservation Plan, Buffer Zone

healthcare, sanitation, roads and electricity etc are the areas where the govt. agencies and schemes need to assist the villagers.

(iv) Tourism:

Tourism is one area which is not a traditional practice in this part of the state. Though Corbett is the first National Park of the Asian mainland but large scale tourism is something new to the area. Till the eighties tourists used to stay in the guest houses of forest department. Private tourist lodges started 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 sky-rocketed 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.

(v) Industry:

As mentioned earlier there is very little industrial activity around CTR buffer area. Perhaps extraction of minor minerals is the largest employment provider for the local as well as outsiders. Forest based industries like pulp and paper, plywood units and processing of herbs also provide some employment opportunities.

5.4. Human Wildlife Conflict:

In comparison to the buffer area, the core zone remain safe from this man-animal conflict. A sizable stretch (about 42 km.) 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 regular victims either by elephants or tigers. Since most of the human settlements are close to the buffer area, they are the place of conflict. The Eastern boundary has specially become sensitive for human casualties during the last two years. The reason for this sensitivity is the presence of unauthorised encroachers in the corridor. Buffer forests are the areas where villagers go for collection of forest produce for bonafide consumption, which increases the chances of conflict. The area in question belongs to the administrative control of Amargarh Range of Bijnore Forest Division. Since the Uttar Pradesh Government has

Tiger Conservation Plan, Buffer Zone

notify 80 sq. km. of reserve forest area as buffer area of Corbett Tiger Reserve it will be easy to manage the complicated protection aspect as specified by the guidelines of the NTCA. It has been a long drawn grievance of the affected villagers for not getting adequate compensation for the loss of crop and cattle, resulting from the intensive man-animal conflict. It is now possible that the Bijnore Division could get adequate fund to compensate the loss of cattle, crop damage and human life from NTCA. This will prove beneficial for Corbett Tiger Reserve as well as the Amangarh part of the buffer area to protect tiger and its habitat from the intense man-animal conflict.

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

Other departments are active in the human settlements and are providing basic services to the population. But 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 department. Police and revenue departments occasionally help in the mitigation of man-animal conflict issues. The after effects of man-animal conflicts are considered as the sole responsibility of the CTR administration and other departments maintain a calculated distance. Tourism around the TR remains uncontrolled as no guidelines exist for the construction of lodges and land use is changed easily without taking into account the concerns of CTR. 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 is – WWF, the Corbett Foundation, WTI, Mahasheer Conservancy and Rainbow Friends of Nature. Regular interaction with various line agencies is necessary as mandate by the NTCA. The CTR 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 man-animal conflicts.

Chapter-6

Vision, Goal, Objectives and problems

6.1. Vision:

To manage the buffer area so as to promote the co-existence between wildlife and human activity with due recognition of the livelihood, developmental, social and cultural rights of local people.

6.2. Management Goal:

The Corbett Tiger Reserve should remain as an ideal place for wild flora & fauna for posterity. It must provide the sustenance to the people who wittingly or unwittingly are forced to support such a huge ecosystem. In the process it should protect & conserve the tiger and its huge prey base as well as its unique biodiversity from all sorts of threats, natural or otherwise.

6.3. Management objectives:

The following are the management objectives of Corbett Tiger Reserve:

1. To ensure robust protection mechanism augmented by strong intelligence network.
2. To restore & rejuvenate the habitats which have been degraded by various factors.
3. To manage & enhance productivity of the grasslands.
4. To manage and maintain waterholes.
5. To facilitate long term and short term research programme by coordinating with various National and International Institutes. The programme should lead to logical conclusion with regard to conservation issues.
6. To promote a vibrant management set up to instill confidence in its staff & higher level of functionaries.
7. To ensure capacity building of the frontline staff for effective enforcement, apart from staff development and staff welfare measures, based on a 'Staff Development Plan' which will be an integral part of the Tiger Conservation Plan. Exposure visits for field staff to learn the good practices of wildlife management within & outside the country.
8. To adopt and practice 'Responsible Tourism' taking into account of the ecological need of the area. Tourism should be strictly regulated in the permissible zones of buffer area. Fringe villagers will be encouraged to adopt ecotourism to reduce

Tiger Conservation Plan, Buffer Zone

- tourist pressure in the designated zones and consequently increase their income which will reduce their dependency on forest produces.
9. To provide site specific, need based, participatory eco-development inputs to local stakeholders for rationalizing their resource dependency on the Tiger Reserve and strengthen their livelihood, so as to elicit their support for the conservation of the area.
 10. To provide habitat supplement to the spill-away population of tiger and its prey from the core area, conserved with the active cooperation of stakeholder communities.
 11. Mainstreaming wildlife concerns in various production sectors of the area.
 12. The Tiger Conservation Foundation should facilitate and support the management for tiger conservation and eco-development, by involving local people, as per the guidelines issued empowered to receive tourism gate collections and assistance from Government non government entities to create a “development fund”, and deploy it for the benefit of the reserve, local people and the staff. Apart from the above mandates, the tiger Conservation Foundation should ensure development of eco-tourism facilities in the buffer areas as well as in the neighbouring forest Divisions with a target to reduce pressure of tourism from the core areas.
 13. To maintain such infrastructures like – forest rest houses forest roads, culverts, fire lines, chowkis, watch towers, elephant sheds, residential & non-residential buildings, Kalagarh training institute, barriers and such other structures which are essential for managing tourism and welfare of the field staff.
 14. To relocate the Gujjar families from the buffer area.
 15. No ecologically unsustainable land use activities operate within the Tiger Reserve and along the 'zone of influence' (beyond the boundary).
 16. To acquire abandoned revenue villages of buffer areas by extending adequate compensations to the land owners.
 17. Strengthening EDCs along the border of the core zone and maintain a good working relationship with neighbouring forest divisions and to maintain a liaison with police & civil administration for effective coordination.
 18. Timely redress of man-wild animal conflicts would be ensured to prevent revenge killings of tiger and other wild animals.
 19. To serve as an extended habitat and act as social buffer.

Tiger Conservation Plan, Buffer Zone

6.4. Problems in achieving objectives:

The following are the limiting factors which restricts the desirable pace of management practices.

1. The delay in budgetary allocation.
2. Inadequacy of budget leads to unavailability of motor boats, tractors and even vehicles for Range Offices.
3. Vast area under cover of lantana and weeds.
4. Man – animal conflict like damage to crops, cattle lifting and human loss is often make people impatient thus hampering smooth work of the CTR administration.
5. The buffer forest is connected to other forest areas (except in parts of the Southern boundary) and the buffer forest act as corridors causing large scale to and fro migration of animals. Thus the quality of the adjoining forest should remain high and free from all kinds of adverse biotic interference.
6. The unauthorized human settlements at *Sunderkhal* which is situated at the eastern boundary of the buffer, choked the vital corridor, joining Corbett with Ramnagar Forest Division.
7. The buffer forests are good habitats for a large number of wild animals including tiger and elephant. Villagers sometimes penetrate very deep in these forest areas in search of forest produce thus inviting conflict with the wild animals.
8. Majority of the adjoining population are low income group people and their resource dependence on forests is high.
9. Line departments like UREDA and Veterinary Healthcare department do not have any tiger reserve specific programme or policy.
10. Reducing resource dependency of villagers is a capital intensive programme which requires people's participation. No NGO have come-up with such activities. Thus the CTR administration has to mobilize possible outside supports to help people on this direction.
11. EDC's though formed but not very active. Inadequacy of fund causing measure obstacle for generating additional income or employment which should improve the livelihood of the people.
12. Uncontrolled tourism by the resorts and hotels has further compounded the conservation concerns around the tiger reserve. The mushrooming of the resorts and

Tiger Conservation Plan, Buffer Zone

hotels has already doing much harm to the general ambiance of the reserve. Lack of ecotourism guidelines and no regulations 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.

13. The high cattle population of Gujjars also pose 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.
14. Lack of fruitful research in the field of tiger ecology & related matters.
15. Ageing frontline staff.
16. Lack of adequate staff.
17. Lack of quality infrastructure facilities for staff & their families.
18. Lesser opportunities of exposures to good practices in other renowned tiger reserves for lower level to higher level functionaries.
19. Lack of proper exposure training of official, field functionaries.
20. Weak intelligence network.

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

6.5.1. Strength:

Uttarakhand is famous for its 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, six sanctuaries, two 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 area is approximately 14% of the State's geographical area.

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

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, if not in the world. Uttarakhand is also famous for its rich population of Elephants, Snow Leopards, Himalayan black bears, Ghariyals , Magars, resident as well as migratory birds. It is also famous for faunal diversity, the epitome of

Tiger Conservation Plan, Buffer Zone

which is nothing less than Valley of Flowers. Uttarakhand is also endowed with diversified aquatic ecosystems represented by Ganga, Yamuna, Ramganga, and many famous rivers, lakes, reservoirs and marshy lands.

Corbett National Park is the first National Park of the Asian mainland and third throughout the world after Yellowstone National Park and Kruger National Park. It was notified on 8th August 1936.

Jim Corbett and Sir Malcolm Hailey, the then Governor of United Province were the pioneer to start a campaign to save wildlife of India. They were visionary of the future protection need of wildlife of India. Consequently the British Government established the first National Park named after Sir Hailey- the Hailey National Park. After the death of Jim Corbett, in 1955, Government of India rechristened Hailey National park as Corbett National Park in 1957.

It was one of the launching sites for the post-independent India's prestigious conservation effort - Project Tiger. One of the main strength lies in the fact that the entire tiger reserve is a compact area.

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 landscape scale).

There are few places on earth as breathtaking as the Corbett Tiger Reserve. The interplay of rivers, *chaurs* (grasslands) and *sal* forests encourages a vast diversity of insects, birds and animal life to thrive. It is famously known as 'Land of Roar, Trumpet and Song'. These donate to tigers, elephants and birds respectively.

The Corbett and Rajaji National Park between them hold India's north-western most population of tigers, and one of the world's most significant populations of Asiatic Elephants.

In this exquisite tiger land, birdwatchers can seek out almost 685 species of birds, which is highest in any of the Protected Areas of India. Corbett Tiger Reserve has been recognised as one of the India's most crucial *in situ* Gharial breeding site.

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

Tiger Conservation Plan, Buffer Zone

levels and different intensity of patrolling are carried out throughout the reserve. Long distance patrolling during monsoon season which is popularly known as 'Operation Monsoon'. During this period large tract of vulnerable areas are regularly scanned to ward off any kind of possibility of intrusion which may lead to poaching of wildlife in general and tiger in particular.

Apart from regular staff, the tiger reserve has 200 personnel under 'Tiger Protection Force' and 60 ex-military personnel under 'Operation Lords'. Since they are from the adjoining villages, they help the Tiger Reserve to get cooperation from the villagers as well as 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 selected Corbett Tiger Reserve to install a 24x7 electronic surveillance system (e-eye) to scan 400 sq. km of highly vulnerable southern boundary of CTR. Nine towers have been set up. Infra Red cameras are installed which can be monitored through internet. It is also pertinent to note that another 5 towers will be set up by NTCA to cover other vulnerable areas of the buffer zone. This system will help the management to strengthen the protection measure of the Tiger Reserve.

The most outstanding achievement of Corbett may be the constantly increasing population of tigers. It is evident from the fact that the adjoining forest divisions have also considerable number of tigers. Tiger population shows increasing trend since 2001.

Year	Tiger Number
2001	137
2003	143
2005	141
2008	164 (Range 151-178) (population of 1524 sq. km of Corbett Landscape which includes CTR)
2010	214 (Range 190-239) (population of 2288 sq. km of Corbett Landscape which includes CTR)

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 Conservation Plan, Buffer Zone

Tiger Reserve) has the highest tiger density in the world (9.4 tigers/100sq.km at the landscape scale) and serves as a source for the entire landscape extending from Kalesar in Haryana to Pilibhit Forest Division in Uttar Pradesh.

Special Tiger Protection Force:

The Corbett Tiger Reserve is in the process of constituting Special Tiger Protection Force. Thirty percent of the tiger forest Guard will be recruited from local Gujjars, which besides generating employment opportunity; will strengthen protection of tigers and its habitat.

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.
- (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.

The other noteworthy positive factors are:

- Very low human presence inside the buffer zone
- The human population more or less supportive to conservation
- Corbett is already an important driver of local economy

Tiger Conservation Plan, Buffer Zone

- Man-animal conflict though present, still people are not averse to conservation
- Very few cases of retaliatory killing
- Most of the villages already have functional EDC's.
- Presence of local and international NGO's in the landscape
- A large section of society employed directly or indirectly through Corbett

Enhancement of compensation for man-animal conflict:

The State Government has constituted a corpus fund and substantially enhanced the rate of compensation for loss emanated from man-animal conflict. The government notification has been given as **Annexure-6/1**

6.5.2. Weakness:

The Park suffers from many weaknesses. The most important being its ageing frontline staff whose average age is about 50 years. Lack of proper promotions and some basic incentives like nutrition allowance, good quality uniform, drinking water, lighting and transport facility demoralized the frontline staff. The timely unavailability of budget also causing embarrassment to the lowly paid personnel of 'Operation Lords' and 'Tiger Protection Force' who could not get their salary for months together.

There is a serious inadequacy in the field of research and development activity in the CTR. Though CTR offers vast opportunity for research on tiger ecology, weed ecology, grassland management, species re-introduction, regeneration, tourism, interpretation, man-animal conflict, HRD, training & education etc., lack of structured approach may prove fatal in the near future. The park administration should harness the expertise of Wildlife Institute of India, the Garhwal and Kumaon University, Pant Nagar University etc., for furthering research on various subjects, whose prescriptions will be invaluable for the management of the reserve.

Intelligence and coordination remains one of the weakest link in the intricate chain of protection strategy. This requires specialized staff and equipment as this kind of expertise cannot be expected from all the staff. Identification of the willing staff and grooming them in this specialized job is necessary.

The other inadequacies are:

- Tourism flourishing on the boundary but the local people not getting proportionate benefits

Tiger Conservation Plan, Buffer Zone

- Community participation in eco-tourism is not forth coming.
- Tourism is going in traditional way, no innovations in the past many years
- The gujjars and the inhabitants of 'Khattas' are not getting basic minimum facilities who needs to be relocated.

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 forest Divisions like, Ramnagar, Tarai West, and Lansdowne. 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 potential for tiger is a great opportunity to enhance the quality of gene pool of tigers and elephants.

Given the unique reputation of CTR regarding the rich biodiversity and accessibility to New Delhi, various type of nationally and internationally sponsored conservation programme can be implemented simultaneously. That will disseminate the intricate & complex issues of nature. The Staff & officer posted can be front runner in conservation programme if they are given proper exposures & facilities to pursue various extracurricular activities like photography, bird watching, flora identification etc. They can be emerged as experts thus serve & play long innings in the Park which ultimately will be good for the conservation efforts in this part of Uttarakhand. 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 can be easily motivated for the cause of conservation.
- Rate of literacy is high.
- The general level of knowledge of common man regarding environment and wildlife is good.
- With an established network of EDC, community participation in eco-tourism and environmental awareness programme can be ensured.
- NGO's can be easily roped in to assist the departmental initiatives

Tiger Conservation Plan, Buffer Zone

- Eco-tourism opportunities are present.
- The market for tourism is well developed.
- Corbett's 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 Park administration routinely faces suspicion and challenges but for the vigil of staff any ulterior motives of outsider is being thwarted. The poaching continues to be a big threat & means have to be devised to fight it 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. The detail has been described in the Chapter- 5.

Chapter-7

Management strategies

7.1. Delineation of Buffer area of CTR:

The best practice of tiger conservation programme would be to let the breeding tiger population remain undisturbed from the anthropogenic influence and ensure 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, the degree of overlapping increases 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 old tigers are periodically replaced by young adults from nearby forest areas.

The study (Tiger its co predator, prey base and their habitat by NTCA and WII) and analysis of available research data on tiger ecology indicate that the minimum population of tigresses in breeding age, which are needed to maintain a viable population of 80-100 tigers (in and around core areas) require an inviolate space of 800-1200 sq km (the detail is given in the pictorial diagram-"Simulation Results for Viable Tiger Population"). In this respect Corbett Tiger Reserve has more numbers of tigers and consequently more occupied area.

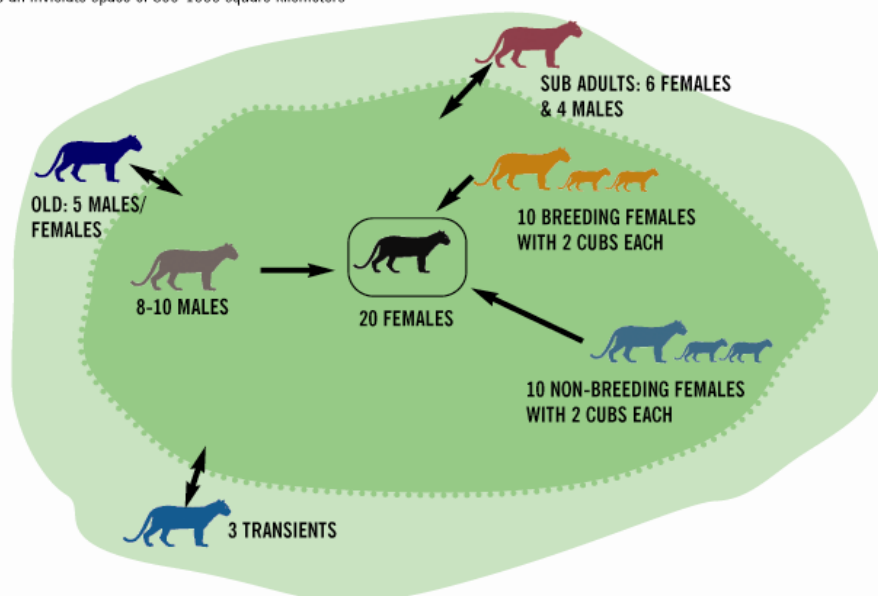
Tiger being an “umbrella species”, this will also ensure viable populations of other wild animals (co-predators, prey) and forest, thereby ensuring the ecological viability of the entire habitat. Therefore, buffer areas with forest connectivity are necessary for healthy tiger dynamics, since such areas 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.

The buffer area absorbs the “shock” of all kinds of adverse anthropogenic pressure on populations of tiger and other wild animals. In case of severe habitat depletion in buffer areas, the source population would get targeted and eventually decimate.

Tiger Conservation Plan, Buffer Zone

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)

The all India tiger status monitoring exercise jointly taken up by NTCA along with State Forest Department and the Wildlife Institute of India wherein Corbett Tiger Reserve was extensively surveyed with a systematic sampling. 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 Institution 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. As a result of which a vibrant density of 19.6 tigers per 100 sq.km. was estimated to be present in the 521.99sq.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 landscape scale) and serves as a source for the entire landscape extending from Kalesar in Haryana to Pilibhit Forest Division in Uttar Pradesh.

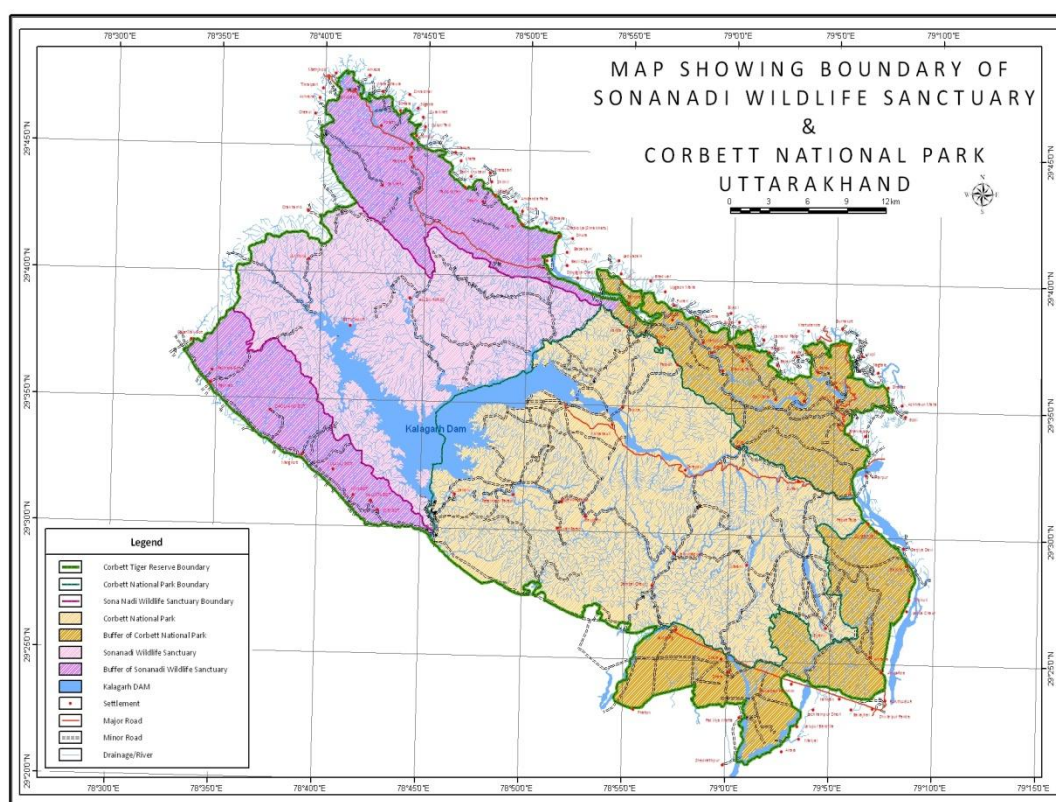
Tiger Conservation Plan, Buffer Zone

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.

Area statement of Core and Buffer Area:

1.	Buffer of Ramnagar Tiger Reserve Division	159.41 Sq. Km.
2.	Buffer of Kalagarh Tiger Reserve Division	306.91 Sq. Km.
3.	Total core area of CTR	4666.32 Sq. Km.

