Management Plan for Upper Spiti Landscape Including the Kibber Wildlife Sanctuary (2018-28)

Himachal Pradesh
Forest Department

Himachal Pradesh Forest Department

Contents

Pr. Chief Conservator of Forest (WL)
and Chief Wild Life Warden HP Shimla

List of Tables

List of Pictures

Pr. Chief Conservator of Forest (WL)
and Chief Wild Life Warden HP Shimla

Team and Acknowledgements

From HPFD:

Shri. Rajeev Sharma, Shri Rajesh Sharma, Shri TR Dhiman, Shri HL Rana, Shri Devender Chauhan, other field staff and officers of the Spiti Wildlife Division.

Guided by HPFD Officers:

Dr GS Goraya, Dr RC Kang, Shri S.S. Negi, Shri JS Walia, Dr Lalit Mohan, Shri AK Gulati, Shri RK Sood, Shri Islam, Shri Vinay Tandon, Dr Sanjeeva Pandey, Shri PL Chauhan, Shri RK Sood, Dr. S Kapta and Shri KS Thakur.

Also guided by Officers of the Spiti District Administration:

Dr Vikram Singh Negi, Shri Jagan Thakur, Shri Suneel Sharma, Shri Rahul Chauhan, Shri Hemis Negi, and Shri Priyatu Mandal

From NCF:

Yash Veer Bhatnagar, Charudutt Mishra, KS Suryawanshi, Pranav Trivedi, Ajay Bijoor, Dipti Humraskar, Radhika Timbadia, Rishi Sharma, Ranjini Murali, Saloni Bhatia, Abhishek Ghoshal and Aditya Malgoankar.

Local Field Coordinators in Spiti:

Tanzin Thinley, Kalzang Gurmet, Sushil Dorje, Rinchen Tobge, Kesang Chunit, Tanzin Thuktan, Tandup Chhering, Lama Tanzin Chewang, Takpa Tanzin and Sonam Chhering.

Acknowledgements

We are very thankful to the Government of Himachal Pradesh for their forward and progressive vision to undertake a novel model of conservation of their high altitude habitats of snow leopard. The MoEFCC has consistently provided the funds under the annual plan of operations to implement the innovative programmes under the Upper Spiti Landscape Management Plan.

Published by Himachal Pradesh Forest Department, Government of Himachal Pradesh, 2018

Design: M/s Trailblazers Pvt. Ltd. Bangalore for Nature Conservation Foundation, Mysore

Executive Summary

The Himachal Pradesh Forest Department recognised the entire Spiti Sub-Division of the Lahaul-Spiti District as a Wildlife Division and also about 4,000 km^2 of the region as the first Project Snow Leopard reserve of the country. The responsibility for preparing the management plan for this landscape, referred to as the Upper Spiti Landscape, which includes the Kibber Wildlife Sanctuary and other forest and community areas, was assigned to the Nature Conservation Foundation (NCF), an NGO working in the region since about two decades. This was done under a MoU between the Government of Himachal Pradesh and NCF, which was later renewed to assist the Department in implementing the management plan beginning from the financial year 2011-12.

Work carried out since 2011 includes wildlife surveys, state-of-the-art research on snow leopard, innovative community-based conservation interventions, capacity enhancement, conservation education, awareness and livelihood generation.

Wildlife Monitoring

The Spiti Sub-Division is among the best areas for snow leopard in the State of Himachal Pradesh, as well as the country. This was further established by wide ranging surveys conducted across the landscape which have allowed us to estimate the number of snow leopards in the landscape over a period of 5 years making this amongst the most robust data from snow leopard landscapes, globally.

Snow Leopards are wide-ranging species with individual home range sizes usually exceeding 100 km^2; this is reflected in their low densities. Camera trap surveys across the landscape were used to estimate their density in the Upper Spiti Landscape. Density estimates from 2011-12, from November 2013 to June, 2014 and May to October, 2015 indicate a stable population of snow leopards in Spiti Valley. The higher estimates are the result of limiting potential habitat to areas below 5200 m in altitude.

Method	2011-2012	2013-2014	2015
SECR (density per 100 km^2)	1.08(.65 - 1.85)	0.92(.57 - 1.49)	0.80(.46-1.38)
SPACECAP (density per 100 km^2)	1.48(.97 -2.15)	1.15(.91 - 1.32)	1.21(.78 - 1.62)

Monitoring wild ungulate population is an important objective given that they are an important determinant of large carnivore densities and play an important role in maintaining the ecosystem. A double-observer survey technique which accounts for observer differences in the ability to detect the

target species has been adopted to provide precise estimates for Bharal (*Pseudois nayaur*) and Ibex (*Capra sibirica*) in Spiti. Results from surveys carried out in 5 blocks of Spiti indicate a stable wild prey population. These 5 blocks were identified as

Study Site	Area (km^2)	2010 (*CI 95%)	2011 (CI 95%)	2012 (CI 95%)	2013 (CI 95%)	2014 (CI 95%)	2015(CI 95%)	2016(CI 95%)
Kibber	411	735 (47)	649 (155)	946 (202)	872 (186)	946 (182)	744 (139)	698 (135)
Lossar	219	30 (14)	34 (24)	30 (15)	52 (25)	38 (11)	44 (23)	89 (39)
Pin Valley	186	184 (40)	263 (74)	271 (72)	188 (65)	269 (57)	192 (77)	224 (72)
Lingti	497	593 (50)	503 (130)	426 (161)	651 (199)	596 (135)	593 (156)	523 (154)
Tabo	341	509 (53)	476 (98)	409 (91)	397 (121)	461 (82)	572 (158)	496 (110)

*CI – Confidence Interval

Expanding the work the research was expanded over an area of c. 20,000 km^2 covering most of the potential snow leopard range in Himachal Pradesh. Through secondary surveys attempts were made to understand snow leopard and prey occurrences, and threats. Accurate maps with the better wildlife areas have since been developed of which the Hangrang area of Kinnaur and the Mayar nala area of Lahaul are good areas for snow leopard conservation. Wildlife surveys were also carried out in Bharmour and a set of recommendations have been made.

Community-based conservation through micro plans

Project Snow Leopard emphasises on promoting participatory techniques for conservation. In implementing the first management plan, a number of community-based conservation interventions were made to address losses faced by the local community due to conflict with carnivores (snow leopard and wolves) and wild prey (blue sheep and ibex) covering 19 villages within the Upper Spiti Landscape.

Conservation Intervention	Villages covered
Set up *grazing-free reserves* based on the concept of Core Landscape Units	6 villages – Kibber, Chichim, Losar, Kiato, Lalung and Langza

Community-run Livestock Insurance programme to compensate livestock killed by wild carnivores	3 villages – Kibber, Chichim and Kee
Corral reinforcement to prevent snow leopards entering corrals	4 villages – Salung, Rama, Chubrang and Lalung
Local guards to prevent crop damage by wild prey	5 villages – Kibber, Kiato, Gete, Tashigang and Demul
Sterlisation of free-ranging dogs	8 villages – Kaza, Rangrik, Losar, Hansa, Morang, Quiling, Kibber and Kee
Garbage management enclosures	3 locations – Kibber, Kee and Kee Monastery
Artificial glaciers with local community	2 locations in Kibber
Installation of 2 kW HimUrja solar power plan	Kee Monastery
Installation of house-hold solar unit on trial-basis	3 villages – Kiamo, Gete and Tashigang
Handicraft-based Enterprise led by local women	5 villages – Kibber, Chichim, Kee, Gete, and Tashigang

In all, over 40 micro plans were implemented under the previous management plan period (2011-16) with active support from the local community.

Capacity enhancement

The management plan calls for a novel approach to conservation involving local community. A great deal of effort was, thus, spent on building capacity within local staff of the Himachal Pradesh Forest Department. Similar efforts were made to engage the local community and expose them to ideas that were tested through the implementation of the first management plan.

Participatory Planning and Implementation

- Biodiversity Conservation and Rural Livelihood Improvement Project (BCRLIP) Centre, Periyar, 21 February to 3 March, 2015 for field staff of the Spiti Wildlife Division.
- BCRLIP Centre, Periyar Tiger Reserve, 1-8 March 2014 for staff from HPFD Headquarters in Shimla and local officers of Spiti Wildlife Division.
- Exposure Visit to Conservation and Development NGOs in Ladakh, 15-22 September 2011. Covering innovative approaches for water conservation and harnessing renewable energy – Fourteen members from Spiti, including nambardaars, villagers, and local officials.

Developing Local Structures to Facilitate Participation

- Identifying and organising local facilitators for participatory conservation in Spiti, 15 November 2014 held in Kaza.

Self Help Group (SHG) Establishment and Management

- Agencies in Ladakh, June 2012: About 15 ladies from Kibber and Chichim villages visited Ladakh to interact with reputed agencies there, including the Women's Alliance and Ladakh Ecology Group to learn skills of producing and marketing of handicraft items. Further trainings were organised for skill development in crochet and knitting in Kibber.
- Umang Cooperative, SOS Organics, etc. in Kumaon, Uttarakhand: In an endeavor to establish good practices for production, running and marketing eco-friendly products, a team visited various organizations in Kumaon in Uttarakhand to learn these aspects. Six ladies with six local staff visited these agencies over a week and learnt various aspects of running SHGs dealing with production and marketing of crafts, agro-based products and tourism.

Advanced Wildlife Monitoring Techniques

- Kaza, 8 September 2011; Rishi Sharma, Research Scholar, NCF, who led work on camera trapping of the snow leopard, conducted a day-long workshop for all field staff and local volunteers. Handling camera traps and designing studies for abundance estimations were the main subjects.
- Kaza, November 2013; Dr. Koustubh Sharma, Regional Ecologist, Snow Leopard Trust, was invited for a workshop and field training of HPFD frontline staff and local volunteers. Over 20 individuals, which included 8 from HPFD and 12 local youth, were trained in this 15 day exercise of classroom, followed by field placement of cameras in 2000 km^2 area.

Mountaineering and Mountain Rescue

- Kaza-Shilla Nala, 2-8 June 2015; Mountaineering experts from Manali, Mr. Garrett and Dr. Jeph Mathias, were invited to Spiti to help our HPFD and NCF staff in mountain rescue, including other aspects such as river crossing and rock climbing.

Wildlife Law and Enforcement

- Kaza, 22-24 June 2015; Experts from the Wildlife Conservation Trust, Dr. RK Singh and Mr. Kiran Rahalkar were invited to deliver this module to all the 22 plus field staff and officers of the Spiti Wildlife Division.

- Nilgiri Biosphere Reserve, 24 February – 4 March, 2012: The APCCF, with DFO, Kaza and RFO, Kaza visited the Nilgiri BR on an exposure visit to understand the challenges of conservation at landscape scales.

Conservation Education and Awareness

The conservation education in Spiti has been active since 2006, with an aim of facilitating bio centric outlook towards nature among children, teachers and the local community. Under the program Himalayan Nature Clubs (HNC) were set up in 20 schools targeting students between the 5th and 9th standard. Several resource materials such as posters, a storybook called 'Nono, the Snow Leopard', children's workbooks with an accompanying teachers' guide have been produced, printed and distributed.

Under the HNC, three activities are held every year in every school, in and around their campus. A Teacher's Guide is given to them, which has details on how to conduct the activities from the Children's Workbook. Of the three activities, one activity is conducted by the teachers' themselves. An annual teachers' meeting is held for coordinators where teachers have the opportunity to interact and inspire each other, and discuss the activity they will be conducting.

In addition to the activities every year, a nature education camp is conducted. It is held for 3-days, 2-nights with thematic and structured modules. It is set in the outdoors and provides a joyful and engaging learning experience. Five camps are held every year close to Kibber. The modules are designed to create knowledge based on experience and develop positive attitudes and awareness about nature and wildlife.

Year	No. of children	No. of teachers
2012	148	8
2013	128	9
2014	146	11
2015	121	9
2016	145	6
Total	**688**	**43**

Separate measures have been implemented in the past targeting local adults and other target groups too:

- Three posters created by local artists from Spiti and Ladakh depicting linkage of biodiversity with their culture with messages from prominent Buddhist leaders were released in Spiti,

H.H. T.K. Lochen Tulku the Rinpoche of the Kee Monastery released the posters in the presence of the SDM, DFO, RFO, Spiti Sub-Division in November 2014.

- A poster depicting the threatened wildlife of the trans-Himalayan landscape was created distributed in Spiti valley targeting the armed forces in 2016.
- A formal interaction was held with the Dogra scouts; a paramilitary unit manning the Indo-Tibet border in Spiti during November 2014.
- Signages were designed to display along the road in Spiti to spread awareness to tourists and instil pride among local residents were installed across Spiti in 2015.
- A detailed set of guidelines for the functioning of the contractors and their labourers has also being prepared and is being discussed with the SDM, Kaza with the intent to make all contractors sign up to these guidelines in 2015.