The buffer area of CTR is in form of four strips (refer the map) which encircle the core area except in the southern boundary.



Tiger Conservation Plan, Buffer Zone

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 man-animal conflict, restriction of corridors, presence of Gujjars in the core and buffer area, biotic influence of khatta & 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.

The buffer zone of CTR is contiguous to the core zone. There are 46 chacks (small revenue villages), 03 khattas and gujjar deras in the Buffer Zone. Most of the chack are abandoned by villagers and transformed into jungle. These khatts needs to be acquired and due compensation should be extended to the land holders. Relocation of gujjars and inhabitants of khattas are the need of the hour. The different zones of the buffer area are-

1. Ecodevelopment Zone (habitations in and adjoining the boundary of the buffer zone)
2. Production Zones (extraction of dried timber by the Uttarakhand Forest Development Corporation.)

Tiger Conservation Plan, Buffer Zone

7.2.1. Zone Plan:

A zone is an area of specific management category distinguishable on account of its objective.

7.2.1.1. Ecodevelopment Zone:

The habitations in and adjoining the boundary of the buffer zone will be developed as eco-development zone. These habitations have its immense potential to influence the well-being of wildlife and forest. Reciprocal benefit sharing will be encouraged through intensive people cooperation. The subject has been discussed in chapter-8)

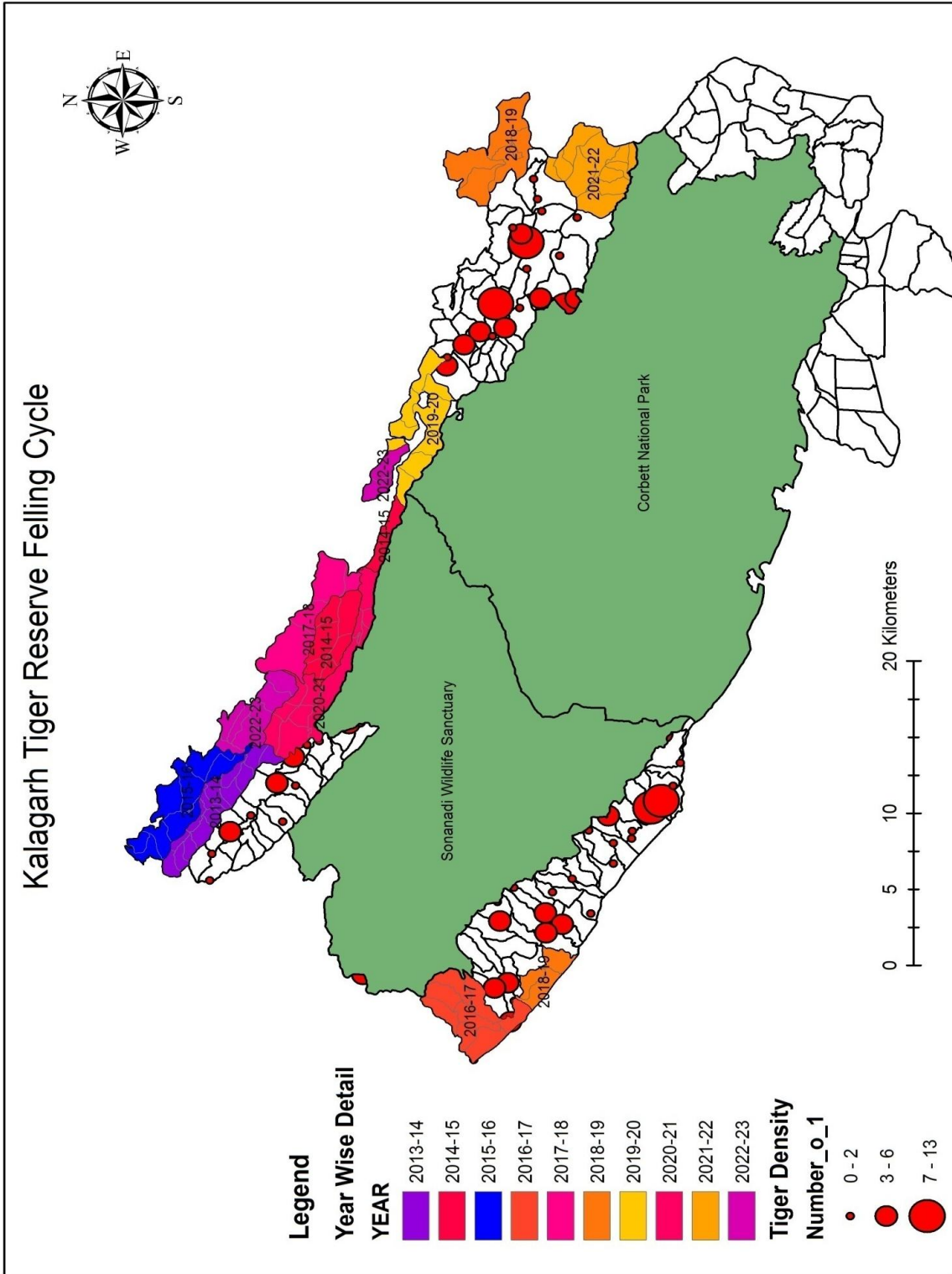
7.2.1.2. Production Zones:

There are very few production sectors available in the buffer zone. The matter has been discussed in the chapters- 4 & 10.

7.2.1.3. Extraction of dried and fallen timbers and Bhabar Grass: (Buffer Areas):

The Uttarakhand Forest Development Corporation carries out extraction of dried and fallen timber and Bhabar grass from the areas outside the Sonanadi Wildlife Sanctuaries. Since the sanctuary in question is now a part of the 'Core or Critical Tiger Habitat' of Corbett Tiger Reserve, intensive care will be taken to save the area from the rippling effect of the timber extraction works to be carried out in the buffer area of the Tiger Reserve. As the wildlife Act, 1972 under section 38 V-4(ii) emphasized "at promoting co-existence between wildlife and human activity with due recognition of the livelihood, developmental, social and cultural rights of the local people" through lesser degree of habitat protection.

Tiger Conservation Plan, Buffer Zone



Tiger Conservation Plan, Buffer Zone

Under such provision which promotes employment through Uttarakhand Forest Development Corporation, the extraction of dead and fallen timber will be carried out. But such activities, has its potential deleterious effect on the habitat of the wildlife. The Phase-IV exercise on ' Status of Tigers in Corbett Tiger Reserve' has shown high tiger density in the Sonanadi Sanctuary as well as the buffer area of Kalagarh Division. Ref: **Annexure-2/2**. The management of the extraction shall be as per following guiding principals and restrictions:

Guiding principals: The following points shall be the guiding principal for silvicultural operations:

- Clear felling and all silvicultural systems resulting in concentrated regeneration should not be allowed, since this would foster wild ungulates and increase human-wildlife interface problems.
- A high forest system with diffused regeneration (selection/group selection etc.) or accessory system (improvement felling etc.) should be allowed.
- The status of regeneration should be used as an overarching condition for permitting tree felling. An area with unestablished regeneration should not be permitted for felling.
- A relationship between canopy class and mean ungulate dung density should be worked out for areas subjected to different silvicultural operations.
- As a thumb rule, the buffer areas should be managed for wild ungulates at a level which is lower than the optimal level observed in such habitats (core area can be taken as a standard for reference).
- Thus, the thinning/removal can be permitted in a selective manner so that the canopy cover does not fall below 40% in winter months (more canopy opening would result in more exposed areas which would foster/lure wild ungulates). However, if the thinning prescribed earlier for the area resulted in lesser canopy opening (less quantum of timber), then the same should be adopted.
- The timber exploitation activities in coupes should be staggered in such to ensure minimum edge effect.
- The plantation activity should be staggered to safeguard from induced edge effect, especially near human settlements.
- Only species indigenous to the area should be taken up for plantation.

Tiger Conservation Plan, Buffer Zone

- Indicators for sustainable harvesting of NTFP (based on regeneration status of the species) should be prescribed.

Restrictions: Following restriction will be imposed before handing over the designated area for salvation of dead and dried timbers by Uttarakhand Forest Development Corporation.

1. All existing rules regarding the felling/marketing will be applicable as have been issued from time to time by Honourable Supreme Court, Government of India, Government of Uttarakhand, PCCF Uttarakhand, Chief Wildlife Warden, APCCF Working Plan and Director Corbett.
2. All trees will be marked by making two marks, one at breast height and another at 15 cm from the base of the tree. In case the tree is on a slope, the height will be measured from the higher side.
3. No felling will be done above 1000 mts above MSL as per the directions of Honourable Supreme Court.
4. In case the markings are not clear due to damage by termites, the marking will be done again and no felling will be done till the felling is completed. The Unit Officer will inform the Section Officer in writing, who in turn will inform this to DLM and Range Officer.
5. The trees will be divided into various categories as per the order no 124/2-7-1 dated 19-11-1956 of Conservator of Forests, Western Circle.
6. The marking will be done under the guidance of an officer no less in rank than Assistant Conservator of Forests. All marking lists will be vetted and signed by the concerned ACF.
7. The areas selected and the various zones to be selected are subject to change depending on the tiger monitoring data (Phase IV and subsequent phases).
8. No marking and felling activities to be allowed in high tiger density areas.
9. The given lots will have to be worked in the current year and no extensions will be given for the same. Given the special status of the area and its significance, the U.F.D.C. will have to give it priority and ensure that all working is completed within the given time.
10. Areas in a width of 20 meters on both sides of any stream or rau will not be marked and no extraction of any sort will be attempted from such areas.

Tiger Conservation Plan, Buffer Zone

11. Local labour, in consultation with local Eco-development Committee will be employed by the Forest Corporation. This will require a certificate from the head of Eco-development committee.
12. Temporary labour sheds will be constructed only in existing forest campuses. Labour living by themselves in the interiors may indulge in illegal activity .In case where it is absolutely required to built temporary labour sheds in other location specific permission for the same will be obtained from an officer not below the rank of A.C.F. Moreover no labour sheds shall be permitted within 100meters of any water hole or sot/stream.
13. The system of bona-fide collection of timber by the fringe villagers for fuel wood will be allowed.
14. Priority will be given to the traditional rights (*Haq-hakuku*) on timber (only dead and fallen). The compartments identified for meeting such demands will not be handed over to the Forest Corporation..
15. Four dead and dried (Two fallen and two standing) trees per hectare will be left for use by wildlife. Care will be taken that no disturbance should be caused to the sheltered wildlife while working in the adjoining areas. Periodic 'Snag Analysis' will be carried out to determine the number of snags left for collection by the Forest Development Corporation. The 'Snag Analysis' has been given as **Annexure-7/1**.
16. If the area is habited by cub rearing tigress, under no circumstances the work should be carried out by UFDC. The area should be abandoned in the favour of the tigress.
17. A pair of camera traps has to be installed in the working area in the grid of 1 Sq. Km. The expenditure on camera will be borne by the UFDC.
18. In the event of unavailability of dead and dried timber in the designated area, no other area will be allowed for salvage of dead and dried trees.
19. Under no circumstances dying trees should be felled.
20. No eligible tree should be felled if it poses destruction to regeneration.
21. No roads, how so ever temporary should be constructed for extraction of timber.
22. The Phase-IV monitoring of tiger population should be compared between preceding and succeeding data of the work. For example, the tiger population before the commencement of the work will be compared with the tiger population taken after the work completed. This will ascertain the effect of salvage operation on the dynamics of tiger population on the area in question. In the event of adverse result the entire operation will be scrapped.

Tiger Conservation Plan, Buffer Zone

23. The concerned Divisional Forest Officer will ensure implementation of all rules and regulations.
24. Village Ecodevelopment Committees will be encouraged to bid for Bhabar Grass. Rotational collection method will be applied in the Ranges keeping in view that no over exploitation should be allowed.
25. Under no circumstances honey-collection will be allowed from the buffer areas.
26. It is recommended that a thorough study has to be carried out by a reputed Institute (like WII) on the effect of such anthropogenic activities on the livelihood of local people as well on the wildlife.
27. No such extraction of timber and other such produce will be allowed from the buffer areas of Corbett National Park. The practice of regulated collection of fuel wood for *bona fide* use by the fringe villagers will continue.
28. The extraction should be phased out in the 10 year cycle.
29. A tree selected for removal should be considered as 'ecologically available' only under the following conditions:
 - a. Its removal does not create a gap beyond 40%.
 - b. The regeneration of species at various 'formation levels' within a radial distance of twice the crown radius of the tree being selected for felling should have an 'established' status. (This requires a regeneration survey).
30. Plantations of only indigenous species should be done.
31. 'Adopting' of plants by protecting/fostering existing root stocks should be given priority.
32. No bamboo working should be permitted in areas frequented by tigers/leopards. New bamboo culms attract wild herbivores and hence, if bamboo working is resorted to in the area, then patches of unworked culms should be staggered with worked areas.
33. NTFP collection should not be permitted in areas with maximum biotic disturbance, forestry working coupled with unestablished regeneration status. In general, the regeneration status of NTFP species should be compared with its status in the core/critical tiger habitat for reference. Further, simple indicators for fuelwood, leaved, fruit, flower, seed, bark, rizome should be standardized vis-à-vis the regeneration status of the species to avoid overexploitation.
34. The grazing/fuelwood collection should be regulated on a rotational basis.

Tiger Conservation Plan, Buffer Zone

Following is the 10 year-cycle rotational areas identified for extraction of dead and fallen timber:-

Felling cycle for buffer areas of Kalagarh Tiger Reserve				
S.No.	Year	Range	Block	Area (ha)
1	2013-14	Palain	Kugadda 1 to 14	1301.5
2	2014-15	Adnala	Halgaddi 7 to 12	1020.5
3	2014-15	Adnala	Mandal Block 9, 10	332.7
4	2015-16	Palain	Bijoragad 1 to 8	1560.9
5	2016-17	Sonanadi	Pakhro 1 to 8	1520.4
6	2017-18	Adnala	Halgaddi 13 to 16	1317.3
7	2018-19	Sonanadi	Dhaulkhanda 6,7,14	445.5
8	2018-19	Mandaal	Eda 2,3	670.6
9	2018-19	Mandaal	West Jameria 5 to 6	705.4
10	2019-20	Maidavan	Mandal Block 4 to 8	819.1
11	2019-20	Maidavan	East Mandal 1 to 4	523.3
12	2020-21	Adnala	Halgaddi 1 to 6	865.6
13	2020-21	Adnala	Adnala 1 to 5	740.6
14	2021-22	Mandaal	Domunda East Block 1 to 6	1835
15	2022-23	Maidavan	Kartia 1 to 2	261.8
16	2022-23	Adnala	Halgaddi 17 to 23	1141.7
			Total Area	15061.9

7.2.2. Theme plan:

There are certain areas which govern 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. Protection against hunting, etc.
6. Recovery plan for hog deer
7. The otter rejuvenation programme
8. Staff welfare programme

Tiger Conservation Plan, Buffer Zone

9. Maintenance of infrastructure

10. Relocation and Co-existence

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 grass land is vulnerable to forest fire and some parts are subject to submergence during the monsoon.

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. Habitat management has been generally confined to creation of water holes, protection against forest fire and attempts at removal of exotic 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.

The buffer area has some patches of Teak, Eucalyptus and Ailanthus plantations and Teak are highly vulnerable for theft as these are near the habitations. Such type of plantation forests along the National Highway are discouraging the wildlife to come near the traffic thus saving them vehicular accidents same is the case with plantations near habitations which also discourage animals to come near the human settlements. Since the phase-IV and the reports on 'Status of Tigers, co-predators and prey in India' emphasized the high density of tigers and its prey, there is no immediate need of removal of such plantations, however such operations may be carried out to increase the area of habitat of the wildlife after the need is ascertained by a thorough study. Restrain should be exercised for removal of such plantations only for commercial purpose. Information regarding plantation of non-endemic species like Eucalyptus, Ailanthus and Teak has been given in the **Annexure -1/3**.

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*

Tiger Conservation Plan, Buffer Zone

camara and *Parthenium* have invaded several areas and restrict the growth of native palatable species.

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 buffer area and lack of adequate control on their activities has also contributed to the decline in habitat availability and quality.

Strategy for future management:

The following strategies are to be adopted.

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 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,

Tiger Conservation Plan, Buffer Zone

		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.

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:

Periodic enumeration of the cattle has to be done to disallow dogs, goats, sheep and cows to be reared by the Gujjars. Same exercise has to be done in the case of *Khattas* and *Chacks*. 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* and in case of default by imposing severe possible punishment under Wildlife Protection ACT, 1972.

The following areas should be strictly prohibited from grazing:

The Gujjars are showing rapid increase in both human and cattle populations.

Tiger Conservation Plan, Buffer Zone

They are also not averse to try and sneak their cattle inside the CNP especially during peak summer. They should be shifted to other areas pending rehabilitation.

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,
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, Halduparao-Semalparao-Chokhamb. The areas left for grazing of Gujjar cattle may be utilised on a rotational basis.

Activity- 3:

Strict rules & regulations has to be enforced of for lopping by Gujjars. 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*).

Tiger Conservation Plan, Buffer Zone

- Bhillour (*Trewia nudiflora*).
- Rohini (*Mallotus philippinensis*).
- Bargad (*Ficus bengalensis*).
- Pilkhan (*Ficus infectoria*).
- Pipal (*Ficus religiosa*).
- Khabar (*Ficus cordifolia*).
- Genti (*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.

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 grass, 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 grass land by mean 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 “Chaur”.

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

S.No.	Botanical Name	Local Name
21.	<i>Apluda mutica</i>	Chhari
22.	<i>Veteveria zizianioides</i>	Khus
23.	<i>Cymbopogon martini</i>	Marchi grass

Tiger Conservation Plan, Buffer Zone

24.	<i>Chloris barbata</i>	Firke
25.	<i>Chrysopogan fulvus</i>	Godia
26.	<i>Desmostachys bipinnata</i>	Daab
27.	<i>Bothrichloa pertusa</i>	Doob
28.	<i>Heterogon contortus</i>	Kumeria
29.	<i>Eulaliopsis binata</i>	Bhabhar
30.	<i>Saccharum spontaneum</i>	Kauns
31.	<i>Thysanilaena marxima</i>	Oons
32.	<i>Saccharum munja</i>	Mooni
33.	<i>Capil pidium spp</i>	Chunar
34.	<i>Imperata cylindrica</i>	Sirou
35.	<i>Phragmitis Karka</i>	Narkul
36.	<i>Eragrostis ciliaris</i>	Chriya chuna
37.	<i>Sporobolus indicus</i>	Chriya dana
38.	<i>Sorghum halepense</i>	Vanchari
39.	<i>Dichantuium annulatum</i>	Nalli
40.	<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.

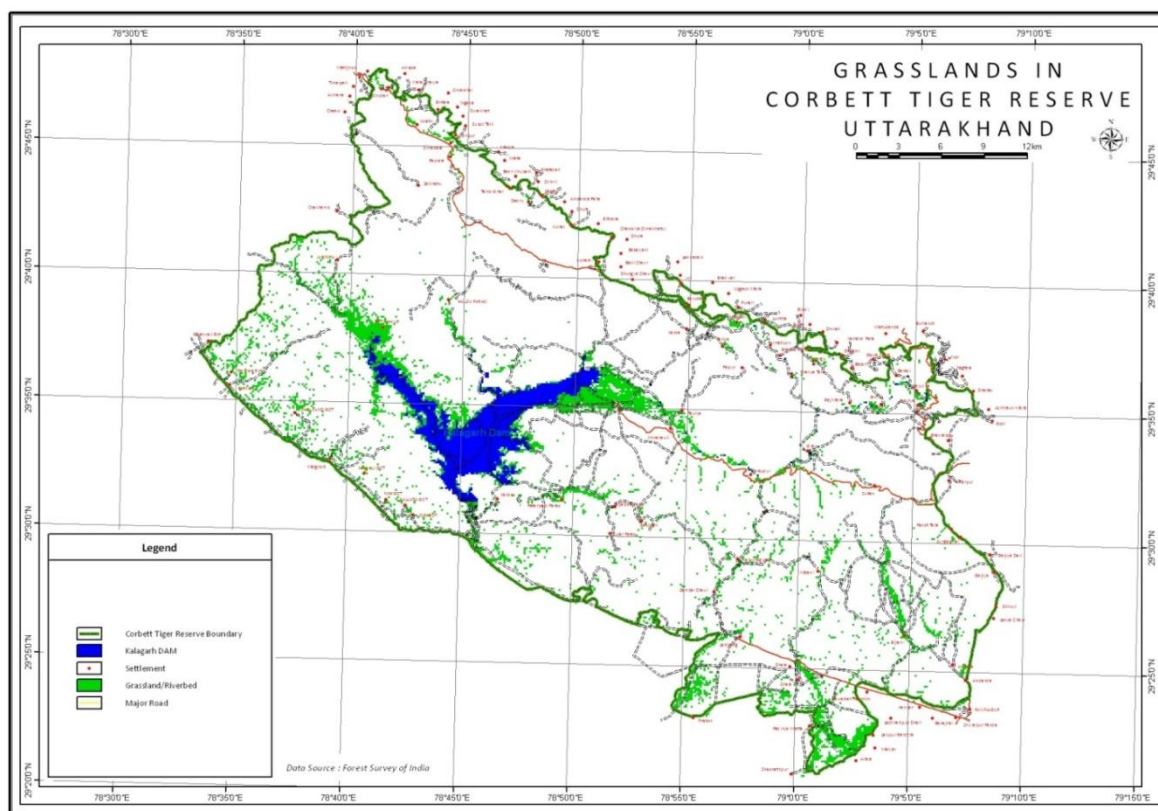
Although tropical grasslands have been studied by several authors (Yadav and Singh, 1977; Kotwal and Pandey, 1981; Lehmkuhl, 1989; Rodgers, 1990), very little ecological information exists on the grasslands of Bhabhar region. Such information is crucial for the conservation of wildlife in the protected 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 this park 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-7/2**.

Tiger Conservation Plan, Buffer Zone

The grass land 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.



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.

Tiger Conservation Plan, Buffer Zone

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. This information should be used while managing the grasslands of buffer area.

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

The grassland 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 pot only. Adequate staff has to be employed for the purpose who also combs the area to ascertain that no juvenile animal 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

Tiger Conservation Plan, Buffer Zone

that situation, nutritious endemic grass has to be planted by removing the coarse varieties. At least 200 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 over grazing by the buffalos owned by Gujjars who are residing in the buffer area. 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 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:

It has been a common sight of woody plants like Shesum, Zizyphus, Bombax, Terminalia belerica, Aonla etc., are growing inside the grassland. This is the indication of the favourable factors which 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 park managers. But due care has to be taken to spare such trees like bahera (Terminalia belerica) which is 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 plants should be allowed to grow as animals very often require shades during the peak summer season. How many trees have to be retained for the above purpose has to be decided by a suitable study based upon peculiarity of each grassland. There cannot be a single Strategy for all the *chaurs* 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.

Tiger Conservation Plan, Buffer Zone

5(v). Plantation of Patera Grass:

The 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). Establishment of 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 Gairal and Dhela. Palatable and nutritious grass along with nitrogen fixing fodder 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 20% of the area of Corbett Tiger Reserve is under thickets of weeds the dominant being the 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 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 which was cleared off from lantana. So while eradicating lantana some pocket may be

Tiger Conservation Plan, Buffer Zone

left near the edge of the grassland till some good shrubby layers of indigenous species replace lantana and cover the area in question.

5 (viii). Strategy for removal of Lantana:

Lantana control and eradication programme is a must for the very survival of Park's habitat. 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*.

The lantana thicket has to be uprooted and allowed to be dried while stacking the portion of root in a 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 demarked 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 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, CTR. 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.

Tiger Conservation Plan, Buffer Zone

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 management 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.

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 CTR 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 vary 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.*

Tiger Conservation Plan, Buffer Zone

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.*
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 easier by individual workers. But this method has one major disadvantage- some rooted prostrate branches left out have developed into new clumps. The grasslands*

Tiger Conservation Plan, Buffer Zone

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.*
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.*

Tiger Conservation Plan, Buffer Zone

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 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*

Tiger Conservation Plan, Buffer Zone

- 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.*
 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 a 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*

Tiger Conservation Plan, Buffer Zone

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 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.*

Tiger Conservation Plan, Buffer Zone

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 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 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 once famous grasslands of Dhikala, which was the pride of Corbett Tiger Reserve, will be endangered. To prevent

Tiger Conservation Plan, Buffer Zone

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.*
- (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 grassland 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.

Tiger Conservation Plan, Buffer Zone

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.

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 joins the flat productive zones to the hilly areas. Wild animals use these patches as

Tiger Conservation Plan, Buffer Zone

corridor to move from one place to another. Sometimes these covers are 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. Bamboo has been planted successfully in some cases. If highly palatable species are to be planted, they 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 1m x 1m spacing immediately after eradication. In case of hygrophilous weed infested grassland, 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 removed to keep forest healthy.

7.2.2.2. Conservation of water bodies:

Despite of 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. The main reason for low water availability is the poor water holding capacity of sandy soil of the area as well dependency of about 600 odd population of elephants. 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 the grassland.

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

Tiger Conservation Plan, Buffer Zone

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, 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

Tiger Conservation Plan, Buffer Zone

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.*).

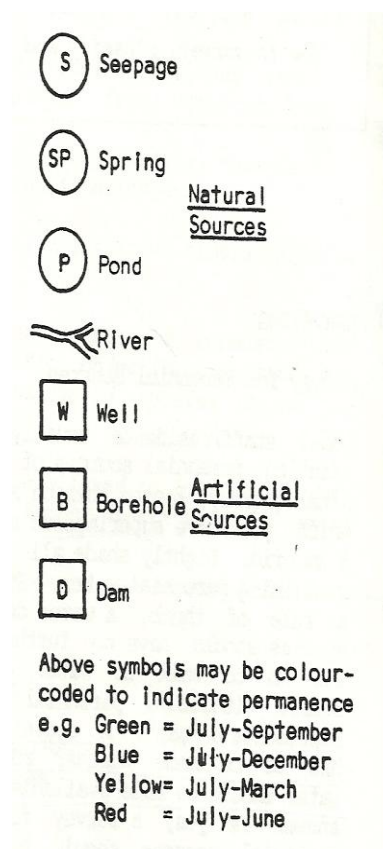
Activity- 3: Classification:

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.

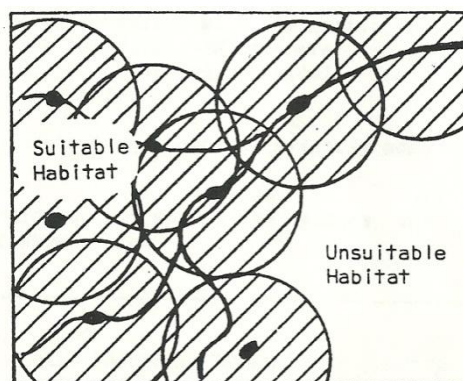


Tiger Conservation Plan, Buffer Zone

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*).

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.*).

Tiger Conservation Plan, Buffer Zone

Activity- 7 Constraints:

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

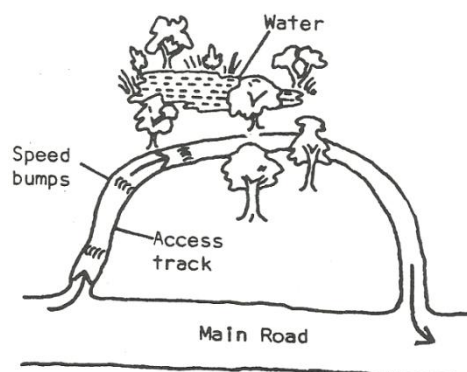
- Withdrawal of water, particularly ground water, may alter natural processes of water cycling and lead to significant changes in ecosystems.
- Water sources in the southern boundary of the core area may bring domestic stock into contact with wildlife, increasing the chance of disease transmission.
- 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:

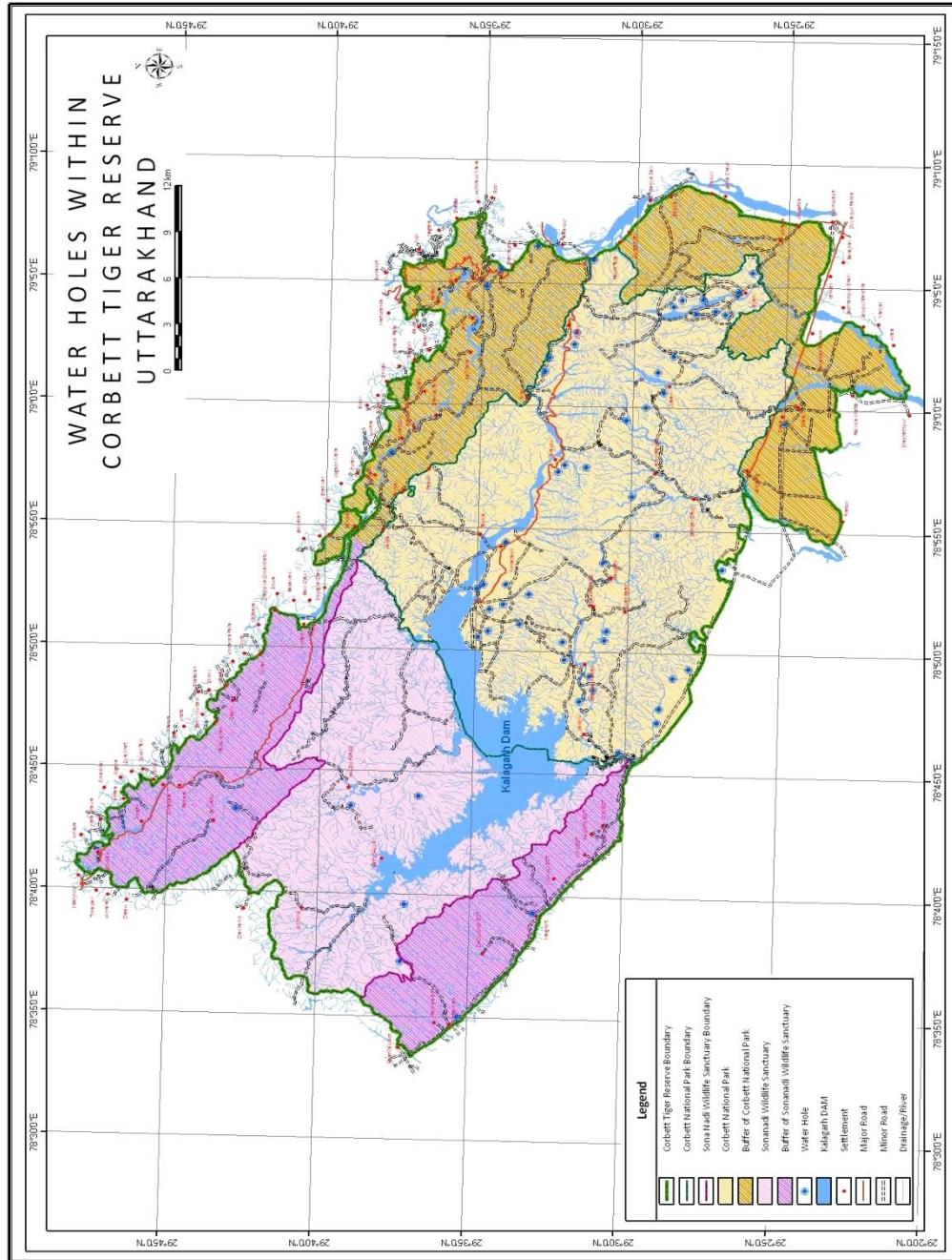
Selection of site for the development of the water hole is one of the most important decision to be taken by the management. Endeavour should be made to ensure the following steps-

- 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.
- In wildlife viewing areas the waterhole 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). In such sites building of an access track will be considered.



Tiger Conservation Plan, Buffer Zone

- 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 ver the top of the bank. (*Manual of wildlife techniques for India, edited by J.B. Sale and K. Berkmuller.,WII & FAO*).



Tiger Conservation Plan, Buffer Zone

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.
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 man-animal 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.

Tiger Conservation Plan, Buffer Zone

7. Over enthusiasm should be avoided to create water holes without studying the requirement of the habitat as well as the target animals. 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.
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 (without flash) can be laid 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 lantana or any other weeds close to the water hole.
11. Tourists vehicles should not be allowed to disturb wild animals particularly the tigers at the waterholes.

The Corbett Tiger Reserve has 56 waterholes. The list of waterholes lies in the buffer zone has been given in the **Annexure-1/2**.

Tiger Conservation Plan, Buffer Zone

7.2.2.3. Soil & water conservation:

This programme forms an important component of any Forest working 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 Park.
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 Park.
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

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, CTR.

7.2.2.4. Fire Protection:

Corbett Tiger Reserve is highly vulnerable for forest fire. Though no major fire incidents has been occurred due to extremely cautious field staff and rigorous implementation of the 'fire plan'. 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.

Tiger Conservation Plan, Buffer Zone

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 the 'fire protection' has been discussed in the Chapter-10.**

7.2.2.5. Protection against hunting, etc:

Protection of the rich biodiversity of Corbett Tiger Reserve needs special attention. It become more important as the density of tigers 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 man-animal conflict. It has been a great challenge for the management to keep the tigers safe from poachers and victims of man-animal conflict.

Given the difficult geographical terrain which provides ample opportunity for unsolicited intrusion by trouble makers as well as to solicit cooperation from fringe villagers, a comprehensive security plan has been prepared and followed with right earnest. There should be flexibility to update/revise the security plan as and when necessitated by the tiger reserve management.

Management Strategies:

1. Two dedicated teams such as rapid response team and rescue & rehabilitation team has to be provided in each Range. The team will be lead by a Forester or Deputy Ranger and the area of operation should not be less than 20-25 Sq. Km.
2. 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.
3. 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 a senior Assistant Conservator of Forests.
4. The other important aspect will be the training programme of staff in various matters of urgency like law, biodiversity, climate change, HRD, anti-poaching.

Tiger Conservation Plan, Buffer Zone

5. 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.
6. At least two informers should be trained each from 37 EDCs to act as eyes and ear of the Tiger Reserve.
7. 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.
8. At present about 200 local youth are employed under 'Operation Lords' 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). The assistance provided by them is vital both in terms of intelligence gathering as well as physical support by the presence of many persons.
9. The elephants need to be used extensively for patrolling in the area, especially during monsoon. More elephants will have to arranged for the same.
10. All trails must be checked once a month using metal detectors to cleanse the area of any chains put up by the poachers for tiger leg-traps.

7.2.2.6. Recovery plan for hog deer:

Hog deer population has considerably been diminished in the past. A detail study has to be conducted to identify various limiting factors and prescribe the right approach to recover the population. Special attention has to be given while treating the grassland where Hog deer lives. Meanwhile in a interim measure, at least 3 enclosures may be created in Dhela, Jhirna & Dhikala ranges. This programme of in-situ conservation will be carried out under the supervision & guidelines of WII and N.T.C.A. The Hog deer thus raised through this programme should be reintroduced in the Dhikala Zone of the Core area. A proposal is still pending with WII for necessary comments and commitment to launch the recovery programme.

Tiger Conservation Plan, Buffer Zone

7.2.2.7. The Otter Rejuvenation Programme:

The Otter population which has not registered a remarkable increase in the recent past, a research programme is strongly recommended to monitor their population trend and prescribe the line of action.

7.2.2.8. The Human Welfare 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 programmes are an important part of human resource development. The frontline staffs of the Tiger Reserve are 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 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 man-animal 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 needs to synchronize its activities with The Corbett Tiger Conservation Foundation. The following suggestions are made –

- The Tiger Reserve should develop two residential campuses – one at Ramnagar and the other at Kalagarh 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 insured at all the campuses situated inside the Tiger Reserve.

Tiger Conservation Plan, Buffer Zone

- Major campuses and range head quarters situated inside the tiger reserve should have some recreational facilities for the staff like – Radio, TV sets with dish connection, indoor games like carom, chess etc and small 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 like operation lord, 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 minimised. When there is no alternative they should be at least accompanied by some gunman staff.
- 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 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 staffs deployed in the core area needs special care and management. 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)

7.2.2.9. Maintenance of Infrastructure:

Forest roads, culverts, chowkis, fire lines, forest rest houses, wireless establishments, drinking water facilities, has to be regularly maintained. Dried and fallen timber should be used for petty repair works of culverts and departmental dwelling units including forest rest houses.

Tiger Conservation Plan, Buffer Zone

7.2.2.10. Relocation and Co-existence:

The buffer area has many human settlements in the form of revenue villages, *khattas* and *gujjar basti*. Because of their proximity to a vibrant wildlife area these human settlements face some negative impacts and in turn also adversely affect the wildlife. In the interest of the residents of these villages as well as the wild animals these human pockets need to be either relocated or managed in a way that conflict issues can be minimised. Corbett has seen many relocation drives in the past as well. Prior to the creation of CNP, the Buksar area was a village which had small human population engaged in all sorts of human activities like agriculture, cattle rearing etc. At the time of creation of CNP this village was relocated outside the boundaries of the NP. The second important relocation took place on the Southern boundary of the TR, when three villages named *Dhara*, *Jhirna* and *Kothi-Rao* were relocated to the forest area of Terai West Forest Div. The relocation of village *laal-dhang* is still underway which again is situated on the Southern Boundary.

The NTCA has issued detailed guidelines and offered packages for relocation. As the offer is restricted for relocation of villages from the core area of the tiger reserve, no such clear cut policy is available for relocation of villages from the buffer areas. Before deciding to relocate the villages a list of priority areas need to be made which should be based on the situation of conflict and importance of the area for conservation. The list is as follows –

- Aam-danda and Ringora Khatta
- Gujjars in the buffer area
- Village *Jamun* and *Kalakhand*
- Village *Teria* and *Pand*

A dialogue should be started with the *khatta* dwellers to accomplish the relocation. The relocation of *Aam-danda* and *Ringora* if accomplished will help in widening of the narrow *Kosi* river corridor of CTR. For *Gujjars* settled in the buffer area, a relocation programme on the lines of one made for the relocation of *gujjars* from Sona-Nadi Sanctuary should be made. Efforts are already been started to relocate *Teria* and *Pand* revenue villages. Since many years these two villagers are striving their hard to shift elsewhere because of the fact that their agricultural land has already been engulfed by dense high forest, and they do not have any land left for cultivation. High density of ungulates has caused their agricultural land unsustainable and people has

Tiger Conservation Plan, Buffer Zone

shifted elsewhere. It will be prudent to acquire the land and relocate the villagers in the forest area marked for relocation (Tumuriya ravine of Tarai West Forest Division) and make the revenue land of the village as a part of the buffer area of the tiger reserve. Otherwise, the land may convert to a thriving hub of resorts. The villagers of *teria* and *pand* have already given their willingness for relocation and some progress has been made in the form of identification of land in which the villagers should be settled. The case needs to be pursued more vigorously so that the relocation can be completed in a given time frame. The rise in tourism activities is a future challenge for relocation because recent years have seen substantial rise in the land prices in the vicinity of Corbett. If the villagers say of *teria* and *pand* start selling their land for people interested in developing tourism infrastructure around CTR, the relocation effort can come to a grinding halt.

Same is the case with *Jamun and Kalakhand* revenue village. There are only 3-4 families reside in the Jamun village and Kalakhand village has no human habitation. Since these two villages are situated along the Ramganga river and encircled by the buffer area of Corbett, both the villages boasts breathtaking beauty of nature. This attracts many influential investors to buy land *in-cognito* and try to bend rule to make use of the land for tourists. Since the villages are converted into forests, and surrounded by the verdant forests of Corbett, the area is well endowed by all kinds of animals, birds and reptiles. This area is well known for one of the richest habitat for tigers and elephants. If the area is subjected for construction of resorts and hotels and tourist activities started in this area, then it will be a irreparable loss for the habitats for tigers and elephant. There will be a strong possibility of increase of man-animal conflict. The relocation of these two villages is going to be a challenge owing to the presence of large no of outsiders and the tourism potential of the area. A dialogue should be started with the villager to assess their willingness for relocation and based on these dialogues the relocation proposal should be prepared.

The NTCA is also of the opinion that the area should be saved from the impeding unsustainable tourist activities and efforts should be made to acquire the land and compensate the villagers adequately. Then area in question would be notified as reserve forest and be part of the tiger reserve. The Govt. of Uttarakhand has passed an order dated 21-11-2012 to DM pauri and Nainital regarding ban on 'Change in Land

Tiger Conservation Plan, Buffer Zone

Use' in the periphery of CTR along with the 46 small revenue habitations (Chacks) which are inside the buffer of CTR (also mentioned in chapter-5).

Coexistence:

Relocation has been suggested for many human settlements and there are still many more villages in and around the buffer forest. Relocation though sometimes inevitable, but is always difficult to come through and requires exorbitant resources and time. Thus relocation in itself is no final solution for conflict mitigation. The villages in and around the buffer forest should be analysed on the human-animal conflict and impact on the forest resource issues. There tourism potential should also be taken into account. Based on the above studies the Corbett Tiger Conservation Foundation should adopt some villages and work with the villagers to address the various issues and problems important both from human and wildlife perspectives. Dove-tailing with government line agencies/departments will enhance the effectiveness and reach of these efforts. The foundation can also rope in the local NGO to facilitate in specialized areas. All said and done, the emphasis should be on devising means so that the villages of the landscape do not need large scale relocations and their issues are addressed in a manner beneficial both for the humans and the wild animals.

Site-specific microplans should be prepared for such villages where the problems arising due to close vicinity of the forests will be identified and mitigation measures can be identified. By doing so, the need for translocation will be reduced and the villagers can be made a partner for the protection of the forest and can harness benefit from various livelihood enhancement projects – by mainstreaming various production sectors- taken up by the tiger reserve management.

7.2.2.11. 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 –

- Publishing literature on vital issues relating to CTR like – why and how the tiger reserve is important for local people, conservation value of important species, man-

Tiger Conservation Plan, Buffer Zone

animal 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 EDC's by providing training on communication skills, creation of co-operatives and SHGs, account keeping, income generation activities etc.
- Organising visit of EDC's 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 man-animal conflict.
- To work for the popularisation of local art, craft and culture and to impart training to the local youth.

Kalagarh Wildlife Training Centre should be made the hub of all capacity building programmes. The training centre should be strengthened to cater to the future need of the management of the tiger reserve. The foundation could help in strengthening of resources and assets of the training centre.

7.2.2.12. Conflict Management Zone:

Man-animal 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 the writings of Jim. 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. Man-animal conflict normally presents itself in the form of crop damage/raiding, loss of life

Tiger Conservation Plan, Buffer Zone

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. The data of man-animal conflict post creation of Uttarakhand is as follows –

Construction of stone wall and erection of solar electric fencing has been tried in the past to reduce man-animal 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 –

- 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 EDC's and wages should be paid by the department through the EDC.
- The man-animal conflict hot spots should be identified and special micro-plans should be prepared for these areas along with the EDC's. The emphasis should be on mitigation of conflict with active support of villagers.
- The areas which are not connected to other forests and have no corridor value can be fenced using stone wall. The traditional stone walls have served well, but a new model seems to be more effective and can be considered for future constructions. The photograph of the new model is given below –
- Solar fencing should be erected only if the area to be protected is a small chunk and the fencing is being maintained by the department.
- 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 – Ramnagar, Kalagarh and Kotdwar.