Future Strategy: Sustain the landscape-level approach to understand the ecology of snow leopard and other high altitude wildlife in a manner that can help their conservation and management, and implemented with active local participation.

Management Planning (2018-28)

The current management plan intends to carry forward the landscape level work that was started in the first plan period. The broad aim of the current plan is to:

1. **Sustain and extend ongoing wildlife monitoring and conservation efforts** to cover all wildlife hotspots and villages within the Upper Spiti Landscape.
2. **Develop proactive interventions to address species conservation goals** that can help local people to realise direct benefits from protecting wildlife. This was partly initiated through the 4E approach of focusing on Energy, Ecology, Education and Enterprise.
3. **Aim towards convergence within administrative departments in the Sub-Division** to bring together line departments within the District Administration, the local community and experts from various domains who can help implement the activities identified under the management plan. This will be done through the Spiti Snow Leopard Conservation Society that was constituted in March 2016.

A large part of this effort will be driven through the development of micro-plans with the local community. Emphasis will also be on building capacity within field officers and local community members and enable them to take up micro planning within the landscape.

Budgets

The total proposed budget for the 10-year period stands at Rs 725.95 lacs. A year-wise breakup of the financial budget is given below:

Year-wise break up of Financial Target for Management of USL including Kibber WLS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021- 22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
I	Development of USL including Kibber Wildlife Sanctuary											
A	Vehicle	10.00	2.00	-	-	-	2.00	-	-	-	2.00	16.00
B	Purchase of field equipment	0.75	0.75	0.50	0.75	0.75	0.50	1.00	1.00	0.75	1.00	7.75
C	Staff amenities	1.00	2.00	1.00	1.25	2.25	1.25	1.50	2.75	1.50	2.00	16.50
	Sub Total	11.75	4.75	1.50	2.00	3.00	3.75	2.50	3.75	2.25	5.00	40.25
II	Protected Area Management											
A	Boundary protection	5.75	1.75	1.75	2.00	2.00	6.00	2.25	2.25	2.25	2.50	28.50
B	Maintenance of road network	6.00	2.50	2.75	3.75	8.00	2.40	3.90	4.65	5.25	5.50	44.70
	Sub Total	11.75	4.25	4.50	5.74	10.00	8.40	6.15	6.90	7.50	8.00	73.20
III	Development of Responsible Eco Tourism											
A	Manage tourism at Upper Spiti Landscape including Kibber WS	12.00	17.50	6.50	5.00	6.50	13.75	11.00	6.00	5.75	10.75	94.75
	Sub Total	12.00	17.50	6.50	5.00	6.50	13.75	11.00	6.00	5.75	10.75	94.75
IV	Eco-Development											
	Sub Total	9.00	10.00	11.00	12.00	13.00	14.00	15.00	17.00	17.00	20.00	138.00
V	Research, Monitoring and Training											

Year-wise break up of Financial Target for Management of USL including Kibber WLS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021- 22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
	Sub Total	7.00	7.50	8.00	9.50	10.00	11.00	12.00	12.00	13.00	13.00	103.00
VI	Publicity & Awareness											
	Sub Total	2.00	2.75	2.00	3.25	2.50	3.50	3.00	4.00	3.00	4.25	30.25
VII	Establishment Costs											
	Sub Total	10.50	11.50	12.75	13.75	15.50	16.50	17.75	18.75	20.00	21.00	158.00
VIII	Maintenance of Permanent Assets at USL including Kibber Wildlife Sanctuary											
	Sub Total	7.00	7.00	7.00	7.00	7.50	10.00	10.50	10.50	11.00	11.00	88.50
	Grand Total	71.00	65.25	53.25	58.25	68.00	80.90	77.90	78.90	79.50	93.00	725.95

PART – I

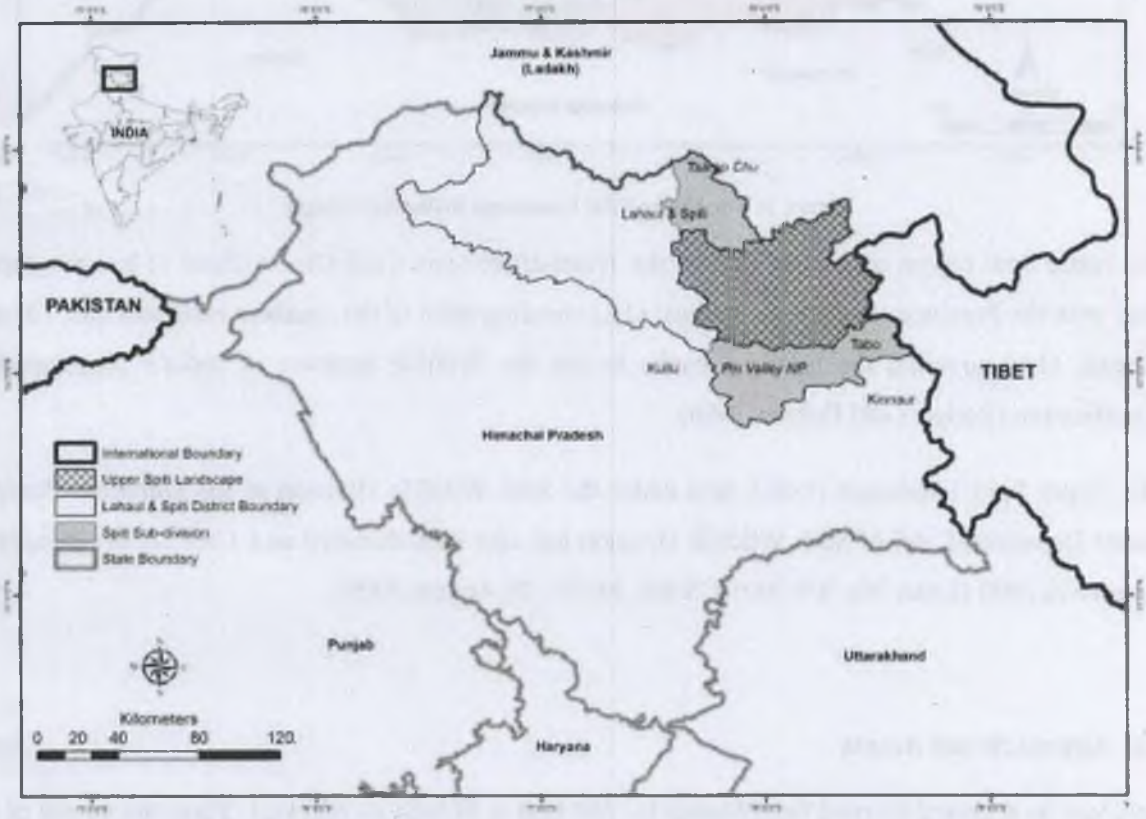
The Protected Area: The Existing Situation

1. Introduction to the Area

1.1. Location, Constituent and Extent

The Upper Spiti Landscape (32°07'30" - 32°47'30"N to 77°37'2" - 78°30'00" E) is located in the Spiti sub-division of Lahaul-Spiti district in Himachal Pradesh. The total area of the Upper Spiti Landscape comprises 3,944 km^2 covering 2/3rd of Spiti's land area, leaving aside only Tsarap Chu, the Pin Valley and Tabo areas. The landscape includes the Kibber Wildlife Sanctuary (1,200 km^2) as well as numerous other areas of significant wildlife importance that are outside the existing Protected Area.

Figure 1: The Upper Spiti Landscape



The Upper Spiti Landscape holds 30 villages in eight panchayats, with most of the population concentrated along the main Spiti valley and the Kibber-Langza plateau. The area below 5,200m, the normal limit of vegetation in Spiti, is 2,163 km^2 (54%) in the Upper Spiti Landscape.

Figure 2: The Upper Spiti Landscape including villages

The entire Spiti region is classified under the *Trans-Himalayan Cold Desert* (Zone 1) bio-geography zone with the Province 'Ladakh mountains' (1B) covering most of the southern bank and the 'Tibetan plateau' (1A) covering the northern banks as per the Wildlife Institute of India's biogeography classification (Rodgers and Panwar 1988).

The Upper Spiti Landscape (USL) falls under the Spiti Wildlife Division of the Himachal Pradesh Forest Department. All of Spiti Wildlife Division has also been declared as a *Cold Desert Biosphere Reserve* in 2009 (Letter No. 9/9/2005-CS/BR, MoEF, 28 August 2009).

1.2. Approach and Access

Spiti can be accessed by road from Manali (*c.* 160 km) or Shimla (*c.* 420 km). There are no rail or air heads close to Spiti.

Access to Spiti from Shimla via. Kinnaur is open for most part of the year, except for sporadic closure of roads due to weather related blockages, especially in winter (December-May). This route forms part of National Highway 22 (NH 22), the old *Hindustan-Tibet highway* that was built around 1850. Travellers usually are advised to break their journey at Rampur or Reckong Peo. The journey can be completed by buses run by the Himachal Road Transport Corporation (HRTC). The other option for

travel is to hire a local taxi that can be hired from Spiti, Shimla or Rampur. Kalka (90 km) is the closest railhead to Shimla.

Access to Spiti from Manali via. Gramphoo is open for four months in a year (typically, July to October). Access through this road for rest of the year is shut as travelling on this road requires travellers to cross two Himalayan passes—Rohtang La and Kunzum La. A single bus run by the Himachal Road Transport Corporation (HRTC) runs daily from Kullu to Kaza, the sub-division headquarters, during the four months when the passes are open. The other option is to hire a local taxi from Manali or Spiti. The drive can take of 8-12 hours, depending on the condition of the roads. There are no options to stop on this route, except at Chota Dhada and Batal, which offer basic meals to travellers. Kullu (40 km) is the closest air head, while Una (250 km) and Kalka (275 km) are the closest railhead to Manali.

Pic 1: The Spitian Landscape

Kaza is the sub-division headquarters and the largest town of Spiti. Travellers have options to stay in Kaza which range from basic hotels to local home stays. There is also a hotel run by the Himachal Pradesh Tourism Development Corporation in Kaza. Kaza is also equipped with a Community Health Centre to attend to basic medical requirements of locals and visitors travelling to Spiti. There is one refuelling station in Spiti, in Kaza, which holds the distinction of being the highest refuelling station in the world at 3,800 m above sea-level. There is one bank branch of the State Bank of India (SBI) in Kaza and a single ATM machine to dispense money, for travellers. The other SBI branches in Spiti are in Hansa (without an ATM) and Tabo (with an ATM). The only telephone service provider

covering Spiti is the Bharat Sanchar Nigam Limited (BSNL) who has an office in Kaza. Telephone network coverage is available only in parts of Spiti; several villages have no network coverage. Internet is available but low bandwidth makes it an unreliable medium of communication. Fax services are available in only some government offices. A single daily bus service through summer (July to October) run by HRTC connects some of the larger villages and routes of Spiti—Losar, Kibber, Lalung, villages in Pin Valley and Tabo—to the sub-division headquarters Kaza. A local taxi union offers services from Kaza to any of the villages within Spiti and even to parts outside Spiti. Post offices and post runners cover most villages of Spiti. The world's highest post office at an altitude of 4,389 meters above sea-level is located in the village of Hikkim, in Spiti.

1.3. Statement of Significance

The Indian high altitudes are unique, in that; they represent vast rangeland systems that are sparsely populated by communities that have practiced pastoralism for several millennia. These landscapes are also inhabited by highly endangered populations of species of wildlife. These landscapes represent a unique biogeographic region where wildlife is distributed across the landscape, and not restricted to protected areas. Natural resource use including grazing and other forms of resource extraction (fuel, timber, medicinal plants) is pervasive in these landscapes, including inside protected areas. In addition, these regions provide essential ecosystem services and harbours river systems vital for the nation's food security. Given that most of these regions are along international border, these areas are also important for the country's national security as well as international relations. Recognising these salient aspects of high altitude landscapes the Government of India launched Project Snow Leopard (vide Notification No. F. No., 15-5/2006 WL I, Dated 31 July 2006) as a flagship species programme to strengthen wildlife conservation in the Himalayan high altitude. Two of the key aspects stressed upon by Project Snow Leopard are to:

1. Shift from a PA-centric approach to adopt a landscape level management approach, because given the nature of these vast regions, wildlife is distributed across the landscape and not restricted only within protected areas.
2. Encourage participatory approaches to manage the landscape, dependence of both humans and wildlife upon the landscape is pervasive. More so, the communities residing in these landscapes have traditionally inhabited these regions for millennia and could act as strong partners in efforts to conserve the landscape.

The Upper Spiti Landscape in Himachal Pradesh was thus the first landscape identified for landscape level conservation under Project Snow Leopard. The first management plan for the landscape was prepared for the plan period of 2012-16. The current plan is in continuation to manage this landscape.

One of the reasons to select the Upper Spiti Landscape was the availability of baseline information about the presence of wildlife in this region, a basic understanding of the dependence of local communities on local natural resources including—grazing and other forms of resource extraction (fuel, timber, medicinal plants)—and a sense of the conflict arising between locals and wildlife from interactions that were primarily impacting their livelihoods. The experience of implementing the past management plan that included components of research, capacity building and community-based conservation have brought insights on the benefits and challenges of working at the level of a landscape. The current plan aims to adapt to these challenges, while continuing target conservation at the landscape level adopting practices that foster local participation—with the community along with the Wildlife Department, other Government agencies and NGOs.

2. Background Information and Attributes

2.1 Boundaries

Spiti is a subdivision of the Lahul & Spiti district of Himachal Pradesh, which happens to be the largest district in the state. The western sub-divisional border is along the Kunzam La ridge on the left bank of the Chandra River. The whole sub-division of Spiti comes under the Kaza Block and Kaza Tehsil. There are 13 panchayats in Spiti with c. 95 villages (including some hamlets) spread in six patwari circles. The Lahul & Spiti district is spread over 13,885 km^2 (24.85% of the total State area) with a population of 33,224. Within this Spiti constitutes 7,591 km^2 (13.85% of the total State area) with a population of c. 10,600 people. The Spiti subdivision is governed through a mechanism called the 'single-line administration' whereby all departments functioning there directly work under the Additional District Commissioner (ADC), who is aided by a Sub Divisional Magistrate (SDM) and Tehsildar. This system was necessitated to streamline administration due to the poor connectivity and communication with the Divisional HQ in Keylong and state capital Shimla since the district was carved out in 1960's.

Three protected areas (PAs), Chandratal Wildlife Sanctuary (38.56 km^2), the Pin Valley National Park (675 km^2) and the Kibber Wildlife Sanctuary (1,200 km^2) exist in Spiti. Bulk of the land is under the control of the State Forest Department (74%), while the rest being with the Revenue department. Community have de facto and de jure rights over most land and in places thus can lease out land for grazing to migratory herders. All of Spiti Wildlife Division has also been declared as a 'Cold Desert Biosphere Reserve' in 2009 (Letter No. 9/9/2005-CS/BR, MoEF, 28 August 2009) by the Government of India.

2.2 Geology, Rock and Soil

Spiti has contributed tremendously to the geological knowledge owing to the almost complete sequence of exposed sediments from the Pre-Cambrian era to the Cretaceous period (Wadia 1967). The first account of the geology of the area was given by Stoliczka (1865). However, Hayden (1904) was the first to provide a comprehensive and systematic account of the stratigraphy of Spiti, establishing an almost complete sequence of rock formations from Cambrian to Cretaceous. The fossil flora and fauna from Carboniferous-Permian-Triassic period have been documented in Spiti (Gothan & Sahni 1942, Tewari 1959). Most of the fossils are marine in origin, mainly brachipods, trilobites, ammonites, bivalves and also certain corals and algae, indicating its Tethyan past. The ammonite and trilobite fossils are of particular importance as they are excellent index fossils, enabling geologists to date the age of the rocks in which they are found on the basis of particular species or genera of fossils.

The lithology of the area follows its stratigraphy and is characterized by sharp changes in a combination of quartzite, shales, limestones, sandstones, dolomites and conglomerates. The high altitude desert soils are predominantly sandy and shallow, derived mainly by disintegration due to marked diurnal and seasonal fluctuations of temperature. The avalanches and streams bring down enormous soil masses to the lower valleys and alluvial fans (Gupta 1994) making them particularly rich in plant cover. The soils are mostly silty loam to silty-clay loam in texture with a slightly alkaline pH, poor organic matter and water holding capacity. The soils are low in available nitrogen, phosphorous, potassium and carbon, however are better supplied in calcium (Gupta 1994).

2.3 Terrain

The Spiti valley covers an area of about 7500km^2 and ranges from 3200 m to 6500 m in altitude. The upper Spiti valley consists largely of high mountainous terrain breaking sharply near the river valley into gently sloping terraces which end in cliff faces along the river. The lowest point is where the river flows into the Kinnaur district near Hurling. The river cuts a deep gorge in the lower areas and opens up further upstream near Tabo where the river meanders over a vast valley, at times close to a kilometre wide. The slopes on the right bank of Spiti are more rugged and have longer streams, while the left bank is less rugged. In fact there is a c. 40km plateau from Kibber to Demul on the left bank, which also extends into much of the mid Lingti valley, covering over 500km^2. Of the about 7,600 km^2 covered by Spiti, about half occurs above an elevation of 5,000m, while bulk of the remaining half occuring between 3,800 and 5,000m and very little below 3,800m. There are numerous high peaks (>6,000m) in Spiti but the highest is Gya (6,794m), while others such as Manirang (6,593m), Kalak Turbo (c. 6,250m), Chau Chau Kang Nilda (6,380m) and Shilla (6,132m) are popular climbing destinations. Apart from the access along the main Spiti River, the important passes are the Tari Khango (Bhaba) pass (4890m) with Kinnaur, the Pin Parbati pass (5319m) with Kullu, on the Pir Panjal range, the Parang la (5578m) and Takling la (5575m) with the Pare Chu Valley, on the Zanskar range, and the Kunzam la (4590m) with the Chandra Valley or Lahaul.

2.4 Climate

Spiti occurs on the leeward side of the Pir Panjal branch of the Himalaya that cut off the monsoonal effect from the plains rendering the area dry and cold. Westerly disturbances in the winter bring some precipitation in the form of snow, but most areas still receive much lower snowfall compared to the adjacent Lahul Valley, Kullu and Kinnaur regions. The annual precipitation in Kaza is recorded at c. 200 mm annually. Some areas of Spiti such as Pin Valley do receive heavy winter snows as well as some monsoonal rains. The temperatures can range from -40 degree Celsius in peak winter, to c. 30

degree Celsius in peak summer, with the minimum temperature remaining sub-zero from September to April in most places. Severe winds occur almost every day and are further reason for the desiccated atmosphere and lack of trees. The overall climate in Spiti is thus dry and cold with a long winter extending from mid-November to March. The thaw begins in April heralding the spring with sprouting at lower, south facing slopes that extends to the higher elevations by late May when the peak plant growth season of summer begins. Senescence sets in by late August leading to the short autumn season.

Recent local reports and metrological data suggest a marked change in whether patterns in Spiti such as an increase in summer precipitation and a decline in winter snows. Winter snows are important for both providing irrigation water through snowmelt streams in summer as well as soil moisture for rangelands during the crucial spring and early summer period. Late summer rains in (July-August) are seen as threats to standing crop, doesn't really help rangelands that have entered senescence and cause flash floods and damage to private and public property. Rangelands may degrade due to runoff of topsoil and not having enough soil moisture when really needed early in the season. In most cases this is likely to cause degradation, but in some cases they may improve too and remains an important area of research.

3. History of Management and Present Practices

3.1 General

The first Management Plan for the Upper Spiti Landscape was developed and implemented since April 2011 as an innovative and pioneering effort under Project Snow Leopard. This effort is being led by the Himachal Pradesh Forest Department with support from agencies and organisations that have been working in this landscape for quite some time.

Addressing a large area for conservation, including those outside the Protected Area Network is a challenging task but that is what has been tried in the Upper Spiti Landscape (USL). Our implementation has managed to achieve wildlife conservation to a considerable degree in the past plan period. This has been possible through a combination of efforts in research and capacity building coupled with the development of village-level micro-plans aimed at improving the habitat within areas identified to have good wildlife value, in this landscape and mitigating losses arising from negative human-wildlife interactions.

Capacity building, especially within department staff and the local community is critical to affect work in field. Our plan implementation has focused on trying to expose department staff and the local community to novel examples of community-based conservation across India while also training them with field techniques relevant in the landscape. In addition considerable effort in the first plan period was spent to gather baseline data on wildlife occurrence and abundance in the landscape. Areas of conflict within the landscape have been mapped, which has then allowed focus on devising conflict-mitigation measures through village level micro plans.

Pic 2: Community meetings led by local champions

Based on discussions with local community champions across the landscape, the approach was to carry out village-level micro plans in four areas that were identified as being of a high priority in the landscape – the ***4-Es*** of Ecology, Enterprise, Education and Energy. It was important for each of these interventions to be bound around a strong conservation focus to reinforce the local connection that the community shared with wildlife with which they share the landscape.

Ecology

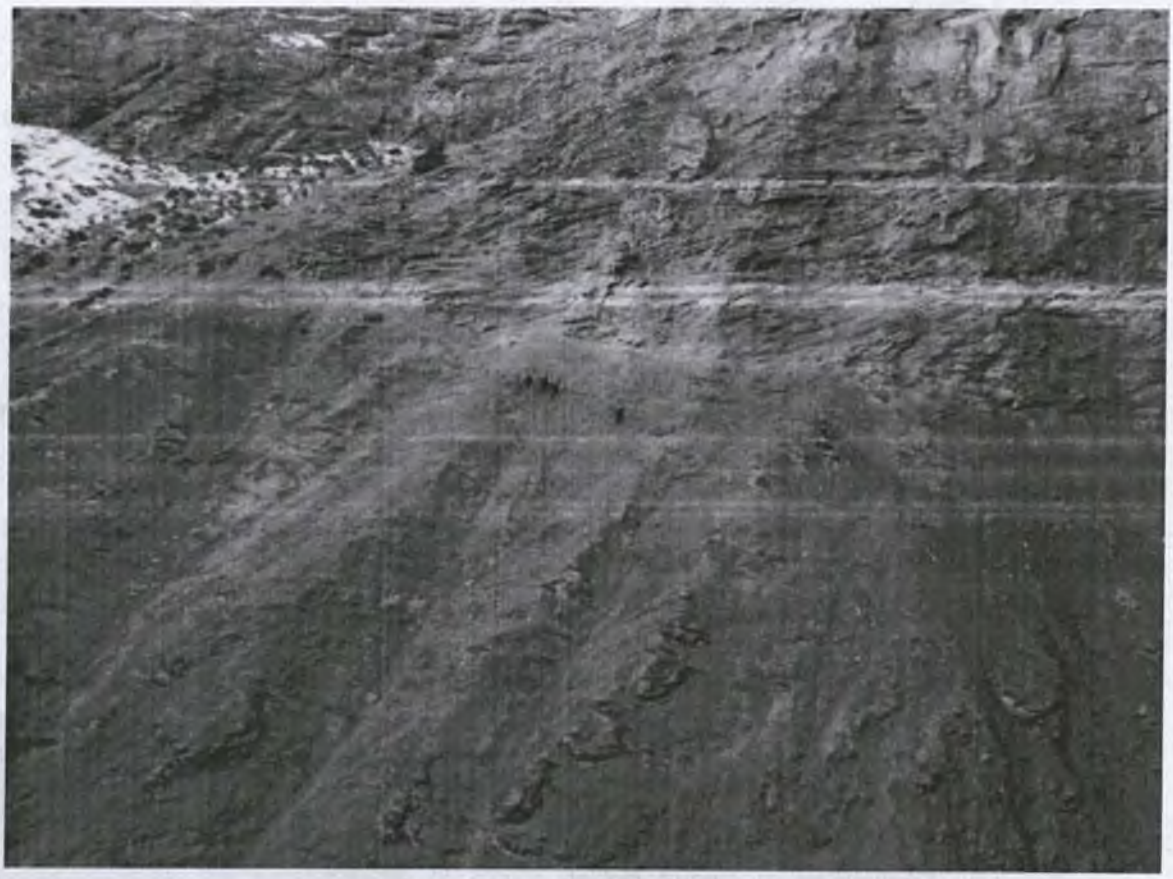
A significant effort in the first management plan period was spent on evaluating baselines for wildlife occuring in the landscape. Details of these efforts are provided in ***Section 3.12 Research, Monitoring and Training***. To state in brief, our efforts in the area have included efforts to:

1. Evaluate presence and abundance of snow leopards across the landscape through annual camera trap survey and also through genetic sampling of scat.

Pic 3: Snow leopards captured on camera trap in 2016

2. Abundance of wild prey species (blue sheep and ibex) in five important blocks of Spiti valley—three of these fall within USL.