Tiger Conservation Plan, Buffer Zone

- 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 NGO's 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 NGO's.
- Compensation distribution mechanism should be swift and transparent.
- Some important drugs like – 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 man-animal 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.

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.

Tiger Conservation Plan, Buffer Zone

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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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)

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 1.1

Maintenance of waterhole: 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)

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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)

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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 trees, den trees, down log material. Use microhabitat descriptors only if relevant.

Remarks : Any other useful information including photographic evidence.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 3.3

Animals : Predation on domestic livestock by wild carnivores

Sr. No.	Range	Month	Category of livestock killed	Location	Numbers	Compensation 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 and 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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	Compensation (Rs.)
1	2	3	4	5	6	7	8	9

Note : **Location, circumstances and species** : Location by comptt. 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 4

PLANTS/WEEDS: 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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 CTR 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.

Tiger Conservation Plan, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer 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, Buffer Zone

FORM CP/CTR – 8

Tourism

Total number of visitors all categories:

Year

Name of complex :

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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 12

Research projects under implementation through PA manpower with or without collaboration with 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. 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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, Buffer Zone

FORM CP/CTR – 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.

Chapter-8

Eco-development, Livelihoods and Implementation Strategy

8.1. Policy and Institutional Framework:

Last decades of twentieth century saw the emergence of new thoughts and practices in the realm of forest and wildlife management in the country. Driven primarily by the realisation that the needs and aspirations of the forest dependent communities had to go hand in hand with the demands of nature conservation, practices like Joint Forest Management were adopted. This, in turn led to innovative experiments by a few resourceful managers in different parts of the country. In the case of the management of protected areas (PA's), a Government of India document (1983) titled 'Eliciting Public Support for Wildlife Conservation' sowed the seed of a philosophy and practice which finally came to be called 'eco-development'. This has purely arisen out of need to conserve nature with active people's support.

By the time the process of formulation of 8th five year plan was initiated in the Planning Commission in the early 1990, it had become clear that the 'protection-exclusion' system of wildlife management was not working. The Protected Areas were losing their values in the face of mounting pressures at a very rapid rate. Also, there was widespread resentment against them. The Ministry of Environment and Forest and the Planning Commission were, therefore confronted on the one hand with pressures to lighten the regulatory regime associated with wildlife and forest conservation, and on the other hand with evidence that, even with the current level of regulations, forest and protected areas were rapidly deteriorating. It was out of such a predicament that eco-development as a strategy gained acceptability.

So, it was for the first time in the 8th five year plan (1992 to 1997) that an eco-development scheme was mooted for field application. Eco-development is a multi-disciplinary and multi-stakeholder strategy to link the conservation values of protected areas with the livelihoods of local people and a developmental processes in the surrounding landscapes.

Eco-development as defined by Panwar is "the promotion of long term sustainable use of resources whilst caring for biological and cultural diversity."

There are about 62 EDCs working around Corbett. There is a prevailing general misconception that eco-development initiatives should be started only in areas which

Tiger Conservation Plan, Buffer Zone

are revenue villages. This concept goes against the basic principles of eco-development as it encompasses all habitations or stakeholders that can have a bearing on the forest resource or the PA. Keeping in view the above fact *gujjars* residing inside the forest area as well as the *Sunderkhal* encroachment village in the adjoining Ramnagar Division , and the khattas like Amdanda, Ringoda, and Neemsot are also qualify for being included in the eco-development programmes of the TR.

The role of the deputy director and DFO, Kalagarh Tiger Reserve Division would be to carry out implementation of inputs regarding forestry/ecodevelopment in the forest areas, while ensuring coordination with other sectors. Wildlife protection would be an overlapping mandate for the entire area.

Objectives:

1. To reduce the dependency of the stake holders especially the villagers on the forest resource by devising and planning alternate technologies suitable for the area. Thus minimizing dependence of local communities on natural resources.
2. To address the livelihood issues of the stakeholders by creating alternative and new sources of income which help a broad section of the society.
3. To strengthen the institutional set-up of co-operatives and SHG's.
4. To create suitable institutional interventions so that the negative impacts of tourism can be minimised.
5. Capacity building initiatives.
6. Lending effective and extensive support for local community development.

Problems:

Damage to crops and loss of cattle by wild animals is seen as the most harmful impact of Corbett Tiger Reserve on the villages. Agricultural crops are damaged by wild elephants, wild pigs, blue bull, sambhar, other deer species, monkeys and birds, including parakeets and peacock. The damage by wild pigs is widespread and most difficult to control. The wild animals, which cause maximum damage to agricultural crops, differ from village to village and region to region. The villagers complain that the rate of interim relief for damage to crops by wildlife does not commensurate to their market value. There is no provision for interim relief for damage to fruit trees and orchards by wild elephants. Proof of ownership of land is required for claiming the

Tiger Conservation Plan, Buffer Zone

interim relief for crop damage by wild elephants. In situations where there are absentee landlords or where there is share cropping, the farmers fail to get any relief. The problem has become acute because of continued presence of wild elephants along the boundary throughout the monsoon season and during other periods as well.

Tiger and Leopard occasionally kill livestock. The number of livestock killed by the predators go up during the monsoon. The villagers do not receive timely payments for the kills. Payment is not admissible for injuries to the animals or where the remains of the dead animal cannot be located. The villagers find the procedure for the payment of relief to be extremely cumbersome and want to be simplified.

On rare occasions wild elephants, tiger and leopard cause injuries and death of human beings. In situations where a human being is killed by a tiger or leopard, the villagers want that the animal should be declared a man-cater without wailing for further deaths and effort should be made to trap the recalcitrant animal at the earliest. The villagers also demand temporary security should also be provided for the inhabitants of such area.

Older villagers are nostalgic about the freedom to move in the area. The villagers resent the restrictions imposed on them in the buffer zone after the expansion and reorganization of CTR. They feel that their rights are being curtailed and they are being denied access to the area and its resources. The villagers complain that they are now being denied the right to use the forest roads falling under the buffer zone and fees was being imposed on them for using these roads. They are being stopped from using these roads after sunset. They also complain that they are being denied access to forest produce and water resources which they enjoyed earlier. The requirement for water for their livestock is most acute during the summer months when most other water sources dry up.

Lack of development activity has also led to a situation where there is a lack of employment opportunities for the youth. The villagers want that priority should be given to the local people while selecting labourers for departmental works or employing workers on a seasonal basis. They also want similar priority in the selection of nature guides.

Impact of wildlife tourism is felt in terms of increased volume of traffic, pollution, sound pollution, intrusion in the privacy of villagers and impact on culture, In

Tiger Conservation Plan, Buffer Zone

order to eliminate these harmful effects, the villagers suggest that a code of conduct should be developed for visitors to ensure respect to local sensibilities.

Poisoning of livestock kills leading to deaths of tigers and leopards has emerged as one of the biggest threats to the protection of larger cats. Some of the other threats include poisoning of fishes and poaching of deer and other animals for the pot.

Hundreds of head-loaders eke out living by removing head loads and selling them at Ramnagar. Constant exposure of villagers in the tiger land has its risk of accidental killing of human beings. At times the tiger turned into man-eater. Sunderkhal, is a case in point, where 4 ladies were killed by a tiger while they were collecting fuel wood in the adjoining forests. The fuel wood collected is often supplied to market which fetches regular income for the poor villagers.

Unauthorized grazing of cattle in the buffer area, particularly grazing and lopping of trees by the Gujars, is gradually eroding the productive potential of the forest. Grazing also enhances proliferation of weeds at the expense of the native palatable species. Incidents involving killing of livestock by predators in unauthorized areas introduce another problem, as interim relief is not admissible for such cattle.

One of the several causes of forest fire is carelessness or deliberate lighting by the villagers. Fires are initiated in order to increase availability of dead and dry fallen wood; promote fresh growth of grass. Recurrent forest fires especially along the boundaries deplete the habitat and reduce forage availability. Furthermore, they are likely to accentuate the spread of weeds.

The population in villages and townships has registered marked increase during the last decade. Large-scale conversion of agricultural land for construction of tourism related infrastructures and residential houses has led to a spurt in the demand for land and consequent anthropogenic effects on adjoining wildlife habitat which is compounded by blockage of corridor at such places. The problem is most acute in villages adjoining Ramnagar and at Dhikuli, which is bustling with construction activity. Changes in land use pattern are having a major impact on CTR resources in two different ways. It is gradually leading to fragmentation of habitat and the destruction of the traditional corridors through which the animals move to Kosi and other rivers.

Tiger Conservation Plan, Buffer Zone

The number of conflicts between villagers and the park staff is on an increase. New kinds of tensions have emerged after the recent spurt in development of private sector sponsored tourism facilities and general increase in the expectations of the villages. Many conflicts are not necessarily based on facts but are a result of false propaganda or misunderstanding.

8.2. Livelihood Support Initiatives through Village Micro-plans:

Depending upon site attributes (climate, terrain, soils, present patterns of farming, fishing, livestock raising, practices of other resource use, status of conservation/degradation, potential for restoration, variety of non-wood forest products, local skills, existing and possible infrastructure etc.) a holistic site-specific package of measures will be an appropriate combination, most suited to the given site.

It will emerge as a result of a fully participatory planning process, involving local people, NGOs and government agencies (concerned with land and resource use, and rural development) as conducted by the PA management with the coordinating assistance of district administration.

The micro-plans will be prepared based upon the following philosophy “A site specific package of measures derived through peoples participation, which addresses all aspects of land use and other resources, in order to promote sustainable land use practice as well as off-farm income generation activities, which are not deleterious to protected area values.”

The existing microplans should be revised with reference to changing scenario. Help of local NGOs can be sought who have knowledge of PRA (Participatory Rural Appraisal) techniques. Reciprocal commitment from the villagers should be an integral part of the micro-plans. The preparation of micro-plans should be done on the basis of guidelines issued by the tiger reserve to ensure uniformity. The funding for the activities identified in the micro-plan should be done through the Project Tiger Scheme and the corpus of the Tiger Conservation Foundation for CTR. The deputy director should oversee the preparation of microplans of all stake holders including the Gujjars and the neighbouring Sunderkhal encroachment village along with *khattas* like Amdanda, Ringoda and Neem Sot, under the guidance of the Field Director. Proper demand should be reflected in the Annual Action Plan of the Project Tiger as well as Tiger Conservation Foundation for CTR.

Tiger Conservation Plan, Buffer Zone

Following are the issues which will be addressed in the microplans.

A. Synergy between Tiger Reserve management and communities:

1. Village Ecodevelopment Committees:

The G.O. No Eco 84/14-Parti Bhumi -19-63/97 dated 21st May 1999 on ecodevelopment issued by the Govt. of UP provides for institution building through the establishment of Village Ecodevelopment Committee. The EDCs so formed are to be registered under the Society Registration Act to provide them with legal backing. A limited number of villages would be selected in each range for implementation of ecodevelopment programme in an effort to bring about acceptance of the concept amongst a larger number of staff. Gradually, an attempt would be made to saturate the programme throughout the entire boundary to test the effectiveness of the ecodevelopment strategy to address the totality of human pressure and dependencies over a large area. So far Ecodevelopment Committee have been formed in sixty two villages.

2. Preparation of Microplans:

Site specific microplans will be prepared through local or village level participatory process, leading to reciprocal agreements between local people and forest department. The agreements would be directly linked to Conservation of PA resources, The microplans will be implemented and monitored by the EDCs.

Investments under ecodevelopment programme will be made as per the following criteria laid down in PIP to quality for financing.

- (a) Conserve biodiversity by reducing negative and increasing positive interactions between people and PAs.
- (b) Are technically and financially feasible.
- (c) Area socially and institutionally feasible
- (d) Are environmentally sustainable.
- (e) And are incremental (i.e. alternative source of funding cannot be readily mobilized.)

Annual plans will be prepared by the EDCs on the basis of the microplans and submitted for approval to the Deputy Director and DFO, Kalagarh. Subsequently,

Tiger Conservation Plan, Buffer Zone

activities will be undertaken and accounts maintained as per the guidelines issued by the Government.

3. Capacity Building:

Implementation of participatory ecodevelopment programme requires development of special skills within field staff, members of EDCs and local NGOs. Capacity building programme through cluster workshops for officers/staff of CTR as well as for EDC members will be organised as before. Each village team consisted of the EDC Chairperson, Treasurer cum Secretary (Forester) and three to four members including at least one female representative.

An annual NGO workshop will be conducted to review the progress of the ecodevelopment programme. Local NGOs as well as other partners in the programme will be encouraged to elicit views about the programme. This will be done to adapt the programme to changing circumstances and establish linkages between learning both in through training and programme implementation.

4. Rights and concession:

Villages situated in the buffer area and in surrounding area enjoy traditional rights and concessions. Non availability of rights and concessions or delay in this provision has consistently emerged as one of the most serious grievances of the villagers.

The quantum and procedure of providing benefits admissible under rights and concessions will be described in the microplans along with specifications about the species and the area from where it would be provided. Measures will be undertaken to ensure that marking, felling and distribution of wood is completed before the start of the fire season. The distribution of rights and concessions will get priority. Dead and dying trees will be handed over to the Forest Corporation only after the admissible demands of the villagers have been met.

5. Inoculation of Livestock against Communicable Diseases:

As per the provisions of Section 33A and of the Wildlife Protection Act 1972, the Chief Wildlife Warden is required to take measures for immunization against communicable diseases of the livestock kept in or within 5 km of WLS. Similarly, Section 35 Sub section 8 prescribes similar conditions for National Parks.

Tiger Conservation Plan, Buffer Zone

A list of villages situated within the Reserve Forest buffer zone of CTR and within 5 km of the boundary of the Reserve Forest is being prepared. Livestock in all such villages will be inoculated against communicable diseases.

6. Publicity and Extension:

Information about the ecodevelopment programme will be disseminated through news releases in local press, booklets and posters. An Annual Report of ecodevelopment will be published and distributed to all the EDCs.

Corbett Newsletter was initiated in April 1994 as part of the Eco Awareness Programme. The newsletter will be revived and published on a six monthly basis and widely distributed in the villages free of cost.

B. Issues on human-wildlife interface:

1. Compensation for Damage by Wild Animals:

Immediate relief will be provided for damage to crops by wild animals, livestock kills and in cases of injury to human beings and death. All claims will be settled at the earliest. Government of Uttarakhand has issued notification making the process of disbursement simple and enhancement of rates of compensation. Adequate budgetary provision and non-dependency on annual budget is the highlight of the notification which will tackle the most sensitive issue of fast disbursement in the cases of man-animal conflict.

The applications for damage to crops by wild elephants will be promptly dealt with and the claims settled in a day or two as it becomes difficult to ascertain the extent of damage afterward.

In case of human death the Wildlife Warden and / of the DFO will pay the amount admissible for funeral rites immediately after the inspection of the site. Departmental assistance will also be provided for the injured. Final payment should not be delayed beyond a maximum of one month. Where the deceased individual happened to be sole earning member of the family, effort will be made to obtain other financial help admissible from the District Administration under various insurance schemes. CTR has excellent reputation for helping the victims by extending personal touch, which needs to be continued.

Tiger Conservation Plan, Buffer Zone

2. Insure Crops and Villagers Against Damage by Wild Animals.

Insurance of crops and of villagers in the worst affected areas offers another way by which the villagers can be protected against damage by wild animals. The premium for insurance could be paid through the EDCs or mobilized through Govt. schemes by dovetailing in the microplans.

3. Construction of Wall:

At many places human inhabitation are juxtaposed with the CTR boundary. Ramnagar township itself is situated next to boundary. The wall needs to be constructed along such segments of the boundary to protect people from damage by stray wild animals and check attempts to encroachments inside the reserve. Construction of wall will be carried out only in those areas where there is a dense population living close to the boundary, where there have been regular incidents of conflict between wild animals and human being, and where incidents involving encroachments have been reported in the past. Long stretches of wall has been constructed in Ranges like Bijrani, Dhela and Kalagarh. However taking into account of the demand from many villagers, an scrutiny will be carried out to determine the most sensitive demands and based on the resource available, at the point of time, construction of protection wall will be carried out.

4. Power Fencing:

Solar powered fencing for crop protection forms one of the important components of many microplans. Solar powered fences will be established for protection from wild elephants in villages where wild elephants have been regularly entering agricultural fields and causing damage to human life and property.

5. Protection Squads to Drive Away Wild Elephants:

Wild elephants enter agricultural fields during monsoon causing havoc with the crops. Regular vigil has to be made by staff in such situations round the clock.

Protection squads will be deployed at sensitive sites in such emergency situation. The squads will need to be given battery lights, ammunition for weapons, torches and also provided with domestic elephants. EDCs will be mobilized to participate in such departmental squads. Regular updating will be carried out about the method adopted by elephant rich states like, Karnataka, Kerala, West Bengal, and Assam etc.

Tiger Conservation Plan, Buffer Zone

C. Alternative livelihood strategies and strengthen beneficial linkages between CTR and adjacent communities:

1. Guide Training Courses:

Subsequent guide training courses are conducted on the behest of CCF, Ecotourism. The candidates will be selected from amongst the name provided by the EDCs. The beneficiaries will be required to return the money spent on their training to the village common funds in installments. The trainees will be provided with an opportunity to work as Nature Guides for a limited period of five years only. Subsequently, they will be encouraged to make use of their experience to get better jobs connected with ecotourism and pave way for the entry of new and enthusiastic youngsters.

2. Community Based Initiatives:

The EDCs will be participate in the orientation of forestry operations for the concurrent promotion of biodiversity conservation and meeting resource needs of and generating employment for local people. This can be done by involving them for various forestry operations related to management of grassland, removal of lantana, soil and water conservation works, repair of roads and buildings, protection against fire etc. These labor intensive works will generate added employment to those villagers who depends upon manual labor works.

The EDCs can be encouraged to undertake enterprises based on agricultural and non-timber forest produce. Such enterprises could be initiated with support from financial institutions either by the EDC itself or jointly by some of the willing members of the EDC. Some of the potential activities, which could be undertaken, are as follows

- Production, packaging and marketing of locally produced Honey
- Sale of Organically Produced Rice, wheat, soybean and vegetables
- Production of art Paper from Lantana
- Floriculture and horticulture
- Production of organic manure

The above products has substantial market in the form of large number of resorts, hotels, restaurants etc.

Tiger Conservation Plan, Buffer Zone

3. Production of Souvenirs:

Several nature shops have come up near Amdanda gate and most private resorts have own nature shops. One nature shop has been established officially at the Dhangari gate and Bijrani. Though there are several outlets, the range of souvenirs is fairly limited and there is tremendous scope for improvement in the quality. As per the NTCA guidelines on tourism, the nature shops will be managed by Tiger conservation foundation instead of by private entities through tender as was the prevailing practice till 2011-2012. The nature shops will be managed by EDCs on behalf of Tiger Conservation Foundation.

EDCs will be motivated to produce quality products exclusive to Corbett and then retail them through the existing outlets. Technical and artistic guidance will be provided with help from specialists in the field to enhance the quality and appeal of the products. This arrangement will be carried out after the necessary approval received from the governing body of the foundation.

4. Technical Training Courses:

Technical courses which enable villagers and others who depend on forest resources for their livelihood to acquire alternative sources of income have not been tried so far. Organization of such courses could complement the micro plan implementation and lead to enhancement of the skills of the villagers. Potential courses could include in food preservation, sewing and knitting, mushroom cultivation, installation and maintenance of power fences, etc.

5. Regulation of activity of gujjars:

The traditional life cycle of Gujjars who used to follow transhumance has been disrupted owing to the destruction of natural resources along their migration routes and political disturbance. Gujjars in and around CTR now follow local cyclic movements which broadly consist of maintaining permanent *deras* in the Reserve Forest areas and temporarily moving into Sonanadi WLS to set up temporary *deras* between February to September.

The life of Gujjars represents one of hardship and constant struggle. The existence is dependent on the fulfillment of their primary requirements for fodder and availability of plentiful supply of water for their huge livestock, particularly during summer. Being illiterate they are unable to derive full value of their milk produce and

Tiger Conservation Plan, Buffer Zone

are generally in great debt. The forest adjacent to their *deras* is also not in a position to meet their demands of their fodder requirement. The younger generation is keen to be resettled and thereby benefit from civic facilities. Until the relocation of Gujjars materialised, the following prescriptions will be carried out.

- Inclusion of Gujjar *deras* under the ecodevelopment programme through micro-plans.
- Selection of Gujjar youth for nature guide training course.
- Induction of Gujjars in STPF.
- Preference to Gujjars while employing seasonal watchers.
- Setting up of primary schools and fellowships for higher studies.

6. Drinking Water Supply:

The villagers have traditionally brought their livestock for drinking water within the Reserve Forest area in many spots along the boundary. Development of sources of drinking water for both human consumption and consumption by livestock is required to keep the villagers away from entering the peripheral areas of the Reserve, particularly on the southern side.

7. Other income generation activities:

- (i) Improved dry farming techniques (improved seed, manure/ fertilizer regimes).
- (ii) Efficacious water harvesting (surface and ground water).
- (iii) Soil conservation measures, through plantation of fodder and aromatic grass.
- (iv) Apiculture.

Phased reduction in population of scrub livestock and improvement of breed through controlled fertilization of female stock in proper health and age with males of better local breeds, aided by sterilization of scrub bulls.

8.3. Integration of Rural Development Programmes:

Continuous funding of village micro-plans is a pre-requisite for the success of eco-development. Government sponsored village development schemes should be dovetailed during the planning process so that maximum benefit can be extracted in the interest of conservation. Funds from MANREGA scheme of Govt. of India should also be utilised for the funding of the micro-plans. District coordination committee should be formed at Nainital Pauri and Almora districts to harness maximum benefits from the village development schemes operated by the districts. It will be responsibility of the

Tiger Conservation Plan, Buffer Zone

Deputy Director to organise regular meetings with the district authorities and progress of implementation of development programme should be reported to the field director. The Deputy Director also seeks benefit from various national and international aided projects to develop the economy of the villages concerned. He will ensure regular village visits by the Range Officers and Sub divisional officers. The ultimate objective of such efforts will be to reduce dependency of villagers on forests, and to check diversion of agricultural land into resorts and hotels.