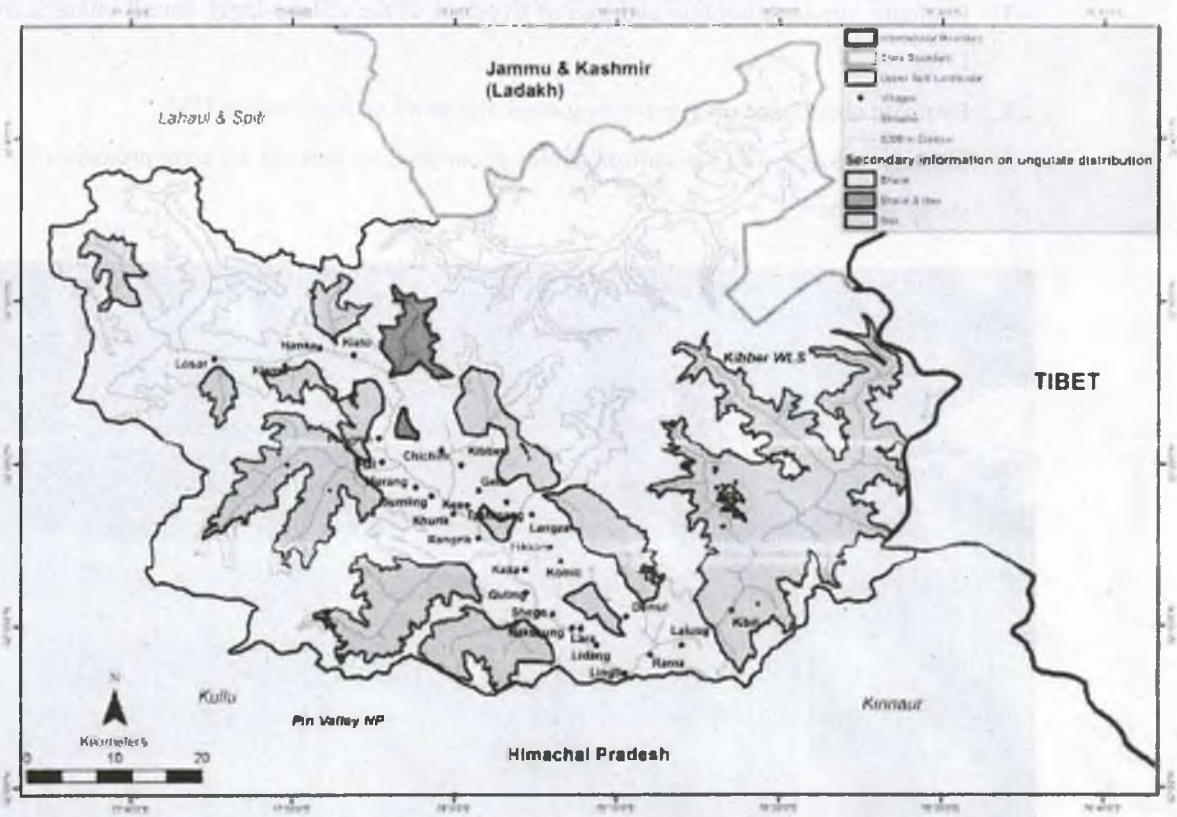
3. Evaluate livestock holding and loss of livestock at the village-level, for all villages within USL.
4. Evaluate abundance of free-ranging dogs across all villages within USL.
5. Identify villages with agricultural fields prone to crop damage by crop predation by blue sheep and ibex.



Pic 4: Teams travelling to Lingti Valley for bharal survey

Based on the collection of data on these ecological aspects, helped initiate conservation action in areas, through village-level micro plans:

1. Work with village communities to set aside pastures that were left free from livestock grazing for a fixed period of five years. These areas had been identified as core landscape units (CLU) in the first management plan prepared for USL.



Map 1: Core Landscape Units identified in Upper Spiti Landscape

2. Run a community-run livestock security programme for 3 village clusters that is managed by locals and compensates the death of an insured animal that is covered under the security programme.
3. Deployment of locally elected guards to keep blue sheep and ibex out of agricultural fields prone to crop predation, in the vulnerable months.
4. Sterlisation and vaccination of free-ranging dogs through collaboration with the Animal Husbandry Department, local Panchayats and Animal Welfare Groups.
5. Reinforcement of livestock corrals that had seen predation by snow leopards.

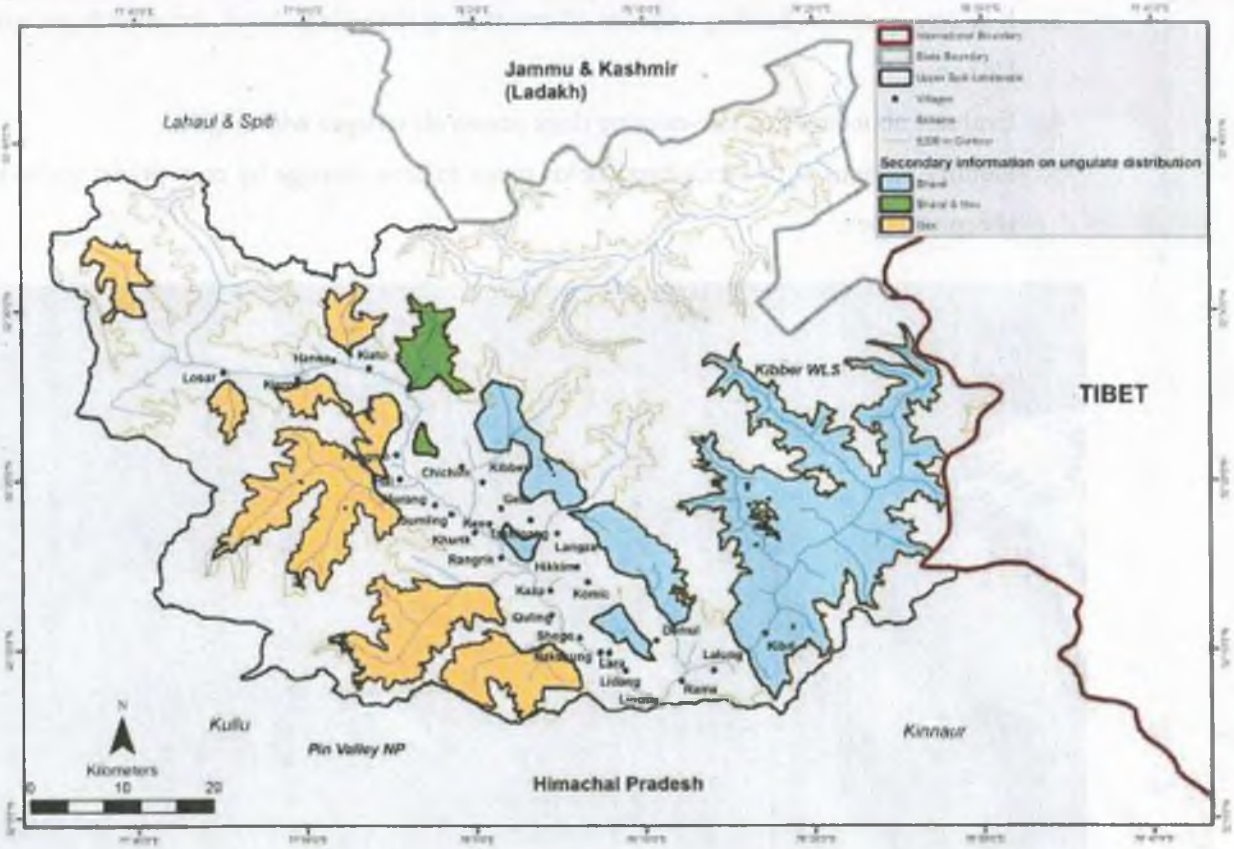
Pic 5: Dog sterilisation with support of Animal Husbandry Department and local communities.

3. Evaluate livestock holding and loss of livestock at the village-level, for all villages within USL.
4. Evaluate abundance of free-ranging dogs across all villages within USL.
5. Identify villages with agricultural fields prone to crop damage by crop predation by blue sheep and ibex.

Pic 4: Teams travelling to Lingti Valley for bharal survey

Based on the collection of data on these ecological aspects, helped initiate conservation action in areas, through village-level micro plans:

1. Work with village communities to set aside pastures that were left free from livestock grazing for a fixed period of five years. These areas had been identified as core landscape units (CLU) in the first management plan prepared for USL.



Map 1: Core Landscape Units identified in Upper Spiti Landscape

2. Run a community-run livestock security programme for 3 village clusters that is managed by locals and compensates the death of an insured animal that is covered under the security programme.
3. Deployment of locally elected guards to keep blue sheep and ibex out of agricultural fields prone to crop predation, in the vulnerable months.
4. Sterlisation and vaccination of free-ranging dogs through collaboration with the Animal Husbandry Department, local Panchayats and Animal Welfare Groups.
5. Reinforcement of livestock corrals that had seen predation by snow leopards.

Pic 5: Dog sterilisation with support of Animal Husbandry Department and local communities.

Energy

Energy security was identified as another area of relevance in the landscape. Efforts to promote house-hold level power generation through roof-top solar power units were propagated. With support from HimUrja a 1 kW, rooftop solar unit was installed at the Kee Monastery. The Monastery acknowledges the efforts of the Department and continues to help with the dissemination of messages supporting the cause of conservation. Similar efforts were piloted in 3 other villages in the USL.

3.2 Timber operations

The entire USL is a desert steppe comprising rangelands that are characterized by perennial grasses, sedges, forbs and small shrubs, while the tree layer is largely absent. As a result, there are no major timber operations, including bamboo and firewood harvest within the landscape.

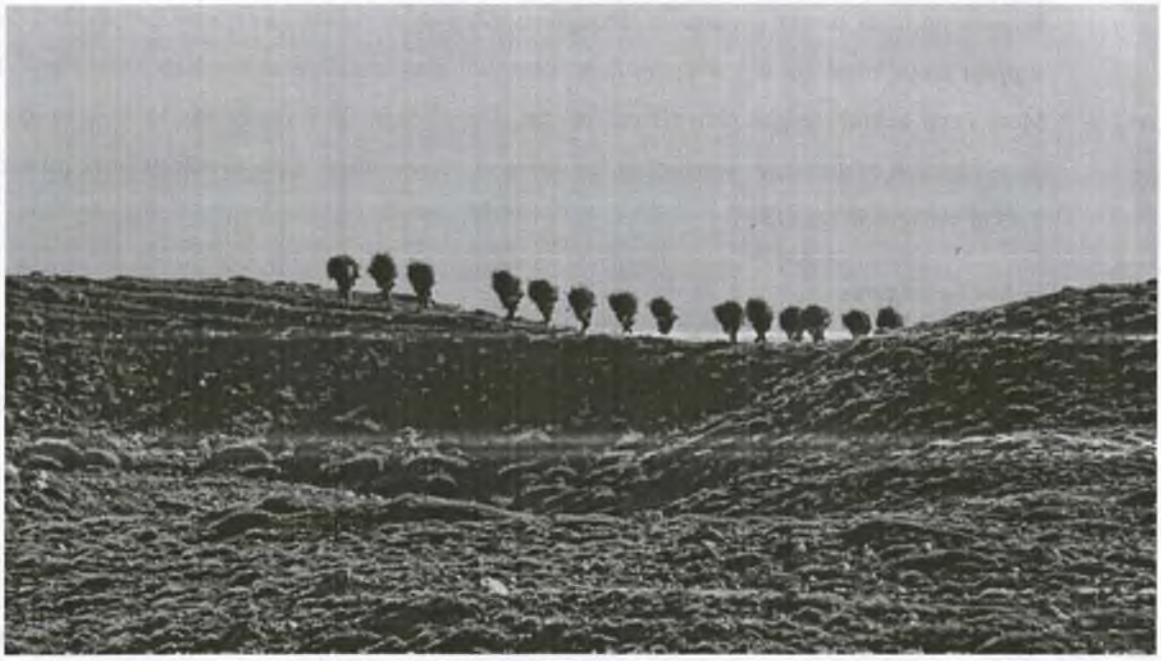
3.3 Non wood forest produce (NWP) collection

The local community of Spiti are agro-pastoralists and they depend on local resources for fuel, fodder, construction material and other non-timber produce such as medicinal plants. A systematic assessment on village-level extraction was carried out (*c.* 2010) through key informant surveys from a sample of 29 villages in the last management plan for USL. Similar surveys were carried out through the sample of 30 villages in June-July 2016 to assess the levels of consumption. While the figures remain coarse estimations, they are indicative of relative extraction by villages and importance of species for a variety of uses. Overall, the levels of collection across USL appear to have reduced due to a combination of several factors. This is elaborated in the following sub-sections.

3.3.1 Fodder

Traditionally, fodder collected in autumn from designated pastures is used for stall feeding of all species of livestock, in winter. Livestock is also left close to the village for grazing, during winter, if the weather permits. Agricultural residue and plants growing around agricultural bunds are harvested at the time of harvest and form bulk (84%) of the total fodder collected. Rest of the fodder (16%) is collected from community held pastures designated for winter fodder collection. During the previous management plan period (2011-16) collection from designated pastures formed a larger part (23%) of the total fodder collected. Of the 30 villages surveyed, 16 villages reported that they had stopped extraction of fodder from pastures over the last 4-5 years. This change has happened for a combination of reasons ranging from: change in livestock composition (increase in yak rearing coupled with a complete stoppage of rearing

sheep and goat in several villages) to the availability of dry feed transported from Punjab and Rajasthan to local villages by traders upon their arrival in Spiti at the time of the apple harvest.



Pic 8: Fodder collection from community-held pastures

Village	Fodder collected from pastures per HH (kg)	Agricultural fodder residue per HH (kg)	Total fodder per HH (kg)	Fodder collected from pastures per HH (%)
Chichim	200	4400	4600	4%
Chubrang	1000	1800	2800	36%
Demul	1300	1200	2500	51%
Gete	700	3600	4300	16%
Hansa	0	5900	5900	-
Hikkim	1500	3300	4800	31%
Hull	0	2000	2000	-
Kee	0	7100	7100	-
Khurik	0	1200	1200	-
Kiamo	0	5000	5000	-
Kiato	0	2900	2900	-
Kibber	100	5600	5700	2%
Komic	3000	2500	5500	54%
Kwang	1800	2900	4600	39%
Lalung	0	2300	2300	-
Langza	500	1600	2100	23%
Lara	2000	800	2800	72%
Lidang	1000	2400	3400	29%
Lingti	2100	0	2100	100%

Village	Fodder collected from pastures per HH (kg)	Agricultural fodder residue per HH (kg)	Total fodder per HH (kg)	Fodder collected from pastures per HH (%)
Losar	0	2600	2600	-
Morang	0	7400	7400	-
Nakchung	0	1200	1200	-
Pangmo	0	2200	2200	-
Quiling	0	700	700	-
Rama	0	1900	1900	-
Rangrik	0	2500	2500	-
Salung	400	1400	1800	22%
Shego	0	3700	3700	-
Sumling	0	1700	1700	-
Tashigang	300	4300	4600	7%

Table 1: Extraction of biomass from rangelands (designated winter pastures held by the local community) and collected through agricultural residues collected from agricultural fields, based on a sample of 30 villages as sampled in 2016. The estimated fodder collected is given in kilograms per household (HH).

The main species collected from pastures include *Trigonella sp.*, *Cicer sp.*, *Aconogonum sp.*, and *Festuca sp.*

3.3.2 Fuel Wood

Fuel wood is provided by the Forest Department at subsidized rates to all households up to a maximum of 1000 kg per household. This is the primary source of heating through the long winter months when temperatures mostly remain sub-zero and could drop as low as -40 degrees Centigrade in some parts of the valley. A handful of villages still continue to collect fuel wood, though this number has gone down through the last management plan period.

Village	Fuel wood collected per HH (kg)
Chubrang	2100
Demul	500
Gete	100
Hikkim	300
Komic	1000
Langza	500
Lara	900
Nakchung	600
Shego	1000

Table 2: Extraction of fuel wood from rangelands (held by the local community) and Spiti river bed. Of the 30 villages sampled in 2016, only 9 reported that they still collect fuel wood. The estimated fuel wood collected is given in kilograms per household (HH).

Of the seven villages that continue to collect fuel wood, four villages i.e. Chubrang, Lara, Nakchung and Shego collect part of the fuel wood from the Spiti river bed. The species collected include *Caragana sp.*, *Salix sp.*, and *Hyppophae sp.* Apart from wood, collection of livestock dung forms an important source of fuel and the collection of dung is carried out actively in all of the 30 sampled villages.

3.3.3 Other non-timber products

Woody species are commonly used for construction of traditional mud brick houses. Poles used for the roof are obtained from local willow and poplar plantations owned by people in villages along the main Spiti valley. Roof edges are lined with bushes as a protection against seepage of rain water and snow melt. The main species used for this purpose include *Lonicera sp.* and *Caragana sp.* Typically, at the time of constructing a new house, every family of the village helps in the collection of these species for use in the newly constructed house.

The collection of medicinal plants has also gone down and is limited to few *amchi* (local Tibetan medicine practioner) families in some villages. The practice is on the decline with the advent of modern medicine. However, there is also a possibility of extraction to serve external markets as the demand for some species is increasing. These especially include *Arnebia* or ratanjyot and *Dactylorhiza sp.* or salaam panja.

3.4 Other programmes and activities

One of the key perspectives from which landscapes are valued is ecosystem services.

3.4.1 Ecosystem Services

Ecosystem services are the contributions that ecosystems make to human well-being. A fundamental characteristic is that they retain a connection with the underlying ecosystem functions, processes, and structures that generate them.

Ecosystem services are divided into three sections provisioning, regulating, and cultural services:

1) Provisioning services include all nutritional, material, and energy outputs from living systems. It includes crop production, livestock production, collection of materials etc.
2) Regulating and maintenance include all the ways in which living organisms can mediate or moderate the ambient environment that affects human performance. These include pollination services, pest control, disease control, etc.

3) Cultural services include all the non-material and normally non-consumptive, outputs of ecosystems that affect physical and mental states of people. These include sense of place, experiential use etc.

In each of these cases varying amounts of human inputs are required to provide these services. Services are valuable at different scales. Local ecosystem services are valuable locally for example collection of firewood; regional ecosystem services are used by people outside the point of origin of these services such as water used by people downstream; and global ecosystem services are services that are relevant globally, for example carbon sequestration.

Given below is a list of ecosystem services from Spiti Valley. It also indicates whether they have local, regional, or global reach.

Table 3: Ecosystem Services from Spiti Valley

Ecosystem Service Type	Services from Spiti Valley	Reach of services
Provisioning	Crops including Green pea, barley, apple, black pea, wheat.	Local
	Sheep and goat for wool, meat from all livestock except donkeys and horses, yak hair used to make ropes, cow and dzomo for milk, butter and cheese.	Local
	Wild onion as a spice, mushroom, and green leafy plants to eat.	Local
	Water for household and agricultural purposes. Snow melt. Water for downstream users.	Local, regional
	Medicinal plants, plants for dyes, plants for roofing.	Local
	Animal dung as fertilizer, wild plants as fertilizer, collection of fodder.	Local
	Wood and animal dung for heat	Local
	Yak to plough the land, donkey to transport materials.	Local

Ecosystem Service Type	Services from Spiti Valley	Reach of services
Regulating	Storage by ecosystems, i.e, water storage pits built using soil and plants are allowed to grow around it for fresher storage of water. Irrigation channels also made using the same principle.	Local
	Clean air and clean water, i.e no pollution of air and water.	Local
	Control of soil erosion	Local
	Pest and disease control	Local
	Soil fertility	Local
	Clean water	Local
	Good climatic conditions. Important for it to rain and snow at the right time.	Local and regional
Cultural	Tourism	Local, regional, and global
	Cultural heritage, traditional knowledge systems, knowledge of traditional Tibetan medicine passed down through generations.	Local, regional, and global
	Beautiful landscapes, wildlife and biodiversity	Local, regional, and global
	Sacred spaces around the villages, sacred plants used in religious ceremonies, and sacred animals.	Local, regional, and global
	Enjoyment provided by wild species and the landscape. Sense of peace.	Local, regional, and global
	Preserving nature for the future generations.	Local, regional, and global

Monetary value of ecosystem services from Spiti Valley

Spiti Valley has a population of around 12,000 people who use the local ecosystem services. Spiti being an agro-pastoral system, the local community depends directly on the ecosystem for provisioning services. In addition, transhumant pastoralists with a total of 55,000 to 80,000 livestock visit the region from Ladakh in the north and from the main Himalaya in the South. Some villages rent out pastures to the herders with grazing charges varying between 5,395INR

to 81,250INR for three months based on the size of the pasture and fodder quality. Around 40,000 – 50,000 tourists visit the valley every year to enjoy the stunning landscape, unique biodiversity assemblage, and the Buddhist cultural heritage. This number is rapidly increasing every year.

An economic valuation of all the provisioning ecosystem services from the Spiti Valley amounted to 235,430 ± 9,685 INR HH-1 yr-1 to the local community (Murali et al, unpublished). This was 3.8 times higher than the average annual household income (62,075 INR; Revenue department, Kaza, Spiti Valley, 2014). The total value of the subsistence goods in Spiti Valley amounted to 173,355INR per household, which was 2.8 times higher than the value of the commercial goods produced. This indicates that the pasturelands in Spiti provide the local community with economic security.

At a regional scale, water is an important ecosystem service from this valley. Mountain regions world over generally serve as important water towers (Viviroli et al. 2007). The Spiti River is one of the two major rivers that drain into the Sutlej, an important river of the Indus basin that drains the fertile agricultural plains of North India and Pakistan (Gupta and Sah 2008).

At a global scale, the unique biodiversity assemblage of Spiti Valley which includes the snow leopard, the blue sheep, Ibex, and the Tibetan wolf, is of immense conservation value. It is recognised as an important landscape for snow leopard conservation (Snow Leopard Working Secretariat 2013). Cultural services, such as the unique Buddhist cultural heritage (Handa 2004), and scientific and educational value from rock art, and Bonpo cave paintings (Thakur 2008), from the landscape are relevant at both regional and global scale.

3.5 Forest Protection

3.5.1 Legal status

Three wildlife protected areas (PAs), the Pin Valley National Park (675 km^2), Chandratal Wildlife Sanctuary (38.56 km^2) and the Kibber Wildlife Sanctuary (1,200 km^2) exist in Spiti. The area of the Upper Spiti Landscape covers *c.* 4000 km^2 which includes the Kibber Wildlife Sanctuary. Bulk of the land under the control of the state's Forest Department (74%), with the rest being with the Revenue department. Community have de facto and de jure rights over most land and in places thus can lease out land for grazing to migratory herders. All of Spiti Wildlife Division has also been declared as a 'Cold Desert Biosphere Reserve' in 2009 by the Government of India (Letter No. 9/9/2005-CS/BR, MoEF, 28 August 2009).

3.5.2 Hunting

Hunting is legally not permitted in these areas as wildlife occuring in this landscape is protected under the Wildlife (Protection) Act, 1972.

3.5.3 Illegal activities

Poaching

Poaching is largely not prevalent in the landscape. However there have been past reports of retaliatory killing of snow leopards and wolves in cases where they have damaged livestock *en masse* (snow leopards) or in cases where they have been perceived as a threat to livestock rearing (wolves). In current years, there have been no such reports of this nature—largely due to awareness of prevailing wildlife laws.

Spiti is seeing a lot of changes in recent years, with a flux of a large migrant labour population that visits the valley for work in the summer months. There have been village-level reports of illegal hunting of birds from some of these areas—largely for personal consumption. There is a clear need to engage with this group and sensitize them to prevent such occurrences in future.

Illegal cutting of trees

Since the USL falls above the treeline, illegal cutting of tress is not possible in the landscape.

3.6 Livestock grazing

Livestock plays a very important role in Spiti and the lives of the local community. Livestock composition is varied and serves multiple purposes.

Animal	Purpose
Yak	• Used for ploughing agricultural fields • Important source of wool and manure • Traded for meat in winter • Mostly free grazing in pastures held by the local community, stall fed during peak winter months
Dzomo (Yak + Cow hybrid)	• Maintained mainly for milk • Source of manure • Grazed daily in local pastures and kept in corrals by their owner
Cow	

Animal	Purpose
	• Maintained mainly for milk • Source of manure • Grazed daily in local pastures and kept in corrals by their owner
Horse	• Maintained for traditional practise by big households (Khangchen) • Off late, traded at traditional fairs and also sold to the Indian Army • Mostly free grazing in pastures held by the local community, stall fed during peak winter months
Donkey	• Important pack animal to transport material • Grazed daily in local pastures and kept in corrals by their owner
Sheep & Goat	• Maintained mainly for meat • Source of manure • Grazed daily in local pastures and kept in corrals by their owner

Table 4: Livestock reared and their utility in landscape

Livestock is grazed in community held pastures through the day and herded into corrals for the night. This excludes yak and horses that are left free for grazing, for most part of the year. With the onset of winter, increased difficulty in accessing pastures makes it necessary to herd livestock indoors. For this period of 3-4 months, livestock are stall-fed by their owners. Livestock numbers are adjusted in tune with the amount of fodder that can be stocked by individual livestock owners. An important source of fodder is the agricultural residue left over from the harvest. Another important source of fodder is forage harvested from designated wintering pastures—communally held pastures that are not accessed for grazing through summer, so that forage can be extracted to stall-feed livestock through winter. Such extraction was seen as a reason for high stocking densities of livestock in this region. In fact there was a significant rise in livestock holding from 1987 to 1996. However, livestock holdings seem to have reduced significantly in the period following 2003-2011. For the same villages compared in 1987, livestock holding had reduced by as much as 50% (Singh et al. 2015). This reduction has occurred due to a combination of factors. It is interesting to note that the composition of livestock holding has also changed over time.