8.4. Monitoring and Evaluation:

Regular evaluation of the impact of ecodevelopment programme on the biodiversity resources of CTR is essential to document the process of ecodevelopment and measure its success. Only then can the programme be adapted and evolved so as to increase its effectiveness.

Evaluation of ecodevelopment programme will be carried out after every two years by an outside agency. The evaluation will be carried out in two stages. First the entire progress made during the period, including detailed description of activities carried out as well as measures for capacity building will be described so as to ensure process documentation. Subsequently, the impact of the programme will be assessed in relation to the baseline information established at the time of the beginning of programme.

Monitoring and evaluation should be made a compulsory part of the micro-plans. This will help in the mid-term appraisal of the planning process. The Deputy Director will monitor the progress of various prescription mentioned in the micro-plans. He will apprise to the District Committee as well as to the Field Director. Regular meeting with the EDCs and Gujjars has to be carried out to ascertain the ground reality of the implementation of various development programme. One SDO should exclusively be posted to look after day to day progress of the Micro-plan. He will assist the Deputy Director from formulation of the Micro-plans to the implementation of the prescriptions. The Executive Committee of the Corbett Tiger Conservation Foundation will be the nodal agency of the confederation of the EDCs.

Chapter-9

Implementation Strategy

The implementation strategy for the ecodevelopment and livelihood will be focused on the preparation of site specific micro-plans for the 62 EDCs by professional help of the NGOs and dedicated field staff. To provide a consolidated platform for the EDCs, effort should be made to register the confederation of EDCs under the Society Registration Act.

A network of 'nature clubs' should be established by involving willing students and enthusiastic villagers. They should be provided some seed money to start various awareness programme not only for saving the tiger and its habitat but also the environment of the region. A term of reference should be prepared by the Deputy Director and a mechanism of monitoring and evaluation will be drawn up. The nature clubs will be assisted to celebrate various forest, wildlife and environmental days which will spread the message of environmental responsibility among the people residing in and around the Corbett Tiger Reserve.

9.1. State level Monitoring Committee:

The State Level Monitoring Committee will be constituted on the recommendation of the Principal Chief Conservator of Forest, Uttarakhand. The structure of the committee will be as follows –

- | | | |
|--|---|------------------|
| 1. Chief Wildlife Warden, Uttarakhand | - | Chairman |
| 2. Nominated representative of NTCA | - | Member |
| 3. Director of a Protected Area other than CTR | - | Member |
| 4. A field biologist/Scientist of WII | - | Member |
| 5. A representative of an NGO | - | Member |
| 6. Director, CTR | - | Member Secretary |

The committee so formed will be the apex body to monitor the progress of TCP and any direction or recommendation of the committee shall be binding on the TR. Annual meeting of the Committee will be held every year, preferably in the month of October. The subject matter of deliberations will be as follows –

Tiger Conservation Plan, Buffer Zone

- Progress on the APO of previous year.
- Details of deviations if any, reason and the approval.
- APO for the coming year.
- Details of deviations if expected with reason and approval.
- Progress of eco-development initiatives.
- Progress of wildlife monitoring, research and training.
- Working of Tiger Conservation Foundation.
- Any policy change if needed.
- Any other issue; with the permission of chairman.

9.2. Tiger Conservation Foundation and District Level Coordination Committee:

9.2.1. 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 9/1**. 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-9/2**.

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.

Tiger Conservation Plan, Buffer Zone

- (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.

9.2.2. Coordination Committee:

Provision of constitution of a coordination Committee at the level of the Protected Area has been issued by a G.O. No. Eco 84/14-Parti Bhumi-19-63/97 dated 21st May 1999 . This committee will provide coordination between different departments, address development issue on PA surrounds, monitor and review the progress of the programme, render advice to PA authorities and help in mobilization of additional resources. Accordingly a Coordination Committee will be formed for Corbett Tiger Reserve .

A. Composition

The Committee will have the following composition

Conservator & Director CTR	Chairperson
Deputy Director/DFO, RTRD	Member Secretary
DFO Kalagarh Tiger Reserve	
DFO Ramnagar Forest Division	Member
DFO Tarai West Forest Division	Member
Nominee of the Chairman, Jilla Panchayat Nainital	Member
Nominee of the Chairman, Jilla Pauri Garhwal	Member
Nominee of the Chairman, Jilla Panchayat Bijnor	Member
SDO Bijrani	Member
SDO Sonanadi	Member
NGO representative nominated by the Chief Wildlife Warden	Member

B. Rules of Business.

- i) The Committee shall meet once in each quarter of the financial year.

Tiger Conservation Plan, Buffer Zone

- ii) The Member Secretary with the consent of the Chairperson shall convene the meeting of the committee.
- iii) The Quorum for the meeting shall be one third of the members including the chairperson.
- iv) The member secretary shall maintain the minutes of the meeting.
- v) Non Official Members will be paid passage at the rate equivalent to the entitlement of category 1 Govt. Servants. They shall not be paid Dearness or any other allowance.

C. Duties and Functions

- i) The mobilize support for the ecodevelopment programme and create a suitable environment for its launch.
- ii) To provide coordination between different departments at the Protected Area level to ensure a high quality of delivery of services.
- iii) To advice to Corbett Tiger Reserve authorities for the formulation of the Corbett Tiger Reserve ecodevelopment plan. This will address issues such as land use practices in the fringe areas, development and urbanization on PA surrounds, corridors for wild animals, local threats to Protected Area resources, impact of tourism, pollution, and measures to safeguard life and property from destruction by wild animals.
- iv) To monitor and review the progress of the village level ecodevelopment.
- v) To help in generation of additional resources for the extension of ecodevelopment activities.
- vi) To integrate Protected Area concerns in plans and activities of the various stakeholders.
- vii) To devise mechanisms for better conservation and improvement of the Corbett Tiger Reserve.

Tiger Conservation Plan, Buffer Zone

9.3. Confederation of EDCs:

Though Corbett Tiger Reserve has 62 EDCs, they remain disorganised because of various factors. The erratic and meagre funding of the EDCs by the State as well as the Central Government has made them inconsistent with the basic principle of eco-development and eco-tourism. But these villages have lots of goodwill towards the Tiger Reserve which is providing employment and generates livelihood opportunities for the needy. In order to strengthen this high potential asset, it is prescribed that micro-plans should be prepared with active cooperation of the villagers through NGOs and to bring forth the common concern of the EDCs, a platform has to be constituted in the form of confederation of EDCs. The Confederation can be a registered society having its own Governing Body and the Executive body. They will have their own rules and regulations, which has to be approved by the Governing body of the Tiger Conservation Foundation. It is also recommended that a small group consisting of members of EDCs and Tiger Reserve Officials can visit some of the Tiger Reserves who has performed well in this field of local cooperation and coordination. The list of EDCs has been given in the chapter-5 (Para 5.2.3.).

Chapter-10

Research, Monitoring, Training & Wildlife Health

10.1. Research priorities, projects implementation:

In order to achieve the objectives of improving the protected area management and 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.

10.1.1. 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; mapping of preferred habitats of Tiger and Leopard, identification of individual Tigers; management problems at the interface.
3. Crocodile: Ecology and breeding behaviour of Ghariyal and Magar 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.

Tiger Conservation Plan, Buffer Zone

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, outsides 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.

10.1.2. 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. Effect of commercial plantations of Teak, Eucalyptus, and Ailanthus on the wildlife and determination of modalities of conversion such plantations into miscellaneous forests.
3. Effects of vast accumulation of dead and drying timbers on forest floor.

Tiger Conservation Plan, Buffer Zone

4. 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.
5. Study of the structural changes in the Ramganga river valley system.
6. Drawdown area (around forty square km.) of the Ramganga reservoir - study of its ecology.
7. Impact of the Ramganga reservoir on fauna, avifauna and aquatic fauna; impact on major mammals - Tiger and Elephant.
8. Weeds - extent area mapping, impact on different species, weed ecology, technique for weed eradications and their evaluation.
9. 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.
10. Human-animal 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.
11. Impact of lantana, on habitat management.

10.1.3. 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 of the catchments of Ramganga within and outside the Tiger Reserve; differing land use practices and their impact.

Tiger Conservation Plan, Buffer Zone

3. Visitors - numbers, pattern, background, nationality, class and age composition; estimation of the carrying capacity of different areas of the Tiger Reserve; private tourist resort, 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, Jhirn, 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 eco-system 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.
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

Tiger Conservation Plan, Buffer Zone

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 park - people interface is passing through a critical phase.

10.1.4. Research Establishment:

Corbett Tiger Reserve lacks a proper research establishment. Two such facilities should be developed one at Ramnagar and another at Kotdwar. 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, and assistants. The data generated across the tiger reserve should be preserved at the repository which should be under the charge of an Assistant Conservator of Forests.

10.2. Monitoring frame work:

Constitution of Research Advisory Committee:

A Research Advisory Committee may be constituted with the following members–

- (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) 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 CTR
- (c) Provide suggestion/recommendations for improvement and smooth functioning of the research activities.

Tiger Conservation Plan, Buffer Zone

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.

10.3. 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.
- 4) Tourism impact monitoring.
- 5) Animal census & assessment techniques.
- 6) Wildlife health monitoring training
- 7) Rescue & relief operation related to wild animal especially Tiger.
- 8) Staff motivation
- 9) Weapon training
- 10) Intelligence collection
- 10) Computer application training

Tiger Conservation Plan, Buffer Zone

10.4. 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 his 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.

10.4.1. Manpower planning & utilization:

Future man power 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.

10.4.2. 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.

Tiger Conservation Plan, Buffer Zone

10.4.3. Competence based training:

Competence based training can be effectively delivered through 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.

10.4.4. 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.

10.4.5. 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 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. Solar light in the chowkis
3. Torches
4. Wireless handset with extra battery
5. Two pairs of walking shoe
6. Two pairs of good quality uniforms
7. Winter Jackets
8. GPS
9. Digital Camera
10. Mobile Phone
11. Motor Cycle etc.

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*

Tiger Conservation Plan, Buffer Zone

10.5. Wildlife Health Monitoring:

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. An 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 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.

Tiger Conservation Plan, Buffer Zone

- 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 Park especially within 5 Km range of the Park.
- 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.

10.5.1. 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. 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 –

- A. Native wild population
- B. Domestic cattle of adjoining villages

10.5.2. 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

Tiger Conservation Plan, Buffer Zone

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.

10.6. 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.

“Death rate” 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 (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 CTR 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 have to come from such studies to minimise un-natural deaths of wildlife.

Chapter-11

Tiger Population & Habitat Assessment

11.1. Daily Monitoring & Forecasting:

The prevailing practice of monitoring of Tiger should be augmented by a system of 'daily monitoring' and regularly generating weekly reports. It will be done through MSTRPIES method . 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 CTR 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 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

Tiger Conservation Plan, Buffer Zone

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 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

Tiger Conservation Plan, Buffer Zone

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 6m 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 1.5km. The PIPs should be cleaned of debris, leaf litter and gravel and covered with fine dust of about 0.5cm 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.

Tiger Conservation Plan, Buffer Zone

-Format for recording the 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>
11	Sloth bear	<i>Present</i>	<i>Not present</i>

11.2. 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, the countrywide monitoring of tiger population was based on the identification of individual pugmark by experts. 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.

Tiger Conservation Plan, Buffer Zone

11.2.1. 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 -

- 1) Tiger presence & relation 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.

11.2.1.1. 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

Tiger Conservation Plan, Buffer Zone

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.

- 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

Tiger Conservation Plan, Buffer Zone

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.

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 (√ 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 (√ 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.

Tiger Conservation Plan, Buffer Zone

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 _____, _____.

6. Comments & Remarks:

Figure 1. Sampling for tiger sign



11.2.1.2. 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.

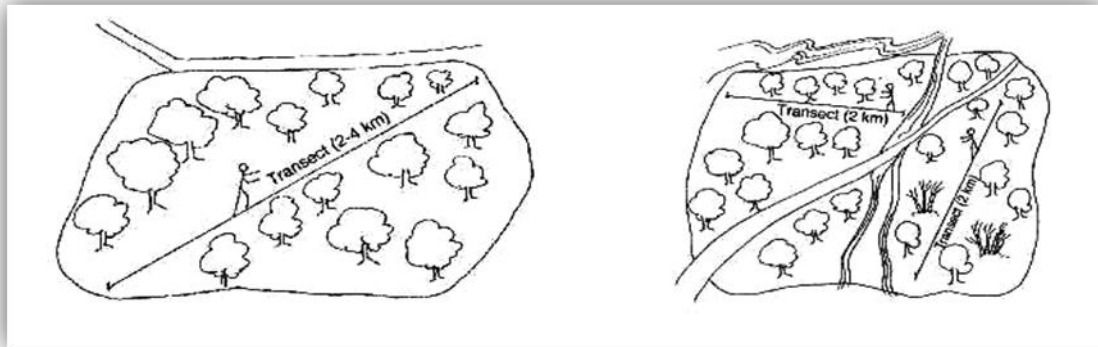


Figure 2. Marking Transects in a Beat.

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 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

Tiger Conservation Plan, Buffer Zone

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.

Data Sheet - 2

Encounter Rate on Line Transects

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



11.2.1.3. 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 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.

Tiger Conservation Plan, Buffer Zone

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 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).

Tiger Conservation Plan, Buffer Zone

Data Sheet-3A

VEGETATION (15m plot)

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

Range: Beat: ID No. of Line Transect:

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.

Tiger Conservation Plan, Buffer Zone

Data Sheet-3B

Human Disturbance

Name of Observer: Date: Forest Circle: Forest

Division..... Range:

Beat: ID No. of Line Transect:

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

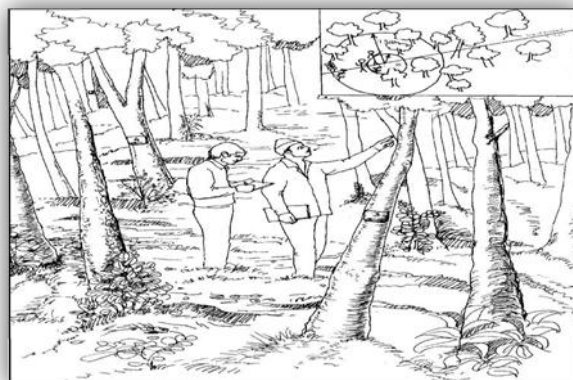
Are there any permanent human settlements in the beat? (Yes/No). If Yes, how many? _____. Approximate human population _____, approximate livestock population _____ Cattle, _____ Goat/Sheep, _____ Other Livestock.

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.



Tiger Conservation Plan, Buffer Zone

Data Sheet-3C

Recording Ground Cover $\frac{1}{4}$ 1 m radius or 2m diameter plot $\frac{1}{2}$

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

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

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 cover in a 1m radius circular plot

Figure.6. Estimating ground



Tiger Conservation Plan, Buffer Zone

11.2.1.4. 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.

- 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



Tiger Conservation Plan, Buffer Zone

Data Sheet-4

Pellet Counts of Ungulates

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

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

Plot No.	Forest Type	Terrain Type	Chital	Sambar	Wild Boar	Nilgai	Elephant	Barking Deer	Hog Deer	Hare	Langur	Cattle	Goat & Sheep	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.

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

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.

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 expert would act as observer wile official in charge insure adherence to the

Tiger Conservation Plan, Buffer Zone

prescribed protocol and transparency of protocol implementation. This system will also monitor the status of other biodiversity resources.

11.2.2. Phase II: Spatial and attribute data:

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

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

Phase 3 of the methodology answers the questions 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.

11.2.4. 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

Tiger Conservation Plan, Buffer Zone

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.

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. CTR 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

Tiger Conservation Plan, Buffer Zone

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 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-2/2**.

11.3. 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.

11.4. 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. Satellite data will be used and classified into vegetation and land use maps on a 1:50,000 scale, with digitized data relating to contour, villages, roads, drainage, administrative boundaries and soil. The spatial layers would be attached with attribute data, viz. human population, livestock population, meteorological data, agricultural

Tiger Conservation Plan, Buffer Zone

information and field data pertaining to wildlife, habitat for evolving regional protocols to monitor tiger and its habitat.

11.5. 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 following activities.

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/whatsnew /Protocol_Phase_IV_Monitoring_r. pdf](http://projecttiger.nic.in/whatsnew/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 1111,11111 individual tiger ID records is suggested.

Tiger Conservation Plan, Buffer Zone

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 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 *ExtractCompare* 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.

Tiger Conservation Plan, Buffer Zone

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. CTR) or Source Site (here Forest Divisions like Ramnagar, Tarai West and Lansdowne), keeping in view 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 co-ordinates 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

Tiger Conservation Plan, Buffer Zone

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 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

Tiger Conservation Plan, Buffer Zone

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-CAM1112-MC003*

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-Cam1112-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.

Tiger Conservation Plan, Buffer Zone

- 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*'.

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:-

Tiger Conservation Plan, Buffer Zone

'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.

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.

Tiger Conservation Plan, Buffer Zone

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'.
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 right flank

'Data Form E':

1. 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.
2. 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 right flank	Temporary Tiger ID	Sex	Age

All Ranges of CTR 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

Tiger Conservation Plan, Buffer Zone

of tiger habitat. The areas in question are frequented by tigers from CTR and vice versa. The Phase-IV tiger estimation shall be carried out by these divisions annually and the CTR administration will guide them. The results should be regularly reviewed by the Chief Wildlife Warden, Uttarakhnad. One MoU was executed between NTCA and CWLW, Uttarakhand for funding of these divisions. The MoU has been given as **Annexure-11/1**.

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.

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 implemented by technically fully qualified personnel.

Tiger Conservation Plan, Buffer Zone

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

All images (including tigers), electronic 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'.

- 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*

Tiger Conservation Plan, Buffer Zone

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 NH24 .

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.

Example: copy images from *Mr. ABC-8-10-2012 > KA-Cam1112-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-Cam1112' was deployed in two locations, the folder *SantoshNaik-8-10-2012 > K4-Cam1112-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-Cam1112-MC003* into folder *NH24 > {images captured at Camera Trap Location ID NH24}*, and images captured in location NH25 from *SantoshNaik-8-10-2012 > K4-Cam1112-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.

Tiger Conservation Plan, Buffer Zone

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 Appendix 1).

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.

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.

Tiger Conservation Plan, Buffer Zone

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).

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-111680, 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)

Tiger Conservation Plan, Buffer Zone

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

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.

Tiger Conservation Plan, Buffer Zone

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-12

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 are victims of man-animal 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 and records substantial increase of number of tigers and elephants. 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 security in the Corbett tiger reserve can be enhanced by dividing the areas in various zones having similar protection needs as follows:

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

Only the buffer area of the above ranges is included in the above security zones.

Protection and intelligence gathering in the buffer area is of not much difference. The geographical peculiarity of CTR does not give any relaxation of protection measures as compared to the Core Zone. Following are the principles on which the protection mechanism will be developed and implemented.

1. Periodic review of the existing patrolling camps/chowkis in Protected Areas, so that each chowki/patrolling camp has, on an average, an area of 7-8 sq. km. under its jurisdiction to ensure the desired amount of legwork by beat guards and his camp

Tiger Conservation Plan, Buffer Zone

followers posted in such patrolling camps/chowkis. Beat reorganization is under progress. The chowkis for the beats will be strategically located.

2. Prescribing a daily schedule of patrolling keeping in mind the vulnerability of the area from protection point of view.
3. Maintaining a monitoring/daily observation register in each patrolling camp/chowki in the local language preferably, in which the field personnel can record their daily observations based on patrolling.
4. Adopting a regular supervision schedule for field officers, along with minimum patrolling to be done by them jointly with patrolling camp/chowki staff.
5. Maintaining a system of “surprise checks” of chowkies/patrolling camps by senior officers.
6. Keeping a record of the local village level market days in the peripheral areas, and deploying staff in civil dress to keep track of any untoward incident/transaction relating to wildlife.
7. Organising vehicular patrolling by constituting squads comprising of field staff, labourers and police/SAF personnel, tools (if necessary), with wireless handset and paraphernalia for apprehending offenders, apart from prescribing a patrolling calendar for the squad.
8. Maintaining a list of vehicles passing through manned barriers, and surprise checks by senior officers at such points every month.
9. Evolving a monitoring system for collation of information regarding livestock depredation/human injury/loss of human life/large scale crop depredation by wild animals through wireless network and prompt payment of compensation as per Citizens’ Charter.
10. Wherever half eaten carcasses of livestock on account of carnivore depredation are reported, such carcasses should be incinerated in the presence of a gazetted officer to eliminate the possibility of poisoning for revenge killing retaliation by local people.
11. In areas where more than three incidents of livestock depredation are reported within a fortnight, continuous monitoring based on field evidences should be done by deploying trackers.
12. Ensuring monthly meetings with the neighbouring district officials for exchanging wildlife crime dossiers to facilitate joint action.