Pic 9: Livestock returning to the village after grazing in community-held pastures

One of the biggest changes across most villages in the valley is the reduction in numbers of sheep and goat. In all, 29 of the 30 villages in USL reported a drop in sheep and goat numbers. Of this, 15 villages had stopped rearing sheep and goat. Most of these villages lie along the main valley of the Spiti River. The reason for this change is largely due to the menace of free-ranging dogs that kill sheep and goat to the extent that people have stopped rearing them. This is coupled with the fact that several of these villages have moved towards rearing Jersey cows (over the traditional breed). The sale of milk produced by these cows has been a source of income to locals rearing them. In summer, a single Jersey cow can fetch milk worth Rs 10,000/- a month under the *Doodh Ganga Yojana*. The cooperative that was set up less than a decade ago, sells milk to hotels, restaurants and residents of Kaza.

Livestock compositions have changed. One of the important changes is the rise in yak rearing. Given that yaks are grazed freely in community held pastures, their rise is noticeable in villages that have access to larger pastures—typically villages situated at higher altitudes, away from the main valley of the Spiti River. Yaks have traditionally been reared for ploughing agricultural fields and also as a

source of meat. In recent years, the sporadic demand for yak meat that can fetch a high price from the adjacent district of Kinnaur is believed to be part of the reason for the rise in yak numbers. With rising economic status from the sale of cash crop, the propensity to rear and consume yak meat—considered *better meat*—could also partly explain the rise in yak numbers.

Horse rearing is also on the rise in certain villages, in the past 5 years (*c.* 2016). This too is characteristically in villages situated at higher altitudes, away from the main valley of the Spiti River. Part of the reason for the rise in horse numbers is attributed to trade. Several young horses are sold in Pin Valley, where the Indian Army has been purchasing local horses of the *Chumurthi* breed for a handsome price (as high as Rs 50,000/- for a 2 year old male). At the same time the number of donkeys reared is on the decline. Donkeys are traditionally used as pack animals. With the ingress of motorable roads and modes of transport their utility has reduced. However, donkeys are still valued in villages away from the main valley of the Spiti River where they may still form an important mode of transporting material to and from the agricultural fields and pastures.

The general drop in livestock numbers has led to a significant reduction in the dependence of local communities on extraction of forage from wintering pastures. The extraction was done in a systematic manner where the number of days and areas to access were clearly defined and within the villagers. While locals were able to list the rules that used to guide such extraction, the practise appears to have diminished drastically. Only 12 of the 30 villages surveyed, reported that they continue to extract fodder for winter months, albeit in lower volumes. The rest of the villages (18) reported that extraction had almost reduced to nil in their villages. It would be interesting to note that a new option is now available to locals—to purchase dry fodder. Dry fodder (agricultural residue) from the plains of Rajasthan and Haryana is brought in to Spiti by trucks that are come in to transport the apple harvest, out of Spiti. The trucks that would otherwise travel empty now bring in dry fodder which is sold in several villages. Consumption of dry fodder is high in villages with smaller pastures that are in the main valley of the Spiti River. The fodder allows them to rear livestock, especially Jersey cows, and participate in the milk cooperative.

An important practice associated with the rearing of livestock was that of the *Dogpas* who would communally rear livestock away from the village (referred to as *dogsa*) in return for their right to retain milk from the animals. The term *dogrin* refers to this payment made by the owners to the caretakers. The village of Demul explained that the last group of Dogpas had discontinued this practise a few years ago (*c.* 2014) since the next generation was moving towards newer vocations. At the time of the surveys, Mane was the only village where this tradition was still in practice. Several villages with smaller pastures (e.g. villages of the Hull Panchayat) pay an annual fees to villages with larger pastures (Chichim, in this case) to allow their yaks and horses to graze in pastures held

tradionally by them. It is interesting to note that the payment made in such cases is also termed *dogrin.*

While the number of livestock reared, in absolute numbers, may have seen a decline it is important to note that with options of fodder for winter, this could change. A lot then will be guided by the demand for livestock and their utility. It's hard to predict which way the trend in livestock rearing could head, but a lot would depend on the market.

3.7 Wild fires

Due to the sparse vegetation across the landscape, the risk of wild fires does not prevail in the landscape.

3.8 Insect attacks and pathological problems

There are no significant problems pertaining insect attacks or pathological problems in the landscape.

3.9 Wildlife Health

While there have been no adverse reports on wildlife health, it remains a subject to be addressed. Currently there is limited interaction between wildlife and domestic livestock. There have been outbreaks of foot and mouth disease (FMD) within domestic livestock, which could also put wild ungulates at risk. There have been reports of free-ranging dogs hunting wild ungulates, chasing snow leopards, and mating with wolves from the region which increases the risk of disease transmission to wildlife. Recently the Uttarakhand Forest Department had reported "symptoms of eye infection" in blue sheep and that were having difficulty in movement in the Gangotri National Park. Keep these in mind, it will be important to develop an action plan to monitor wildlife health and define protocols to tackle the outbreak of any disease in wild animals.

3.10 Tourism

Tourism remains an important source of livelihood in Spiti, in addition to the single annual cash crop harvest which is the main source of income for locals. Remoteness and difficult access route make Spiti a relatively less preferred tourist destination, compared to Ladakh which has a similar landscape and wildlife assemblage. However, Spiti has seen a steady rise in tourism over the past decade. There is a clear rise in the numbers of hotels/homestays and taxis to cater to this blossoming rise in local tourism. Since the last management plan survey in 2008-09 the number of hotels and homestays has risen by 189% (130 in 2016 vs. 45 in 2008), while the number of private taxis has risen by 97% (75 in 2016 vs. 38 in 2008) in the 30 sample villages in the USL.

Village	Number of Hotel & Homestays in 2008 (No.)	Number of Hotel & Homestays in 2016 (No.)	Number of Taxis in 2008 (No.)	Number of Taxis in 2016 (No.)
Chichim	1	3	1	3
Chubrang	-	0	-	1
Demul	5	25	3	5
Gete	0	0	0	0
Hansa	0	1	0	0
Hikkim	0	0	0	1
Hull	1	1	4	5
Kaza	24	55	6	*
Kee	0	0	3	7
Khurik	0	0	6	0
Kiamo	0	0	0	2
Kiato	0	0	1	1
Kibber	5	8	1	3
Komic	-	6	0	2
Kwang	-	0	-	0
Lalung	2	10	2	*
Langza	5	7	2	1
Lara	0	0	0	0
Lidang	0	0	2	1
Lingti	0	0	1	1
Losar	0	11	3	*
Morang	0	0	0	3
Nakchung	0	0	0	1
Pangmo	0	0	2	3
Quiling	0	0	0	0
Rama	0	0	0	0
Rangrik	1	2	0	30
Salung	-	0	-	0
Shego	0	0	0	3
Sumling	0	0	1	2
Tashigang	1	1	0	0

* signifies data unavailable

Table 5: Number of hotels, homestays and taxis in 30 villages sampled with the USL in 2008 versus 2016.

Tourists visiting Spiti are largely drawn in to catch a glimpse of life of the local community inhabiting this remote landscape where a lot of the practices have continued over millennia. Some of the oldest Buddhist monasteries of Spiti—Tabo, Ki and Dhankhar—form a major attraction to tourists. With the

rise in local home stays, tourists now have an option of visiting almost any village of Spiti and living with locals at a nominal cost. In the past few years, tourism focussed on wildlife viewing is also seeing an encouraging rise. So also there is a rise in *volunteer tourism*—where people from urban centres in India and abroad visit Spiti and volunteer their time towards working with and for the local community.

While the challenges of reaching Spiti are likely to remain, the rise in tourism is inevitable. Given this, it becomes important to sensitise tourists about the uniqueness of this fragile landscape. At the same time there is a dire need to build local capacity, in various areas so that it is prepared to benefit from rising tourist numbers without harming the landscape. Tourism, in particular, forms a powerful case where multiple agencies within the local administration ought to work together along with the local community enabling them to run it in a manner that is streamlined and beneficial to all. More suggestions on this topic are provided in Chapter 6.

3.11 Research, Monitoring and Training

The Spiti region of northern India (12,000 km^2) is part of the larger Trans-Himalayan region spread over India, China and Nepal (2.6 million km^2). It represents a high altitude arid ecosystem where annual precipitation is low (200-400 mm $year^{-1}$). The landscape is a desert steppe comprising rangelands that are characterized by perennial grasses, sedges, forbs and small shrubs, while the tree layer is largely absent. These rangelands represent coupled human-natural ecosystems as they are grazed by wild herbivores as well as by livestock herded by a traditional agro-pastoral society.

Until recently, wildlife and humans in the Trans-Himalaya were considered to co-exist in relative harmony. But, over the last decade, primary research into different ecological inter-actions between wildlife and livestock in Spiti region has unravelled a wide array of human-wildlife conflicts, and also helped formulate pertinent remedial strategies. These findings can be categorized into 3 groups.

3.11.1 Research & monitoring

Competition between livestock and wildlife

Initial work in Spiti region focused on ecological characteristics of the native ungulate Himalayan Ibex (*Capra sibirica*) in the Pin Valley region (Bhatnagar 1997). These studies investigated seasonal habitat selection and foraging habits of the ibex. An important insight from these studies was that livestock use of rangelands may result in competitive interactions with the ibex that may be detrimental for conservation objectives (Bhatnagar *et al.* 2000). Subsequent work focused specifically on competitive interactions between livestock and native wildlife such as the Bharal, *Pseudois nayaur* in Spiti (Mishra 2001). Major findings indicated that a large majority of Spiti's rangelands may be overstocked with livestock that result in reduced livestock production for the

pastoralists (Mishra *et al.* 2001). Overstocking was seen as a measure to buffer carnivore related losses of livestock and environmental stochasticity (Mishra 1997), and was also linked to local extinctions of wildlife populations (Mishra *et al.* 2002). The mechanism of competitive interaction was reported to occur through high levels of overlap in forage requirements between the livestock and bharal that results in exploitative competition (Mishra *et al.* 2004). Similar studies were later carried out in Pin Valley region, and these suggested that in addition to exploitative forage competition, livestock may also impose interference competition on ibex by restricting their habitat use patterns (Bagchi *et al.* 2004). Another key finding was that not all types of livestock affect wildlife in the same way, and all interactions need not be negative. Of all the livestock types, the goat and sheep of nomadic herders had the greatest negative impact on ibex (Bhatnagar *et al.* 2000; Bagchi *et al.* 2004). Similar trends have subsequently been seen in other parts of the Trans-Himalaya (Namgail *et al.* 2008). Suryawanshi *et al.* (2010) reported that due to competition with livestock, wild ungulates get forced to forage on plant species which they are not very well adapted to eat. As a result, the reproductive rates of wild herbivores get compromised due to poor nutrition, especially during winter which is also the resource lean season.

Grazing beyond a certain threshold of livestock density is associated with decline in habitat use by Snow Leopards, presumably due to depressed wild undulate abundance as well as associated anthropogenic disturbances (Sharma *et al.* 2015). Recent research into the competitive interactions of small livestock and Himalayan Ibex suggests that grazing by sheep and goats reduces forage quality and negatively affects Ibex populations by reducing kid survival (Ghoshal *et al.* Unpublished). Bagchi *et al.* (2012) suggest that livestock may promote dominance by a few grazing tolerant plants and effectively lower species richness and community evenness, relative to the effect of native ungulates. Therefore, managing livestock grazing is key to conservation of grassland. However, the Trans-Himalayas are not untouched by economic and social changes, which in turn may also manifest themselves in changes in pastoral practices. Livestock numbers have essentially halved in the last decade and the reduced livestock holdings are compositionally different (Singh *et al.* 2015). Whether such changes may benefit wildlife conservation is an aspect that needs to be studied.

Livestock predation and conservation of Spiti's carnivores

Annual livestock losses to snow leopards and wolves can translate to considerable economic loss for livestock owning households, sometimes upto as much as half of the regional per capita income (Mishra 1997). Yet, perhaps due to traditional Buddhist traditions, the levels of retaliatory persecution against carnivores were not as high as is known from other parts of the Himalayan region. However, retaliatory killings of snow leopards in response to livestock losses are an

important cause of decline in snow leopard populations in other parts of its range (Jackson et al. 2010). While snow leopards are entitled to the highest level of legal protection in India and offenders can face legal action, the persistence of livestock depredation can result in frustration, loss of tolerance and animosity against conservation initiatives among the local communities. Moreover, livestock is becoming a global economic asset (Berger et al. 2013), this coupled with the rise in prices of milk and meat due to the surge in domestic demand (Subramanian 2015) may further affect people's tolerance. Therefore, effective snow leopard conservation merits a thorough study of the causes and patterns of livestock depredation by snow leopards as well as its impact on herding communities.

Available evidence suggests that snow leopards kill livestock opportunistically and prefer wild undulates despite their much lower abundance compared to livestock (Johansson et al. 2015). Snow leopard abundance is primarily determined by the abundance of wild ungulates and not the abundance of livestock. However, when wild ungulate abundance in a habitat increases the extent of livestock predation by snow leopards is predicted to increase (Suryawanshi et al. 2013). The same study also shows that livestock are vulnerable to depredation in areas with relatively higher abundance of wild ungulates. Asymmetric apparent-competition between prey species with a shared predator could cause decline in one prey species (Decesare et al. 2010), such an interaction between wild ungulates and livestock could potentially exasperate livestock losses. Lax herding of livestock result in stragglers that become especially vulnerable to predation (Johansson et al. 2015). A community-based and operated livestock-insurance programme that aims to compensate the financial loss resulting from a predation event while incentivizing improved husbandry practices to avoid depredation has presumably helped in reducing livestock losses to less than half of the baseline levels in Spiti(Mishra & Suryawanshi 2014).

The programme also includes creating strategic 'village reserves' that are free of livestock grazing, and are intended to supplement available habitat for the wild herbivores (Mishra et al. 2010) as well as education and outreach activities to improve the social carrying capacity for wild carnivores. Within a period of 4 years since village reserves were established there was a four-fold increase in Bharal densities within the grazing-free reserves (Mishra 2003).

People's perception of the threat of livestock depredation and actual livestock depredation may differ in their underlying causes. In case of snow leopards stocking-density of large-bodied free-ranging livestock(yak & horses) explains people's threat perception while actual depredation by snow leopards is explained by relative abundance of snow leopards and wild prey, whereas in case of wolves while abundance of wolves shapes perception actual depredation is explained by habitat structure(Suryawanshi et al. 2013)

The extent of livestock loss incurred or perceived is however only one of the several factors that influence peoples attitude and their willingness to co-exist with snow leopards. While individual-level differences such as gender, education, number and extent of additional income sources do influence attitude towards wild carnivores but when one scales up from individuals to community factors such as village size and the abundance of large-bodied livestock(yak and horses) in the village have an overbearing influence(Suryawanshi et al. 2014). In effect this implies that in an area with high livestock depredation rates, individuals can develop a strong negative attitude towards snow leopards despite them not personally having lost livestock to snow leopards.

Livestock grazing and ecosystem functioning

Unlike native herbivores, livestock do not have a long co-evolutionary history with vegetation, and their population as well as behaviours (habitat use and ranging patterns) are heavily influenced by human decisions. Research has brought-forth a better understanding of the ecosystem consequences of livestock grazing in Spiti (Bagchi 2009).

Livestock grazing was found to be associated with a change in vegetation composition that favours domination by sedges and concomitant reduction in abundance of forbs (Bagchi & Ritchie 2010). Since sedges and forbs have varying traits, most notably in terms of biomass allocation in shoots and roots, such compositional shifts were also linked with reduction in total plant production driven by excessive livestock grazing. Reduction in plant productivity as well as shifts in biomass allocation could also influence soil carbon sequestration and lead to reduced soil C stocks. Livestock grazing may also promote dominance of a few grazing tolerant species and thus effectively reduce species richness and community evenness, given that species rich communities show greater compositional stability under grazing maintaining species diversity is crucial to the goal of maintaining plant production while preventing large compositional shifts in vegetation(Bagchi *et al.* 2012)

Monitoring of Snow Leopards Population

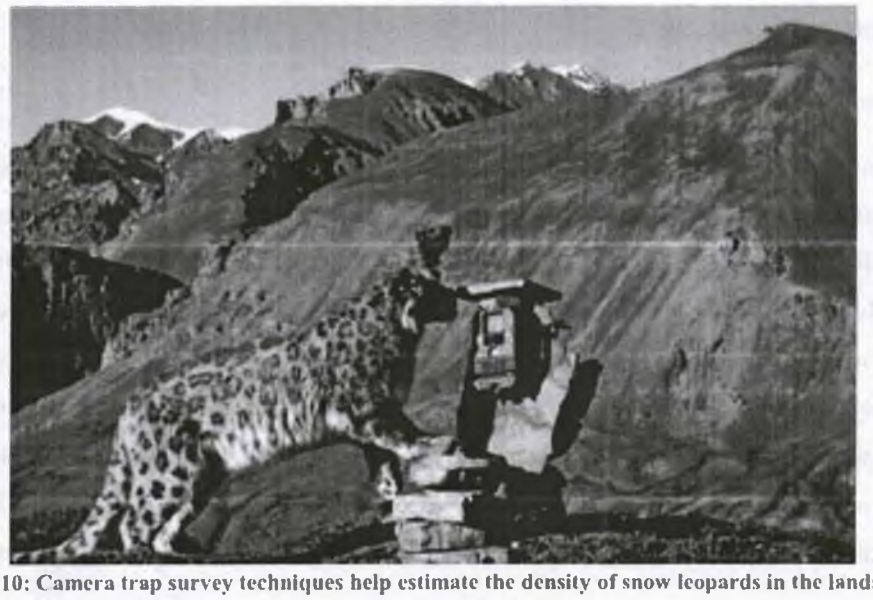
Snow leopards are notoriously difficult to enumerate given their solitary habits, extensive range, low densities and cryptic nature (Schaller 1977). Population estimates of snow leopards were historically limited to a few studies based on radio-telemetry (Jackson and Ahlborn 1989, Oli 1994, McCarthy 2005) and conservationists had largely depended upon snow leopard signs (scrape, scat, pugmarks and sent markings) to compute indices of relative abundance (Fox *et al.* 1991, Jackson 1996). However, these techniques do not address critical issues of observability and spatial sampling. Estimating abundance by calibrating sign frequency in the area with that in an area with known snow leopard density based on radio-telemetry also suffers from several confounding factors and poor understanding of the relationship between density and sign

frequency (Jackson & Ahlborn 1988). The use of photographic capture-recapture to provide unbiased estimates has been demonstrated for tigers (Karanth and Nichols 1998) and reproduced on a variety of felid species including snow leopards (Jackson *et al.* 2006, Silver *et al.* 2004, Wang and McDonald 2009). However, density estimates emerging from these studies are vulnerable to bias as the effective sampling area is heuristically determined using procedures which are poorly understood and difficult to characterize theoretically (Royle *et al.* 2009). To this end, Bayesian as well as Maximum-likelihood based spatially-explicit photographic capture-recapture techniques using statistical program SPACECAP and statistical package SECR respectively in software R were utilised to estimate snow leopard abundance and density in Spiti (Gopalaswamy *et al.* 2012, Efford 2009). During the last five years (2011-2016) four population monitoring exercises have been conducted, of which results for three surveys are available.

Snow Leopards are wide-ranging species with individual home range sizes usually exceeding 100 km^2; this is reflected in the low densities observed in this study. Comparisons with density estimates from similar analysis conducted for the period between November to June, 2014 and May to October, 2015 indicate a stable population of Snow Leopards in Spiti Valley. The higher estimates from SPACECAP are the result of limiting potential habitat to areas below 5200 m in altitude.

Method	2011-2012	2013-2014	2015
SECR	1.08(.65 - 1.85)	0.92(.57 - 1.49)	0.80(.46-1.38)
SPACECAP	1.48(.97 -2.15)	1.15(.91 - 1.32)	1.21(.78 - 1.62)

Table 6: Comparison of Population Density estimates across three seasons. Density in individuals/100km^2, Lower and Upper 95% CI indicated in brackets.



Pic 10: Camera trap survey techniques help estimate the density of snow leopards in the landscape

While the effort to carry out camera trap surveys across the Upper Spiti Landscape continues as an annual exercise, the Himachal Pradesh Forest Department has also embarked on a study to estimate the density of snow leopards across the entire range of snow leopard habitat in the State using similar camera trap surveys and deploying SECR techniques for estimation. The study will be completed between 2018 and 2020.

Monitoring of Wild Ungulate Population

Monitoring wild ungulate population is an important objective given that they are an important determinant of large carnivore densities (Karanth et al. 2004) and play an important role in maintaining the ecosystem (Bagchi and Ritchi 2010). Earlier studies on wild undulates in Spiti a depended on total counts of the population (Mishra et al. 2004, Bagchi and Mishra 2006, Suryawanshi et al. 2010). However, a double-observer survey technique which accounts for observer differences in the ability to detect the target species has been adapted to provide precise estimates for Bharal (Pseudois nayaur) and Ibex (Capra sibirica) (Suryawanshi et al. 2012) .

Variable	Kibber (Blue sheep)[a]	Kibber (Ibex)[a]	Kibber (total)[b]	Tabo (Blue sheep)	Pin (Ibex)	Lossar (Ibex)	Lingti (Blue sheep)	Overall (Blue sheep and Ibex)[c]
C	34	3	37	25	7	1	25	96
S_1	8	1	9	14	3	1	6	33
S_2	8	0	8	6	4	1	7	25
$\hat{G}$	51.8	4	55.9	48.2	15.5	3.5	39.6	162.5
Var ($\hat{G}$)	2.68	0	2.76	5.89	2.75	0.75	2.42	14.2
$\hat{D}$	13.1	11.3	13.1	10.6	11.9	8.6	15.0	12.6
Var ($\hat{D}$)	0.05	2.76	0.01	0.02	0.18	0.07	<0.005	<0.005
$\hat{N}$	678	45	735	509	184	30	593	2,049
Var ($\hat{N}$)	593.5	44.1	494.1	706	400.1	52.9	546	2,339.6
±95% confidence interval	48	13	44	53	40	14	46	96
Total area (km^2)	411	411	411	341	497	219	186	1,654
Density	1.65	0.11	1.79	1.49	0.37	0.14	3.19	1.26
Distance walked per survey (km)	99	99	99	87	91	90	97	464
P_1	0.8	1	0.82	0.81	0.63	0.5	0.75	0.79
P_2	0.8	0.75	0.8	0.64	0.7	0.5	0.8	0.74

C, Number of groups seen in both surveys; S_1, number of groups seen in first survey only; S_2, number of groups seen in second survey only; $\hat{G}$, estimated number of groups; $\hat{N}$ estimated population; P_1, P_2, mean of the estimated detection probability for observer one and two, respectively

Sites Lossar and Pin are occupied exclusively by ibex; sites Tabo and Lingti have only bharal; Kibber has both ibex and bharal

[a] Estimates of bharal and ibex separately for site Kibber

[b] Combined bharal and ibex estimates

[c] Estimates obtained from pooled data from all sites

Table 7: Abundance estimates of Bharal and Ibex obtained using spaced double-observer surveys in five different sites in Spiti, Source: - Suryawanshi *et al.*

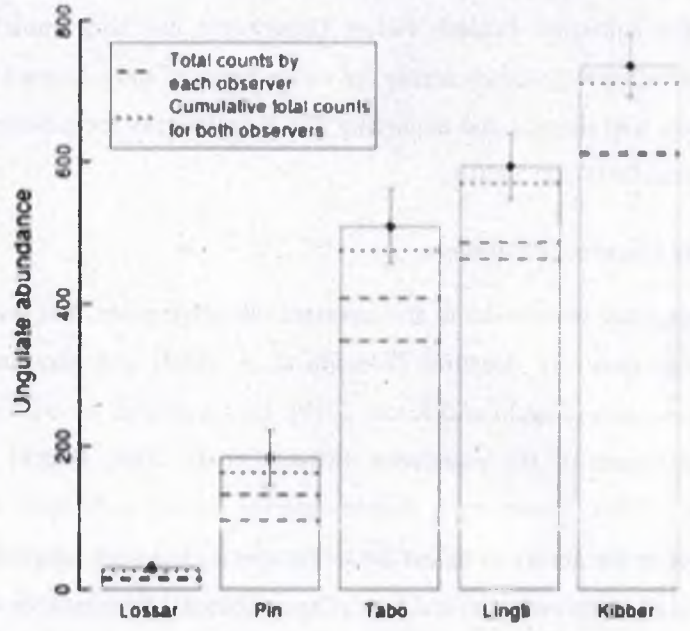


Chart 1: Mountain ungulate abundance estimates obtained using spaced double-observer surveys at five different sites in Spiti Valley. *Dashed lines* indicate total counts of individual observers, *dotted lines* total counts of both observers combined. *Error bars* represent 95 % CI. Source: - Suryawanshi *et al.* 2012.