Tiger Conservation Plan, Buffer Zone

13. Exchange of crime dossiers with local police to facilitate their updating, apart from organizing monthly review meetings with the District Superintendent of Police.
14. Periodic meetings with the District Judge to expedite the disposal of pending cases relating to wildlife offences.
15. Organising surprise raids jointly with the local police in railway stations, local trains, bus-stops, buses and cafeteria.
16. Ensuring special site-specific protection measures, during monsoon such as 'Operation Monsoon' –considering the terrain and accessibility of Protected Areas.
17. Organising inter-state meetings at least once in three months, to exchange wildlife crime data between border Parks/Tiger Reserves/Sanctuaries.
18. The area should be constantly monitored to ascertain the presence of gangs and wandering pastoral people, apart from keeping an inventory of their temporary settlements.
19. Wherever EDCs have been constituted, a village level crime register should be maintained at the EDC level to keep track of villagers involved in wildlife offences.
20. At the range level, dossiers of habitual/ incorrigible offenders should be maintained, to help in tracing new crimes to old offenders.
21. Identifying local persons and imparting them the basics of wildlife crime detection so as to avail their services as and when required as informers.
22. Preparing a monthly crime map of each Protected Area on a 1:50,000 scale indicating the locations of each crime with date. It should also highlight the recorded cases of live stock depredation by carnivores during the period.
23. Patrolling camp/chowki staff should be instructed to collect field evidences like pugmarks, plaster cast of foot-prints on a regular basis, so that individual identities of carnivores like tiger can be fixed. This would serve as a continuous monitoring also.
24. Laying out impression pads near water points in villages to ascertain the presence of carnivores in the area.
25. Constituting a Defence Squads comprising of local, proactive villagers at the EDC level, which can assist the PA staff in apprehending miscreants involved in wildlife poaching.

12.1. Deployment of native workforce:

Corbett Tiger Reserve was ravaged by organised elephant poaching in 2001. At that time the tiger reserve was facing with difficulties in terms of lack of infrastructure

Tiger Conservation Plan, Buffer Zone

and man power to protect the wildlife and its habitat. The serious threat of poaching saw launching of protection force in the form of 'Operation Lords' and 'Tiger Protection Force'. It was a much awaited assistance from NTCA. The protection scheme opens employment opportunity for local youth of adjoining villages. The 'Operation Lords' was constituted by 250 young daily wage earners who were deployed in the outer boundary of the Reserve. Similarly 'the tiger protection force' gave opportunity of employment for ex-army jawans. This force is constituted by 100 such personnel. Their main task was patrolling along with collection of intelligence from their villages. It proved highly beneficial in terms of protection as well as establishing good relationship with the villagers. The scheme is still continuing and should be continued further. This force has been given basic minimum facilities like uniform, cap, walking shoe and winter clothing.

The ambitious 'Special Tiger Protection Force' will be constituted soon. It is also a central sponsored scheme. The STPF will have 90 forest Guards, 18 Foresters, 3 Range Officers and one Assistant Conservator of Forests. Out of the 90 forest guards, 27 will be inducted from the local Gujjars which will again provide employment opportunity as well the benefit of their knowledge about the terrain and movement of animals.

Apart from the 'Operation Lords' , 'Tiger Protection Force' and STPF, hundreds of locals are getting employment as 'Fire Watchers' during the fire season.

12.2. Patrolling Strategy including Joint Patrolling:

The threat perception is different in different areas of the park 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. 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.

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.

1. The **first zone** is important for intelligence gathering, crime detection, man-animal conflict and control on illegal wildlife trade. The area is manned by the staff posted

Tiger Conservation Plan, Buffer Zone

at the periphery, youths of nearby villages working as Operation Lord labours who doubled up as informers and Jawans of Tiger Protection Force.

2. 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.
3. 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.

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 man-animal 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

Tiger Conservation Plan, Buffer Zone

(selected by the SDO) continuously for 5-7 days and cover a distance of about 80-120 km. The track of the petrol 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 petrol 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.

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.

Tiger Conservation Plan, Buffer Zone

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 as well the army remount unit at Hempur.

ii. Beat patrol plan:

- Sensitive zone have been identified in every beat.
- 4-6 patrol routes are designed based on above information.
- 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

Tiger Conservation Plan, Buffer Zone

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. Because of CTR's topography, one never knows which area is still un scanned. CTR has taken an initiative in this direction. GPS technology is being used to help frontline staff in patrolling. This helps in identifying un scanned areas with help of GPS unit. Proper and effective scanning can be done in larger areas with lesser physical activity. For those, who are interested in technology, it makes patrolling a bit interesting.

2. Protection through electronic surveillance:

i. Application of GPS for monitoring of patrolling in CTR:

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 1120 mtrs. Several rain fed rivulets pass through it. On northern & southern side of CTR habitations are interspersed with forest areas. Southern part usually forms boundary with U.P. and is most vulnerable area of CTR. 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.

Tiger Conservation Plan, Buffer Zone

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 –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:-

- 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 or software map, 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 –

Tiger Conservation Plan, Buffer Zone

- Authentic record/documentation of scanning exercise is available.
- Guidance to demarcate next patrol 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 managers' 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 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 need 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 which will have a copy in the Directors' office. The practice of utilizing GPS for patrolling

Tiger Conservation Plan, Buffer Zone

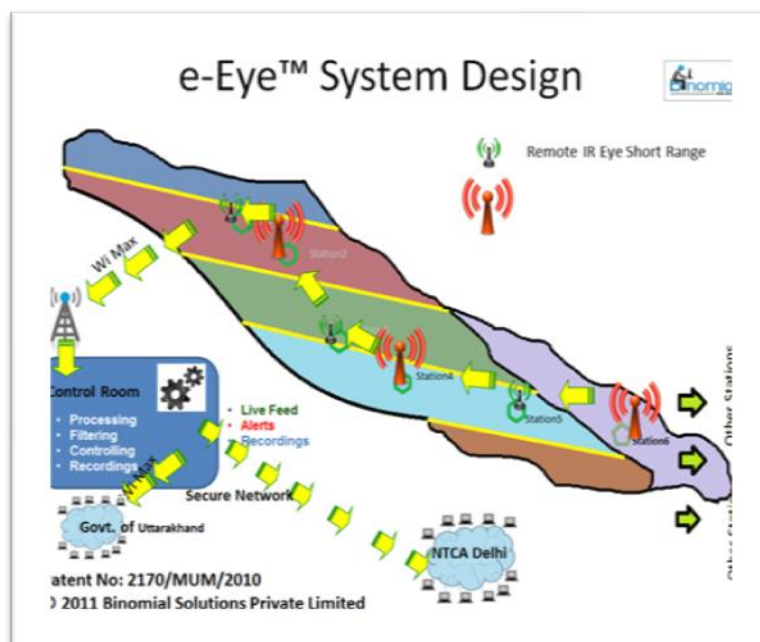
is well developed in the Dhela, Klagarh and Jhirna Ranges which are on the most sensitive southern boundary of Corbett Tiger Reserve. Inadequacy of fund is the constraint to equip all the patrolling parties of remaining Ranges with GPS which need to be addressed. Advanced GPS with larger data capacity 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 among the 41 tiger reserves of India.

Though it is installed in the southern boundary of the core zone, but its mention in the buffer plan is relevant due to the fact that NTCA has shown its willingness to put this system in the buffer zone as well.

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.



Tiger Conservation Plan, Buffer Zone

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 CTR with strategically placed nine towers having long range thermal sensors cameras. The southern boundary of CTR 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. Though this 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 who need to be imparting training to willing forest staff to manage the

Tiger Conservation Plan, Buffer Zone

system when the experts finally handed over the control. Since the control room runs from the 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:

Sl 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



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:

Tiger Conservation Plan, Buffer Zone

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.	HathidangarChauki 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.		

Below image shows the details of each points.



12.3. Maintenance of Village Level Crime Dossiers

A village level crime register should be maintained at the EDC level to keep track of villagers involved in wildlife offences. The village level crime dossier related to wildlife crime is an important document to monitor the movement of potential poachers and trouble makers. The area should be constantly monitored to ascertain the presence of gangs and wandering pastoral people, apart from keeping an inventory of their temporary settlements. This document will also record about deaths of wildlife occurred on the vicinity of the villages and name of the locals who have basics of wildlife crime detection so as to avail their services as and when required as informers

Tiger Conservation Plan, Buffer Zone

The dossiers will be exchanged with local police to facilitate their updation. The concerned Range Officer will be responsible for the overall maintenance of the register. He will assist the EDC to actively participate in this endeavour.

12.4. Fire protection:

Corbett Tiger Reserve is highly vulnerable for 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. Though no major fire incidents has been occurred due to extremely cautious field staff and rigorous implementation of the 'fire plan'. 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.

Tiger Conservation Plan, Buffer Zone

Strategy for fire protection:

Summer fire in the Park 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 park 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 CTR 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 monsoon. There should be additional provision of extra fire watches only in the event of serious dry spell.

Tiger Conservation Plan, Buffer Zone

7. Roads used by public as well as tourists will be regularly cleaned to remove inflammable material.
8. Floating crew centres should be established according to the prescription of the forest fire sensitivity study. A crew should be manned by 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 forest fire. Periodic clearance operation, like lopping and clearing of inflammable material below the power line should be carried out.

Note: Detail of the forest fire management operation can be referred from the 'Annual Forest Fire Plan'.

12.5. 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

Tiger Conservation Plan, Buffer Zone

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 shopkeeper, taxi drivers, hoteliers and some wildlife-oriented persons may provide valuable information.

Collating of intelligence information needs specializing training which is lacking in the part of the CTR. 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 CTR 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 on 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 the CTR but also the Corbett Landscape. For proper coordination following measures may be taken –

1. **Meeting with S.P.** – There should be a regular meeting with S.P. of concerning district and sub-ordinate staffs to review the crime against wildlife. The exchange of crime dossiers must be carried out at range and police station level by concerning range officer and police station in-charge.
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 wildlife crime dossier 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.

Tiger Conservation Plan, Buffer Zone

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.

Chapter-13

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, only 12.1% 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.

13.1. 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

Tiger Conservation Plan, Buffer Zone

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 tourism (particularly in the adjoining civil 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

Tiger Conservation Plan, Buffer Zone

(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 order dated 21-11-2012 is appended as **Annexure-5/2**.

The State Government also cancelled the tripartite agreement which was not conducive for the conservation of tiger and its habitat. The tripartite agreement was facilitating four private operators to conserve 'Mahasher Fish' through angling by tourists in the stretches of Ramganga river in the buffer zone. The State Government order dated 28-11-2012 has been appended as **Annexure-13/1**.

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-13/2**.

Principles:

The 'Tourism Plan' is based on following principles.

- The plan will ensure that the primary objective of tiger conservation is not compromised.
- 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 , including Gujjars in the process decision making;
- Developing mechanisms to generate revenues from wildlife tourism for the welfare and economic upliftment of local communities;

Tiger Conservation Plan, Buffer Zone

- 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;

A. Tourist zones in buffer area:

This is one of the most sensitive zones of CTR. There are five tourist zones available for tourists, of which the entire Durgadevi tourist zone lies in the buffer area. The area statement of the zones of buffer is as follows:

Status of Tourist Zones in buffer area of Tiger Reserve:

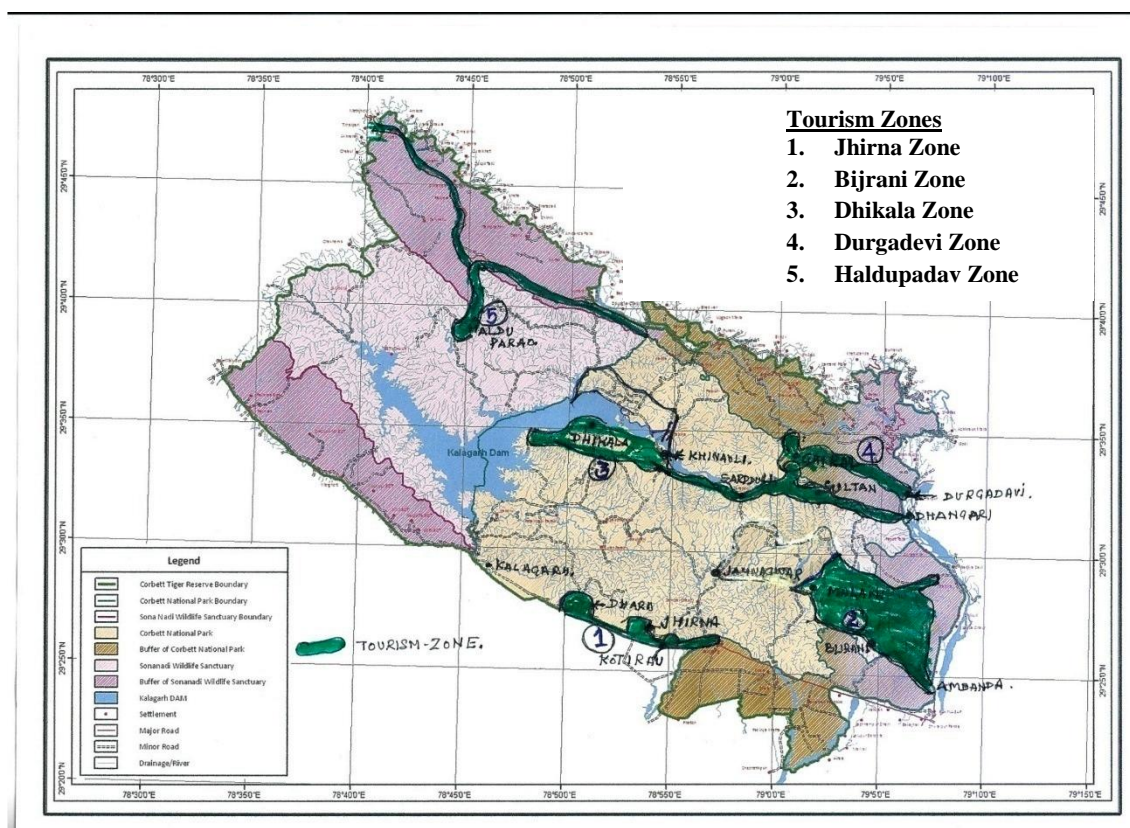
Sl No.	Name of the Tourist Zones	Area in the Buffer Zone
1.	Dhikala	1.8 Sq. km
2.	Bijrani	10.85 Sq. km
3.	Jhirna	8.21 Sq. km
4.	Sonanadi	0.19 Sq. km
5.	Durgadevi	0.12 Sq. km
	Total Area	21.17 Sq. km

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.

Tiger Conservation Plan, Buffer Zone

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.

Map showing tourism zones of Corbett Tiger Reserve.



1. Dhikala Tourism 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. It has only 1.8 Sq.km area under the buffer zone, which is known as the Gairal complex. The entire tourist zone spreads through 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. Detail of Dhikala zone has been discussed in the chapter-11 of the Tiger Conservation Plan of Core zone. The Gairal tourist complex is one of the best destination of the buffer zone if not of the entire CTR. The facility is endowed with the breathtaking beauty Ramganga river

Tiger Conservation Plan, Buffer Zone

flowing along the zone. It has a heritage type rest house popularly known as Old FRH. A new FRH along with dormitory are also available.

2. Bijrani Tourism 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 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:

It was a conscious decision by the authority to keep the Jhirna zone open throughout the year for the protection of wildlife and habitat. Since this zone situated in the highly sensitive southern part of the tiger reserve, it is mandatory to keep the roads maintained for vehicular patrolling. Tourism in this zone during the monsoon season is an offshoot of the protection requirement of the tiger reserve. By doing so some people who could not visit the part during the season, can have a chance to see one of the most beautiful part of Corbett. This generates goodwill among the prospective tourists, creates employment for guides, etc. Apart from that, this is the only zone that offers serious bird watching by experts and enthusiastic round the year. Besides it is giving opportunity for field visit by officers and trainees of various institutions, it also provides employment to tourist guides and tour operators.

However heavy rain fall often damage the roads which sometimes causes difficulties for the tourists but that does not stops patrolling by the staff.

This zone has a two room forest rest house along with an annexe having additional two rooms. A small canteen caters to day visitors as well as the tourists who spends night in the rest house. The canteen needs major repair and it should be shifted away from the rest house.

Tiger Conservation Plan, Buffer Zone

4. Sonanadi Tourism 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, otters, crocodile and tigers. Other forest rest houses in buffer area Pakhrao, Mundiyanpani and Rathwadabh.

5. Durgadevi Tourism Zone:

The Durgadevi Tourism Zone is entirely situated in the buffer area of the tiger reserve. Since this chapter is dedicated to management in the core area, the detail of this zone has been given in the Buffer Plan.

6. Further details about the zone wise facilities:

Following are the tourism zones operating in the 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 Khara, and Kalagarh colony gate.	Morning & Afternoon - 30 Gypsy each.	3 FRHs having 6 rooms. One at Jhirna, Dhela and the other at Kalagarh. 2 rooms are also available in the annex of Jhirna FRH.	Open throughout the year.
2.	Bijrani. The entry gate is at Amdanda.	Morning & Afternoon - 30 Gypsy 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 5 Canters. Each canter have 18 seats.	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.	Durgadevi Zone. The entry gate is at Durgadevi.	Morning & Afternoon - 15 Gypsy each.	Lohachaur and Kanda FRHs has two rooms each.	15 th June to 15 th November.
5.	Sonanadi Zone The entry gate is	FRHs like Haldupadav,	18 rooms are available at Morghatti, Pakhrau,	15 th June to 15 th November.

Tiger Conservation Plan, Buffer Zone

	at Vatanvasa.	Morghati	Haldupadav, Rathuadhav, Mudiapani and Sindhikhal.	
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7. Forest Rest Houses of Buffer area of Corbett Tiger Reserve:

There are splendid forest rest hoses available for use of tourists. They will be promoted to attract serious tourists who found pleasure from the sheer beauty of forests and wildlife not tigers. These areas has abundant population of wild animals including tigers and are known for bird watching. The varied nature of forests provides excellent opportunity for bird watching which is not possible in the tourist zones of core area.

8. Forest Rest Houses of CTR Buffer and adjoining Forest Divisions:

Sl. No.	Name of Forest Rest Houses	Range
1.	Dhela	Dhela Range, CTR
2.	Gargia	Sarpduli Range, CTR
3.	Kalagarh	Kalagarh Range, CTR
4.	Pakharau	Sonanadi Range, Kalagarh Division, CTR
5.	Morghatti	Sonanadi Range, Kalagarh Division, CTR
6.	Sendhikhal	Palen Range, Kalagarh Division, CTR
7.	Haldupadav	Palen Range, Kalagarh Division, CTR
8.	Mundiapani	Adnala Range, Kalagarh Division, CTR
9.	Rathuadhav	Adnala Range, Kalagarh Division, CTR
10.	Kanda	Maidavan Range, Kalagarh Division, CTR
11.	Lohachoud	Mandal Range, Kalagarh Division, CTR
12.	Sitavani	Kota Range, Ramnagar Division
13.	Pawalgarh	Dehchuri Range, Ramnagar Division
14.	Phanto	North Jashpur, Range Tarai West Division
15.	Mohan	Mohan Range, Almora Division
16.	Saneh	Kothri Range, Lansdowne Division
17.	Choukhamb	Kothri Range, Lansdowne Division
18.	Kohluchaur	Kothri Range, Lansdowne Division
19.	Nauri	Duggada Range,

Tiger Conservation Plan, Buffer Zone

An exclusive reception infrastructure is under construction at Kotdwar to facilitate entry of tourists from Kotdwar which has excellent railway and rail connectivity with Dehli and Dehradun.

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 damaged due to 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.

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	Remain open throughout Year (??)	
4.	Sonanadi	15 th November	15 th June
5.	Durgadevi (in the Buffer area.)	15 th November	15 th June

13.1.2. 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.

Tiger Conservation Plan, Buffer Zone

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 the 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 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 staffs 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.

The tourism activity also brought its effect of mushrooming of tourist facilities just outside the border of the Tiger Reserve. Dhikuli, Mohan and Savaldev are the cases in point. These infrastructures have its adverse effect on the free movement of wildlife including tigers that required crossing over to the adjoining forests of Ramnagar and Tarai West forest divisions. Koshi river flowing through Ramnagar forest division is the most valuable water source for elephants and other wildlife. The resorts and hotels operating on the bank of Ramganga River are the potential sources of pollution.

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.

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.

Tiger Conservation Plan, Buffer Zone

13.1.2.1. Strategy:

A. Need for responsible tourism:

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 CTR management has imposed strict discipline for visiting tourists.

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 park, as the case may be. Some of the important regulations are as follows.

- a. All tourists should sign indemnity bond before entering into a zone.
- b. No tourist or vehicle should enter into areas restricted for tourism.
- c. Visitors should keep a minimum distance of more than 20 meters from all wildlife.
- d. 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.
- e. No tourists are allowed to disembark from vehicle while on excursion.
- f. All vehicles are subject to random checking at the entry points.
- g. Only green and registered vehicles can enter into the tourism zone.
- h. All vehicles should be accompanied by registered nature guides.
- i. No horn, music and any kind of loud noise is allowed.
- j. The tourist zones are free from polythene.

Tiger Conservation Plan, Buffer Zone

- 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. Drinking, smoking and chewing tobacco is strictly prohibited.
- q. Any other rule as framed by the authority based upon the prevailing situation.

Apart from above, whatever suitable suggestions come from different sources for restricted and controlled ecotourism, the management implement them after thorough examination.

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 Gypsies into olive green. It was also decided to allow only those gypsies who are registered with the tiger reserve management. Stickers has 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 except in Dhikala, where very restricted number of private vehicles can get entry on humanity ground.. 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 Vehicular Act and antecedent 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

Tiger Conservation Plan, Buffer Zone

well as aware them regarding good practice of 'responsible tourism'. Basic amenities will be provided at the tourist facility centre.

5. Tourists can avail the permission to enter into the park through 'Online Booking Facility'.
6. Under no circumstances, the number of the tourists should be increased from the prevailing limit approved by the Government.
7. 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.
8. The seven elephants should be put more for patrolling duties than to carry tourists.
9. 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.
10. No canteen can serve non-vegetarian food to tourists and even officers on inspection.
11. The canteens and nature shops available inside the core area should be managed by Tiger Conservation Foundation.
12. The tiger reserve authority should review the regulations and at liberty to impose further restrictions to discipline tourist activities.

The SDO, Bijrani, SDO Kalagarh, SDO Sonanadi and SDO Adnala should be responsible for the smooth running of the various provisions regarding ecotourism, in their respective tourism zones which falls 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 Deputy Range Officer who will conduct day to day administration and report to the SDO concerned. The Deputy Director and DFO Kalagarh will oversee the various aspects of eco-tourism in their respective areas.

Tiger Conservation Plan, Buffer Zone

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 park 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 CTR 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 park authority and guides/drivers is necessary but it often remain ineffective due to political intervention and misguiding 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 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

Tiger Conservation Plan, Buffer Zone

with tourists and park 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 suits.

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 them away from a tiger-centric obsession. A periodic assessment of their performance shall be reviewed by the LAC before reissuing their licenses.

6. Booking facility:

1. Visitors can book their accommodation in FRHs by applying to the Director of Corbett Tiger Reserve. The visitors are issued permits by paying the scheduled rate fixed by the Government of Uttarakhand. Online booking facility has been started

Tiger Conservation Plan, Buffer Zone

for morning and afternoon excursion and for night stay in the Forest Rest Houses. The tariff fixed by Government of Uttarakhand, which was made operational from 01-01-2010 has been given in **Annexure-13/3**.

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-13/2**.

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

Tiger Conservation Plan, Buffer Zone

- | | |
|---|--------------------|
| 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- "decible" 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 an energy mean of the noise level over a specific period.

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 as far as possible Mahavats should be responsible for such kind of 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 CTR. 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

Tiger Conservation Plan, Buffer Zone

will be encouraged to take photographs. Photographs are required for park 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 training and workshop on bird watching should be carried out by involving famous 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.

12. Management of canteens and nature shops:

The canteens situated at Dhikala, Gairal, Bijrani and Jhirna should be managed by the Staff Welfare Society which is a registered body under the control of '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 meager 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 difficult for the tourists to afford the high cost, and more particularly for the staff and guides/drivers. These problems can be removed by doing away with the process tender and handing over the management of canteens to the foundation. Similar process should be followed to manage the nature shops available at Dhangarhi and Bijrani.

Tiger Conservation Plan, Buffer Zone

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. But before any new constructions, the existing ones should be maintained properly.

14. Canter:

For safety of the tourists, it is the responsibility of the in-charge of eco-tourism unit to inspect the Canters 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 Gypsies. The concerned SDOs will ensure the minimum standard of safety of the Gypsies in the respective zones under their jurisdiction.

B. Restriction on infrastructure:

As 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, similarly the relocation sites of Corbett Tiger Reserve, such as Laldhang, Dhara, Jhirna and Kothi Rau will not be used for tourism infrastructure. Same will be the case for future relocation of the Gujjars from the core as well as from the buffer areas, and the relocation of other abandoned villages from the buffer areas of the Tiger Reserve.

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-13/4**.

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

Tiger Conservation Plan, Buffer Zone

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. This will ensure that resources generated from tourism can be earmarked for protection, conservation and local livelihood development, tackling human-wild animal conflict and welfare measures of field staff. The prevailing rate of contribution of 20% will be enhanced to hundred percent as per the decision taken in the Governing Body meeting.

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-13/5**). 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 reservation 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 before the honble court. Those comments were approved by the State Government .

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

Tiger Conservation Plan, Buffer Zone

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).

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.

Two Local Advisory Committees (hereinafter referred to as LAC) will be constituted for Corbett Tiger Reserve by the State Government, one under the Chairmanship of Commissioner, Garhwal and other under the chairmanship of Commissioner, Kumaon.

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.

Tiger Conservation Plan, Buffer Zone

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.
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.

Tiger Conservation Plan, Buffer Zone

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.

The Chief Wildlife Warden will have following mandates (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.

(One under the Chairmanship of Commissioner, Garhwal and other under the chairmanship of Commissioner, Kumaon.)

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

Tiger Conservation Plan, Buffer Zone

9. Official of the State Tribal Department
10. Concerned Members of Local Panchayats (2)
11. One Wildlife scientist nominated by the Director, WII, Dehradun.

In addition to the above, special invitees can be co-opted as per the specific requirement.

G. 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 park 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.

H. Development of alternative destinations:

All most all tourism activity in Corbett Tiger Reserve is concentrated in the core area. As per the norm suggested in the NTCA guideline, as against 20% of the core area allowable for tourist activity in core/critical tiger habitat of a the tiger reserves, the CTR is allowing approximately 12 percent of the core area for responsible tourism (as per the guideline, the prevailing area should not be exceeded). The core area has been notified as Critical Tiger Habitat by the Government of Uttarakhand. Since the Wildlife Protection Act 1972 under section 38V– 4 (i) mandates that the core area should be kept as inviolate for the conservation of tiger and tiger habitat., the tiger reserve cannot afford to bear the disturbances caused by the activities of tourism. But at the same time the un-denying fact is that Dhikala is the most favoured destination of tourists not only from India, but also abroad. It has a great potential of income generation for the local investors, guides, room attendants, etc. In this scenario, it is extremely necessary to regulate the activities of the tourists and management of tourism related infrastructure to keep the wildlife in general and tiger in particular, safe from the impact of tourism. Under no circumstances the area of the tourism inside the core area should be increased from the prevailing limit. Effort should be made to develop alternate tourist destinations in the buffer and areas under neighboring forest divisions like Ramnagar Forest Division, Tarai West Forest Division and Lansdowne Forest Division, so that core area of Corbett Tiger Reserve could be maintained as an inviolate zone as envisaged in the Wildlife Act. Some of the outstanding natural sites available around the Corbett Tiger

Tiger Conservation Plan, Buffer Zone

Reserve are already discussed in this chapter. It is reiterated that Morghatti, Rathudhav, Sitabani, Phanto, Pavalgarh, Chaukham etc. should be publicized by the respective forest divisions to attract more tourist. This will cater to the ever growing aspiration of tourists to enjoy nature as well as regular movement of tourists will save the forest from the destruction of flora and fauna by vested interests. Since alert tourists always help foresters by giving information about any kind of unsolicited development inside the forests. This kind of efforts will boost local livelihood opportunities and harness goodwill of local people.

In that direction, a *progressive closure mechanism* should be drawn under the direction of Chief Wildlife Warden to shift the focus of tourism from core areas of Dhikala, Bijrani, Jhirna and Sonanadi tourism zones to other areas at the periphery of CTR. This will be possible by creating infrastructure and developing visitor facilities and amenities in the new tourism zones proposed on the outskirts of CTR.

Since the prime requirement of the tiger reserve is to reduce tourist pressure on the core areas, following new destinations can be explored to divert the tourists, which will make them more participatory towards the cause of conservation, without sacrificing their prime motto to spend quality time with the nature.

I. Some areas suggested for opening as new destinations are as follows:

- a. Area between Aamdanda and Chota-Panod including the one behind Garjia FRH which has an existing network of old contractor roads.
- b. Gairal (being inside buffer) can be developed as a new destination for night stay inside the TR and the forest on the right bank of Sanguri Sot can be made into the safari area.
- c. After the completion of relocation of village Laldhang, the vacated site will also be added to the Jhirna ecotourism zone.
- d. Phanto area of CTR and Terai West Forest Division can be developed into one of the finest birding destinations.
- e. The area adjoining to vatanvasa can be developed as a new tourism zone.
- f. The forest areas of Lansdowne (saneh, Kolhu-chaur) and some area of CTR together can be developed as a fantastic night stay zone for nature lovers.
- g. Treck routes can be developed along the Domunda, where small groups can treck along the Ramganga river. Similarly small circuits' can be developed for bird watching.

Tiger Conservation Plan, Buffer Zone

- h. There are many rest houses along the southern boundary of the tiger reserve as well as in the Kalagarh Forest Division. These rest houses remain under utilized, may be because of the brand value of Dhikala, Bijrani and Jhirna. It is due to lack of marketing strategy of the management. The Foundation can do a lot towards popularising these destinations and increase the income.
- i. The buffer forest of Corbett Tiger reserve is no way inferior to the core areas. In fact some patches are more endowed than the core area. The area along the southern boundary adjoining to Lansdowne Division, the Durgadevi zone of Kalagarh Division, the Vatanvasa, Mundiapani, Halduchaur forests are blessed breathtaking beauty.
- j. Kotdwar has the potential to emerge as one of the best entry gates for one-day wildlife tourism. Various motorable routes are available and such routes should be managed in a way that the tourists can see maximum area without hampering the tranquility of the forest and wildlife. Efforts should be made to discourage night-stay in the FRHs , belongs to such route. That may cause extra burden upon staff for managing the need of the tourists and will affect the habitat of the wildlife. A well planned day visit with brief halt at rest houses will certainly attract tourists in this unexplored regions. Proper marketing strategy should be designed by the help of professionals to aware prospective tourists to visit the proposed areas.

The proposed routes are as follows:

Onward routes	Reverse routes
1. Kotdwar-Saneh-Koluchaur	Chaukham-Koluchaur-saneh-kotdwar
2. Kotdwar-Saneh-Koluchaur	Chaukham-dhimki-naudi-morakhal-duggada-kotdwar
3. Kotdwar-Saneh-Koluchaur	Laldarwaja-kamlavan-pakhrau-kotdwar
4. Kotdwar-Saneh-Koluchaur-laldarwaja	Kandikhal-haldupadav-vatanvasa-dhontiyal
5. Kotdwar-vatanvasa-lalbag- Kandikhal	Haldupadav-kakadidhang-vatanvasa
6. Kotdwar-vatanvasa-chitanala	Gaujara-dhikala-hatipani-tauriyakhal-dhakarbatta
7. Kotdwar-rathusdhav-kalinko-kanda	Dhikala-hatipani-tauriyakhal-dhakarbatta-tauriyakhal-dhikala
8. Maidavan-lohachaur-durgadevi	Durgadevi-lohachaur-maidavan
9. Kotdwar-pakhrau-morghatti-kalagarh	Kalagarh-morghatti-tunusot-kotdwar

Tiger Conservation Plan, Buffer Zone

Special care has to be taken before opening of the routes for tourists. Such facilities should not become the reagent for mushrooming of resorts and hotels in the fringe villages. Adequate funds has to be invested to keep the routes operational during the tourist season. The Corbett Tiger Foundation has to finalize the details of tourist management in these routes.

- k. The management of such tourist destinations can be elaborated in sub-plan where all aspects like online booking, entry fee, trained guides, carrying capacity, delineation of different routes which cater to different activities like bird watching, study on butterfly, beetles, orchids, interaction with Gujjars and other villagers, coordination with different stake holders, rules and regulations for visitors, guides and tour operators etc., has to be incorporated.

J. Exploring the possibility of a Tiger Safari:

Though Corbett Tiger Reserve is known for its tigers and it attracts lots of tourists, many of them could not see tiger and they return with heavy hearts. It is a fact that maximum tourists are only interested with the sighting of tigers. Although the park administration is trying its best to educate and aware tourists to enjoy the breath taking landscape with wildlife such as elephants, deer and crocodiles, casual tourists always hunt for sighting of a tiger. At this point the recent guideline enacted by NTCA for setting up of a 'Tiger Safari' in the buffer area to divert casual tourists from the tourism zone which will ultimately benefit the habitat from unnecessary pressure from growing tourists. The tiger safari will generate huge revenue which will enrich the 'Tiger Conservation Foundation of CTR' and ultimately the fringe villagers. A detail proposal will be the prepared as per the guidelines of NTCA and CZA for funding by NTCA. There is a strong possibility of developing such a safari in Karnashram area of Lansdowne Forest Division.

K. Interpretation Centre:

The Corbett management had prepared an exhaustive plan for setting up of an high standard interactive and educative '*interpretation Centre*' at Amdanda of Bijrani Zone and submitted for approval before NTCA. Efforts should be made to peruse the matter with the NTCA to establish the interpretation Centre.

Tiger Conservation Plan, Buffer Zone

L. 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. | Park Warden | : Member |
| 5. | SDO, Kalagarh | : Member |
| 6. | A representative of CCF, Ecotourism | : Member |
| 7. | Range officer, in-charge of Ecotourism | : Member |
| 8. | A Special invitee from reputed NGO | : Member |
| 9. | A Special invitee from Resort Association | : Member |
| 10. | 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.

Tiger Conservation Plan, Buffer Zone

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.

13.2. 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 five canters for Dhikala for morning excursion and same number in the afternoon session. Each Gypsy can carry maximum 6 tourists, excluding the mandatory nature guide. The five Canter buses cater to maximum 90 tourists per trip. 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 CTR will be focal point to determine the carrying capacity of the tourist zones. The determined carrying capacity will be subjected to examination once in five years.

13.3. 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-13/6.**

Tiger Conservation Plan, Buffer Zone

13.4. Nature education:

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 Park authorities & thus obtaining their opinion. So it is necessary to have a separate interpretation programme of the Corbett Park the following steps will be taken for this purpose.

a. Signage: Corbett National Park has a tradition of having signs. Descent and educative signage have 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 should be prepared with the help of professionals. The web based information will be informative and compact. It will 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 park. 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. This good practice should be started by involving local as well as eminent personalities.

The newsletter will be distributed free of cost to gram sabhas and educational institutions, situated in the vicinity of CTR. 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 visinity of CTR; distinguished visitors to CTR

Tiger Conservation Plan, Buffer Zone

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 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 famous Bedi Brothers are commissioned to prepare a full length film on Corbett Tiger Reserve.

The other noteworthy films produced in CNP, such as *The Man-Eaters of Kumaon* produced by BBC and films on the various species was 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 merely used CNP as a backdrop for wildlife sequenced and cannot be really said to be films on Corbett. A NP like Corbett deserves to have a grand feature film, which can truly bring out its tremendous beauty, diversity and uniqueness to worldwide audience.

Tiger Conservation Plan, Buffer Zone

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 park authority.

1. The permission for foreign film producers should be cleared by a single window system at the level of Fiels Director and CWLW, after they obtained necessary permission from Ministry of External Affairs and NTCA.
2. Assistance from the park 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 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 CTR. Any violations which are reported to the park authorities will need to be taken up with the broadcasting agencies.
4. There seems to be an absence of a clear policy for filming for TV news programme. 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, CTR, 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.

Tiger Conservation Plan, Buffer Zone

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 by a high quality LCD projector at Dhikala. This practice should be continued and improved.

h. Film Library: Corbett Tiger Reserve regularly receives footage of TV Programme and soft copies of wildlife sequences from enthusiastic visitors and park 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 CTR. Such record will be very helpful in case of any legal disputes. The present practice of simply attaching permission letters into a loose file without any paging or record is unsatisfactory. In future, a *film register* should be maintained in the ecotourism-cell. Details of permission given and the fees received thereof should be meticulously entered in this register.

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 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.

Chapter-14

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 is 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.

14.1. Buffer areas Coordination Committee and its linkages with Tiger Steering Committee & Tiger Conservation Foundation

A. Buffer areas Coordination Committee: Corbett Tiger Reserve has its buffer area of 466.32 sq.km. This zone is under the administrative control of the Field Director. Taking into account of the large population of tigers in the adjoining territorial divisions like Ramnagar, Tarai West and Lansdowne, the NTCA has issued advisory to include all these divisions as buffer area of Corbett Tiger Reserve. By doing so these divisions will be recognised as part of Corbett Tiger Reserve and will be eligible to get substantial budget under 'Project Tiger Scheme'. This effort will certainly enhance the present status of protection of tigers and will improve the habitat. In this scenario, the Buffer Areas Coordination Committee encompassing above mentioned Forest Divisions as additional buffer area of Corbett Tiger Reserve will be formed after notification by the State Government. However good working relationship will be ensured between CTR management and authorities of Amangarh Buffer area of U.P.

Tiger Conservation Plan, Buffer Zone

B. 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 Minister—Chairperson;
 - (b) Minister in-charge of Wild Life—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;
 - (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-13/4**.

C. 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

Tiger Conservation Plan, Buffer Zone

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 9/1**. 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-9/2**.

The tiger foundation works on following objectives:

- (m) to facilitate ecological, economic, social and cultural development of the tiger reserve.
- (n) to promote eco-tourism with the involvement of local stake-holder communities and provide support to safeguard the natural environment in the tiger reserve.
- (o) to facilitate creation of and/or maintenance of such assets as may be necessary for fulfilling the above said objectives.
- (p) to solicit technical, financial, social, legal and other support required for the activities of the foundation for achieving the above said objectives.
- (q) 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.
- (r) 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.

14.2. Co-ordination with EDCs & line departments:

Given the present situation no tiger reserve cannot 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

Tiger Conservation Plan, Buffer Zone

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.

EDCs of Corbett Tiger Reserve has been recognised as one of the most important stakeholder for the effective management of the buffer areas of CTR. Regular interaction with the 'confederation of EDCs' will be ensured. Detail about EDCs has been discussed in Chapter-8/9.

14.3. 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, CTR). The Director post was at the level of Deputy Conservator of Forests. Of late the post was upgraded to Conservator of Forests but the functions were mostly like that of the level of DCF. 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.

14.3.1. 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. With all practical

Tiger Conservation Plan, Buffer Zone

purpose the Deputy Director's jurisdiction is restricted to 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 Park will be 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 inspection by the Director/Conservator CTR , besides explicit penalization of various statutes, Acts, & rules and regulations defined for the posts of CF/DCF rather than Director and Deputy Director. Given the importance given to the area by notifying the National Park, Sanctuary and 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. Both the DFOs will remain under control of the Field Director. It is prescribed that a detail proposal should be 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

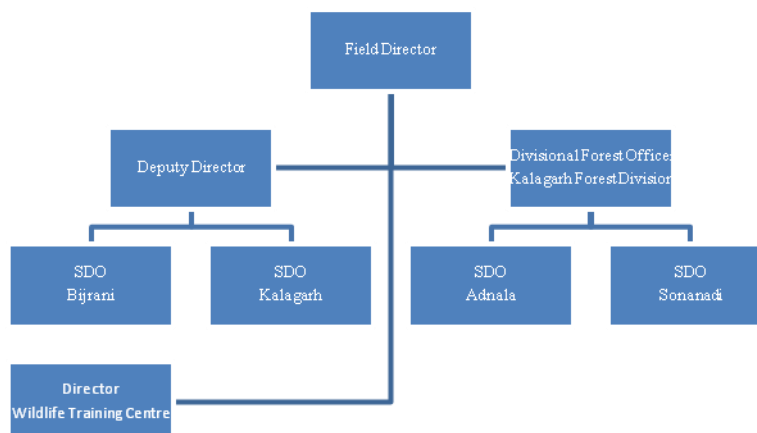
** KTRD- Sonanadi Tiger Reserve Division

14.3.2. 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

Tiger Conservation Plan, Buffer Zone

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 showing the top hierarchy of CTR.



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.Palen	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

Tiger Conservation Plan, Buffer Zone

Table-2. Forest Guard & Foresters in Buffer area of Corbett Tiger Reserve:

Name of Division	Name of Range	Nos. of Beat	Buffer Area		Total Forester and Forest Guard
		Buffer	Nos. of Forest Guard	Nos. of Forester	
Ramnagar Tiger Reserve Ramnagar	Dhikala	0	0	0	0
	Sarpduli	2	2	0	2
	Bijrani	3	6	9	14
	Dhela	5	7	5	12
	Jhirna	3	3	1	4
	Kalagarh	2	2	4	6
Kalagarh Tiger Reserve, Lansdowne	Sonanadi	4	4	5	9
	Palain	1	10	4	14
	Mandal	6	8	3	11
	Adnala	3	4	2	6
	Maidavan	4	5	2	7
Grand Total		33	51	35	86

Table-3. The overall status of staff in CTR

Sl. No.	Post	Sanctioned post	Working	Vacancy
1	Range Officer	19	1	18
2	Deputy Range officer	14	13	2
3	Foresters	65	63	2
4	Forest Guards	219	143	76
Grand Total		318	220	98

The number of Forest Guards Chowkis and Anti-poaching Chowkis have been given as **Annexure-14/1** and **Annexure- 14/2** respectively.

Tiger Conservation Plan, Buffer Zone

14.3.3. 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 –

- ACF - 1
- Range Officer - 3
- Tiger Protection Forester - 18
- Tiger Protection Guards - 90

The process constitution of STPF through an MoU is pending with the State Government. It should be executed at the earliest.

14.3.4. Operation Lords 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.

14.3.5. Reorganisation of beats:

The creation of new beats and determination of their head-quarters as per the reorganized structure has not been done and will be accomplished at the earliest.

14.3.6. Annual Inspection:

Deputy Director, CTR & DFO, Kalagarh will continue to do inspection of Sub-divisions and Ranges under his jurisdiction. The SDOs of CTR 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, Klagarh as before. It is prescribed that the Director, should inspect the Office of the Deputy Director, which was not happening in CTR. 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.

14.3.7. 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

Tiger Conservation Plan, Buffer Zone

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 CTR. 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.

14.4 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

Tiger Conservation Plan, Buffer Zone

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 equipments necessary 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 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 CTR- Staff welfare Association of which all the field staff are members. The staff welfare society will manage all the canteens and nature shops available in the CTR. The present practice of running these tourist facilities through tender has cause un-necessary

Tiger Conservation Plan, Buffer Zone

burden on the park 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 by the staff welfare society 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 staff welfare society 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 sent 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 CTR. All children of the staff are eligible for free guided tour organised by the CTR 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 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.

9. 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

Tiger Conservation Plan, Buffer Zone

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.

14.5. Fund raising Strategies:

With the formation of the Corbett Tiger Conservation Foundation, it has been indicated that the Tiger Reserve should not depend 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. Contribution from the Hotels and Resorts, who are getting massive business due to the Park.

1. Renowned NGOs and Media Houses can contribute for staff welfare activities.
2. National and International Donor Agencies can support research based projects.
3. Well structured, justifiable APO for NTCA & State Government
4. Additional fund from CAMPA
5. Donations by corporate houses and individuals to Tiger Conservation Foundation.
6. Increasing the revenue share (generating from eco-tourism activities) from the prevailing 20% to 100% for the foundation.
7. Earning from online booking.
8. Soliciting vehicle donation from corporate houses.
9. The web site can be used to post advertisements from reputed firms, corporate houses, government agencies etc.
10. Photographs of natural landscape and wildlife will be sold through foundation by executing an MoU with competent persons.

Tiger Conservation Plan, Buffer Zone

11. Motivating resorts to contribute for Conservation Foundation.
12. Management of Canteens and nature shops by Staff Welfare Society through foundation.
13. Detail of fund raising strategy shall be finalized in the forth coming meeting of the Governing Body of the Foundation.
14. 25% of the fund will be maintained as fixed deposit.
15. 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.

14.6. Schedule of Operations:

The conservation plan suggests two types of activities :

1. One which are supposed to funded/implemented by the TR
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.

Tiger Conservation Plan, Buffer Zone

	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												

14.7. Activity Budget:

Schedule of Rates: The CTR does 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. This special need requires a separate 'Schedule of Rates' which will be finalized by constituting a committee under the approval of the Chief Wildlife Warden.

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.

Chapter-15

Miscellaneous Issues

15.1. 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.
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

Tiger Conservation Plan, Buffer Zone

- 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: 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.

Tiger Conservation Plan, Buffer Zone

- 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
- 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.

Tiger Conservation Plan, Buffer Zone

- 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.
- 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-15/1**.

Tiger Conservation Plan, Buffer Zone

15.1.1. 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 – 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
- 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)

15.1.2. 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.

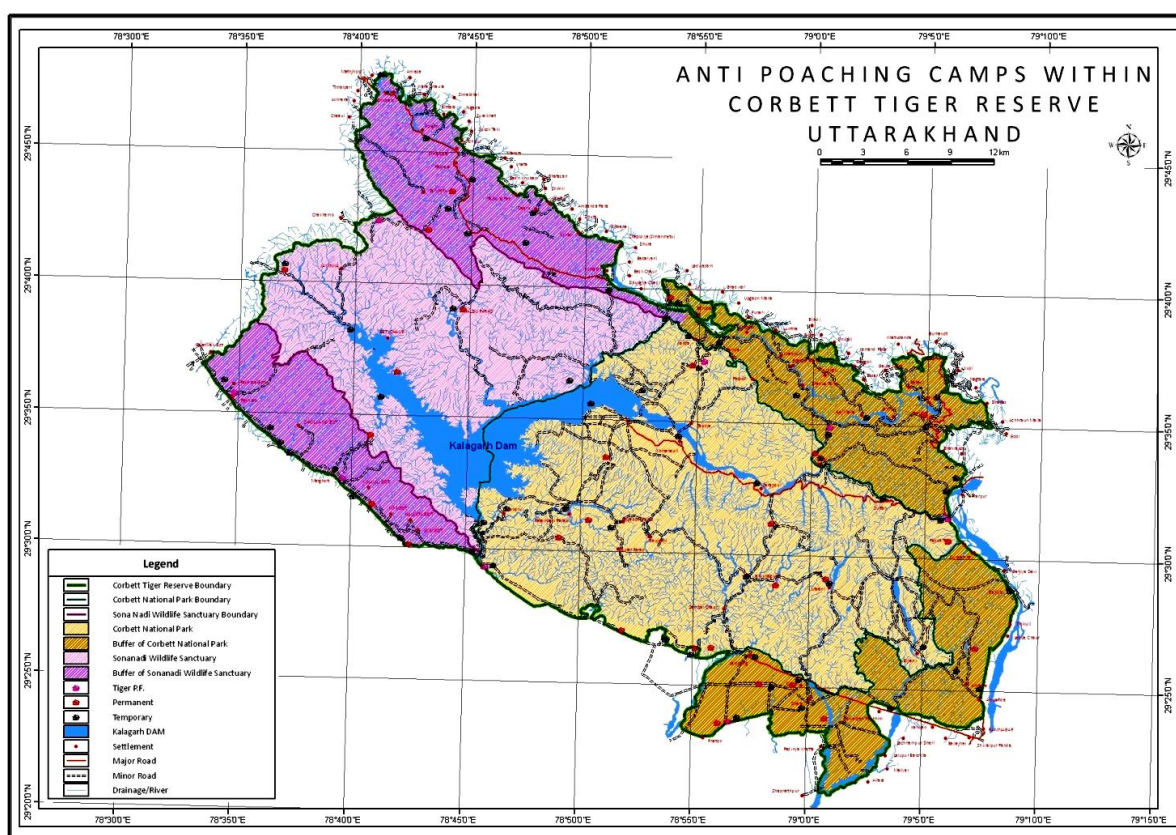
Tiger Conservation Plan, Buffer Zone

- 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.
- 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.

Tiger Conservation Plan, Buffer Zone

15.1.3. www.tigernet.nic.in:

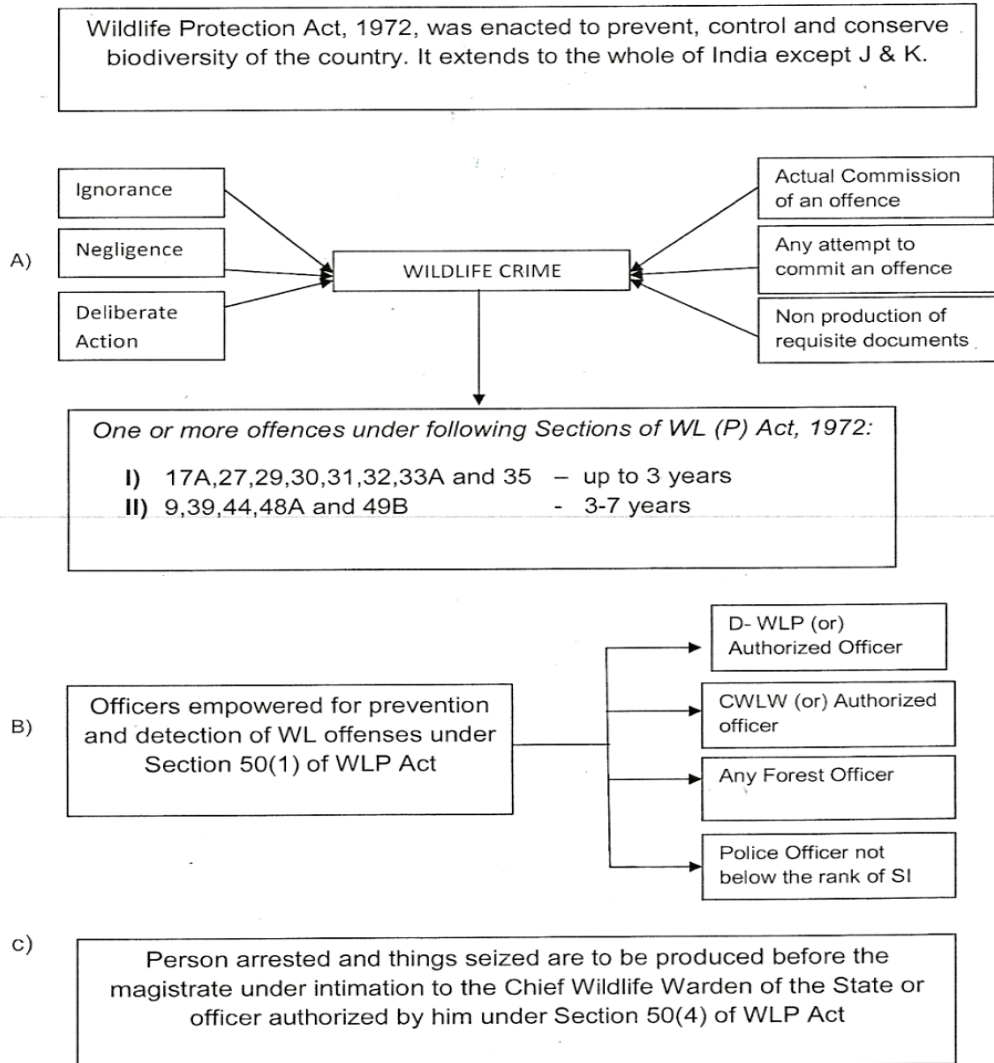
It is the directory of tigers and wildlife mortality. It is the official database of the NTCA of which every Field Director and Chief Wildlife Warden is a mandatory member. All deaths of Tigers and all other schedule one animal has to be reported to this site which maintains a countrywide data on such 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.



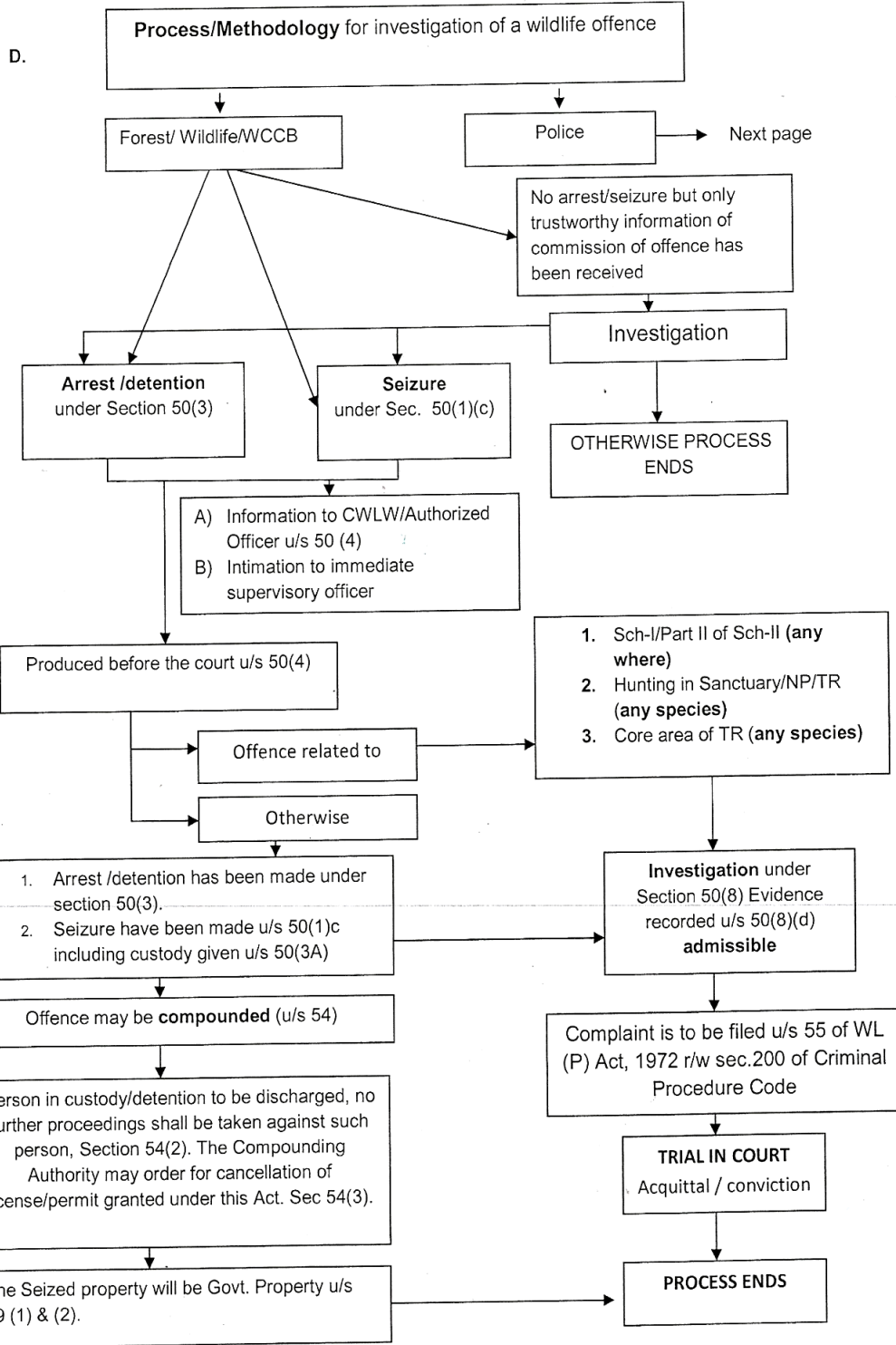
Tiger Conservation Plan, Buffer Zone

15.2. 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 effort will be made to issue the same in Hindi language.



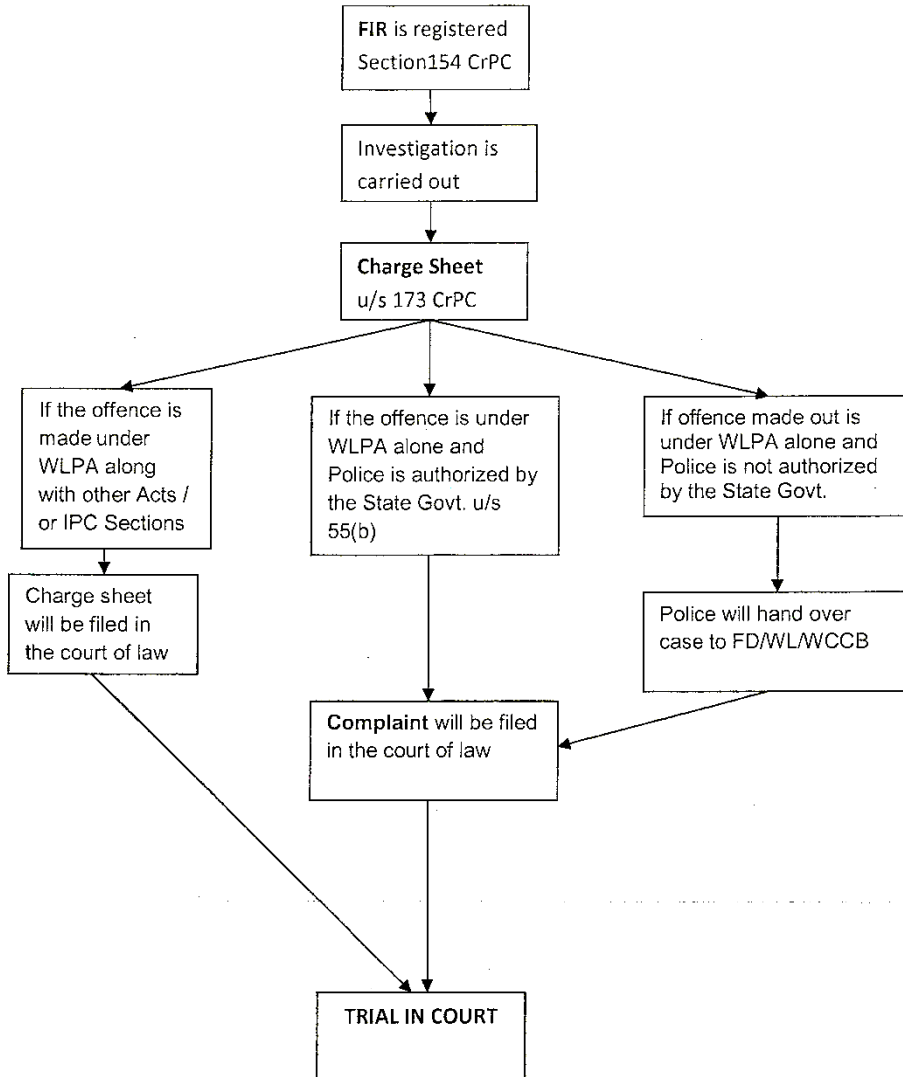
Tiger Conservation Plan, Buffer Zone



Tiger Conservation Plan, Buffer Zone

Police Investigation Process / Methodology

Wildlife Offences are cognizable as per Part II of Schedule – I of the Criminal Procedure Code



Tiger Conservation Plan, Buffer Zone

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.

Tiger Conservation Plan, Buffer Zone

15.2.1. 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 CTR 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 style="text-align: right;">→ 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 Bislayr water. In ethanol sample can be stored on room temperature for many days.</p>	 <p style="text-align: right;">→ 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 style="text-align: right;">Only in case of Silica gel → Filter paper → 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 style="text-align: right;">→ Meat/skin piece/sca → Filter paper → Silica Gel</p>
	 <p style="text-align: right;">→ 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

Tiger Conservation Plan, Buffer Zone

15.3. 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 compensation for loss of human life, cattle and loss of crop, the following urgent measures are suggested:

15.3.1. 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.

15.3.2. Salient points for awareness campaign:

1. Tiger/leopard are not usually inclined to attack people; on the contrary, they avoid people.

Tiger Conservation Plan, Buffer Zone

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.

15.3.3. 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.

Tiger Conservation Plan, Buffer Zone

15.3.4. 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.

15.3.5. 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 CTR 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.
- (iii) 2 mobile phones for continued communication with the authorities.

Tiger Conservation Plan, Buffer Zone

- (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.

15.3.6. 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.
- The area should be cordoned off with barricades, and the public alerted through a public address system. Regular updates should be made available to

Tiger Conservation Plan, Buffer Zone

the administration and local public.

- There should be an ambulance kept ready to take care of any medical emergencies.

15.3.7. 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.

15.3.8. 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.
2. Old rusty, iron cages should be discarded.

Tiger Conservation Plan, Buffer Zone

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 Dent'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 send 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 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.
2. If the area is adjoining a forested area, the animal should be allowed to escape in

Tiger Conservation Plan, Buffer Zone

the night, but if it is in a high human density area it should be tranquilized.

15.3.9. 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.

15.3.10. Release or translocation of captured tigers/leopards:

The decision to capture an animal should be the last option. It is very important

Tiger Conservation Plan, Buffer Zone

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.

15.3.11. 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.

15.3.12. 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 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

Tiger Conservation Plan, Buffer Zone

must be involved in such radio-tracking programmes.

15.3.13. 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.

15.3.14. 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 compensation 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 compensation should be doubled by the State Government.
2. A corpus should be formed for immediate disbursement of compensation. This will take care of non-availability of State Fund.
3. NGOs, Corporate Houses and individuals will be encouraged to donate to the corpus through the Tiger Conservation Foundation –CTR.
4. All field staff including the daily wage earners under 'Operation Lords' and 'TPF' is

Tiger Conservation Plan, Buffer Zone

- 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 man-animal 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 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

Tiger Conservation Plan, Buffer Zone

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 man-animal conflict. This will also reduce fake claims of compensation 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.

15.3.15. 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.

Tiger Conservation Plan, Buffer Zone

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.
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

Tiger Conservation Plan, Buffer Zone

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.

15.3.16. Financial assistance to tackle man-animal 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.

15.4. Extension of the Buffer area of Corbett Tiger Reserve:

The Government of India had emphasized that the neighbouring Forest Divisions like Ramnagar Forest Division, Tarai West Forest Division and Lansdowne Forest Division should be added to the existing buffer area of Corbett Tiger reserve. These forest divisions have considerable number of residential tigers. It is essential to protect the tigers and its habitat which needs considerable financial assistance. The National Tiger Conservation Authority has shown interest to extend financial allocation in the line of Corbett Tiger Reserve. It can only be possible if the forest divisions can be recognised as the buffer of CTR. The proposal is under active consideration of the State Government.

The Kholu Chaur and Kothri of Lansdownw Division and Koshi and Kota Ranges of Ramnagar division has to be added to the Corbett Tiger Reserve for protection. The area is immensely rich in wildlife and has a large presence of tigers that need immediate protection. Till the larger issue is resolved, the Dogadda Range of the Lansdowne Division must be handed over to the CTR.

Pending the Divisions under unified command of the Field Director, the NTCA has funded Rs. 75 lac for protection of tigers in these neighbouring forest divisions. It has been an unique approach by the NTCA anywhere in the tiger range States of India.

Tiger Conservation Plan, Buffer Zone

15.4.1. Inclusion of abandoned villages as buffer area:

(i) Kalagarh Forest Division of Corbett Tiger Reserve has many villages inside the buffer area which are abandoned by villagers due to various reasons and the land has been converted into high forest. These lands are vulnerable for future development of commercial infrastructures which will cater to tourism activities. Since these areas are frequented by wild animals in general and tiger in particular, no such activities should be allowed which will certainly proved detrimental to the habitat. Therefore it is suggested that a proposal will be send to the State Government for acquiring the land with matching compensation to the owners. Such villagers are- 1. Sankar 2. Jameria 3. Banghat 4. Jamun 5. Kalakhand 6. Lohachaud 7. Pand 8. Tadia 9. Kanda 10. Khetyun 11. Dabru and 15. Neem Sot.

15.5. Conservation of Mahsheer:

In order to save mahasheer from illicit fishing and earn revenue from angling sport, four tripartite agreement were carried out between a private operator, Uttarakhand Forest Department through Director, CTR and Uttarakhand Forest Development corporation. The mandate was to encourage angling among tourists while saving the royal fish by employing local villagers as angling guards. Off late the CEE had indicated that all non forestry activities given in the tripartite agreement should be stopped. Since the rivers- Ramganga, Sonanadi and Palen are endowed with rich mahasheer fishes, it is mandatory that adequate provision will be taken to protect the fish from hunting. The rivers flow inside the buffer and core area of Tiger Reserve. Personnel of Operation lords and Tiger Protect force, apart from regular field staff should be watchful against destruction of such fishes. Concerned Ecodevelopment Committees should be activated by CTR management for active cooperation for protecting the fishes. If at all angling is required to earn revenue by involving tourist and locals, a study has to be done by WII to advice about the matter.

15.6. 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

Tiger Conservation Plan, Buffer Zone

hunted only they become dangerous to human life if they are so disabled 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 in 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 man eaters and it is necessary to lay down some guidelines to help the Chief Wildlife Wardens in 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

Tiger Conservation Plan, Buffer Zone

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.

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 men-eater.

Tiger Conservation Plan, Buffer Zone

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 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.