3.11.2 Training

Training and capacity building was a very important part of the implementation of the management plan. Given that the impetus in the last management plan period on community-based conservation, the need to build capacity within Department officials and the local community was carried out through various efforts:

Participatory Planning and Implementation

- BCRLIP Centre, Periyar Tiger Reserve, 1-8 March 2014: Exposure tour was organised for officers including CF (GHNP), DFO, Kaza, RFO, BO and forest guards of Spiti, who visited Periyar's learning centre to learn about participatory functioning developed in the TR. During this visit, officers including the Joint Secretary, Forests, Govt of HP, and from the CWLW Office in Shimla also visited to understand the functioning of the Periyar Foundation, and how it can be adapted for the proposed State Level Society under the PSL.

- BCRLIP Centre, Periyar, 21 February to 3 March, 2015: In continuation with the previous year's visit, a workshop was organised from 21 Feb to 26 February in Thekkadi, Periyar TR for all field officers of the Spiti Wildlife Division. Apart from the 20 officers and staff, the CWLW, HP also joined the group for a few days to provide his inputs. The SDM, Kaza also came for the workshop. Detailed modules were imparted in the BCRLIP centre on participatory approaches and tools, key strengths and weaknesses of such efforts, success stories, functioning of the Periyar Foundation, etc. Resource persons included the Park

Director, Mr. Sanjayan and Mr Francis, from the BCRLIP Centre, as also Dr. Anil Bharadwaj, APCCF (Kerala Cadre), Dr VB Mathur (Director, WII) and Dr. AJT Johnsingh (Retd Dean, WII and Sr Scientist, NCF). It is hoped that some 5-8 of the field staff of the Spiti Wildlife Division can be groomed and nurtured for better participatory engagement.

Pic 11: Dr AJT Johnsingh and Dr VB Mathur interacting with officers of Spiti Wildlife Division

- Conservation and Development NGOs in Ladakh, 15-22 September 2011. Exposure trip in innovative approaches for water conservation and harnessing renewable energy – Fourteen members from Spiti, including nambardaars, villagers, local officials visited Ladakh and interacted with the Leh Nutrition Project, Ladakh Ecology Group and Snow Leopard Conservancy, all reputed NGOs in Ladakh. Aspects covered were climate change adaptation and food security using artificial glaciers, alternate income through local crafts and community based tourism activities. Dedicated inputs from Padamashree Mr. Norphel to interact with the team on not just the intricacies of the artificial glaciers were sort, but also on participatory engagement with villagers that was based on his vast experience in the Government and outside.

Pic 12: Locals from Spiti on an exposure visit to Ladakh

Developing Local Structures to Facilitate Participation (Society and Landscape Level Implementation Committee)

- Identifying and organising local facilitators for participatory conservation in Spiti, 15 November 2014. Various programmes have used the services of local and national NGO staff to enable conservation and development in the region. As a result there are some effective, but very few such programmes in the region. With over 30 villages and hamlets to cover under the USL Plan, it is important that there are persons with suitable participatory skills in the larger region to facilitate conservation and development. It is expected that these persons recognize the need for conservation as well as balanced development in Spiti and are ready to get the villagers together for discussions, planning and implementation of micro-plans (plans developed at the level of village or a village cluster that address solving an issue using participatory approaches. These plans should state a clear issue, and what will be done, by whom, by when, resources needed and their contributors, and monitoring indicators). There was thus a need to identify and train these local champions for integrated conservation and development through robust micro-plans.
- The Nature Conservation Foundation is a National NGO working in Spiti since about two decades and has interacted with numerous such people who are insightful, committed and aware about conservation, local culture and development. Most of these people area local teachers and respected local officials, with a few who are business people, monks and

nambardaars. It was felt that the identified people should be included under the USL Management Plan as a loose brainstorming group initially and then organically develops into a more formal entity. NCF identified about twenty such people from the USL and Pin Valley who were approached individually and then brought together to a workshop in Kaza, the sub-divisional headquarters of Spiti, for a brainstorming session on 15 November 2014 evening in the Old Monk Hotel, Kaza. This group can be developed into the NGIs or the non-government individuals, as learnt from the Periyar Foundation exposure. The broad goals of the event were to: a) Address the entire group together so that they have an opportunity to know each other, b) Brainstorm on the key issues identified for conservation and development of Spiti in the USL Management Plan c) Take up specific action under the focal areas. Apart from NCF staff, the Range Forest Officer, Kaza, also addressed the gathering.

Self Help Group (SHG) Establishment and Management

- Agencies in Ladakh, June 2012: About 15 women from Kibber and Chichim villages visited Ladakh to interact with reputed agencies there, including the Women's Alliance and Ladakh Ecology Group to learn skills of producing and marketing of crafts. Training for them in the skill of crochet and knitting was organised in Kibber.

- Umang Cooperative and Sharing Organic Standards (SOS) Organics in Kumaon, Uttarakhand: In an endeavor to establish good practices for production, running and marketing eco-friendly products, a group visited various organisations in Kumaon in Uttarakhand to learn these aspects. Six ladies with six local staff visited these agencies over a week and learnt various aspects of running SHGs dealing with crafts, agro-based products and tourism.

Advanced Wildlife Monitoring Techniques

- Kaza, 8 September 2011; Rishi Sharma, Research Scholar, NCF, who had been leading our work on camera trapping of the snow leopard, conducted this day-long workshop for all field staff and local volunteers. Handling camera traps and designing studies for abundance estimations were the main subjects. The ADC, Kaza also attended the workshop and provided encouragement.

- Kaza, November 2013; Dr. Koustubh Sharma, Regional Ecologist, Snow Leopard Trust, was invited for a workshop and field training of HPFD frontline staff and local volunteers. Over 20 individuals, which included 8 from HPFD and 12 local youth, were trained in this 15 day exercise of classroom, followed by field placement of cameras in a c. 2000 km^2 area.

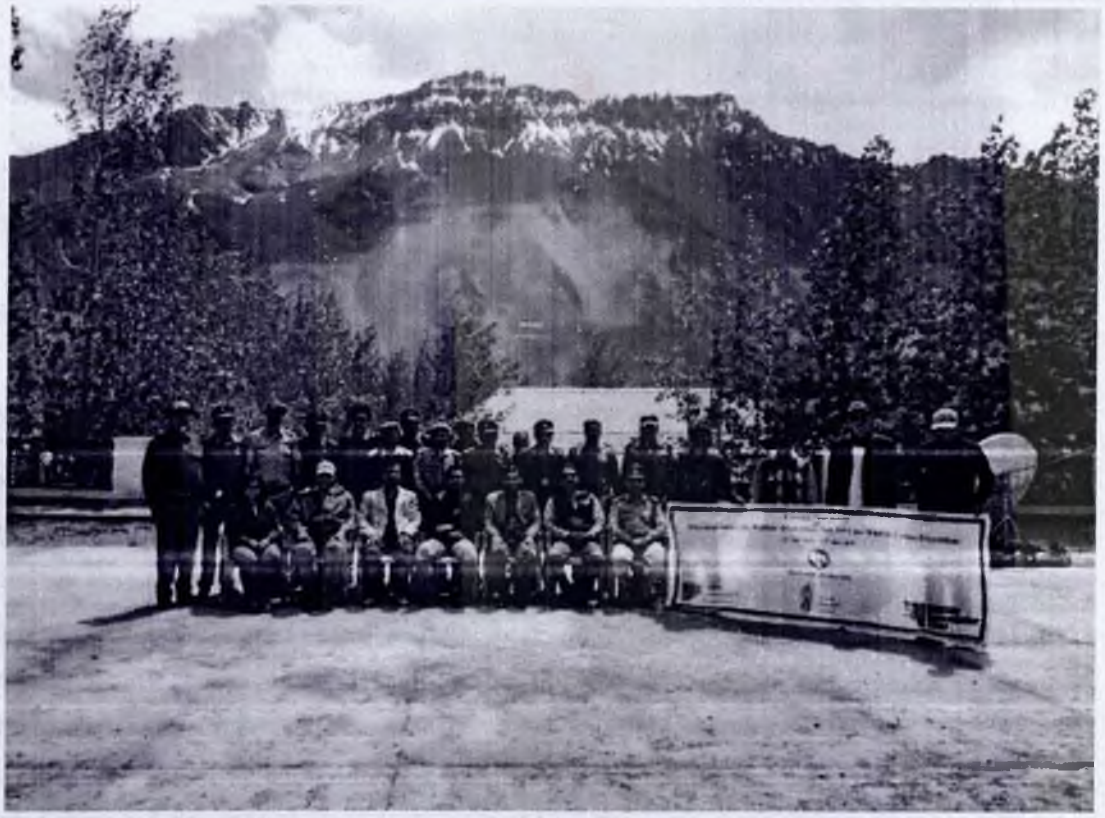
Mountaineering and Mountain Rescue

- Kaza-Shilla Nala, 2-8 June 2015; Mountaineering experts from Manali, Mr. Garrett and Dr. Jeph Mathias, were invited to Spiti to help our HPFD and NCF staff in mountain rescue, including other aspects such as river crossing and rock climbing. This is important based on the increasing number of tourists who are visiting Spiti these days, as also for our own camera trapping exercises in remove valleys of Spiti. The ADC and SDM also attended and made personnel from the Tourism Dept. to attend this workshop.

Pic 13: Training in mountaineering and mountain rescue techniques

Wildlife Law and Enforcement

- Kaza, 22-24 June 2015; Experts from the Wildlife Conservation Trust, Dr. RK Singh and Mr. Kiran Rahalkar were invited to deliver this module to all the 22 plus field staff and officers of the Spiti Wildlife Division. This subject has gained importance with a large number of outsiders in the area due to infrastructure development, tourism, etc that are increasing cases of violations and eroding some of the local tolerance to wildlife.



Pic 14: Training on Wild Life (Protection) Act in Kaza

Landscape based Conservation and Advanced Research and Management

- Nilgiri Biosphere Reserve, 24 February – 4 March, 2012; The APCCF, with DFO, Kaza and RFO, Kaza visited the Nilgiri BR on an exposure visit to understand the challenges of conservation at landscape scales. Interactions were held with the park staff in Mudumalai WLS, Bandipur Tiger Reserve (TR) and Nagarhole TR.

- Knowledge exchange tour of the Himachal Pradesh forest department to premier science and conservation agencies in Sweden (21 to 27 September 2014). This tour was discussed by the CWLW (HP) 2011 onwards as a high level discussion covering larger areas of conservation in the State, with special reference to managing conflicts and encouraging advanced wildlife science at a State-level policy level. The specific objectives of the tour were to exchange understanding on a) human-wildlife damage mitigation b) animal capture and radio collaring c) zoo management d) captive breeding of endangered fauna and e) wildlife disease control. The delegates included the honourable Forest Minister of the State, the CWLW, and two other senior officers from the HPFD.

3.12 Wildlife conservation strategies and their evaluation

The emphasis of wildlife conservation strategies in the previous management plan period has been to three-fold:

1. Compensate losses arising from human-wildlife conflict in the villages within Upper Spiti Landscape.
2. Engage proactively with village communities and seek their participation in minimising human-wildlife conflict.
3. Try to maintain status-quo between local communities and wildlife so that their attitudes towards wildlife remain non-negative.

Participatory conservation is a critical aspect in the USL Management Plan's effective implementation. Through this, suitable conservation actions were carried out all across the landscape. The approach was to identify threats to conservation in a village or cluster of villages and develop innovative solutions for mitigating those with the help of local communities. Village meetings and consultations can often get diverted towards development in general, and it is thus important that the facilitators under the management plan implementation have the skills to develop a suitable solution to the conservation threat in question. Over 12 micro-plans were implemented covering numerous themes in 10 villages (mostly the larger and more important villages – Kibber, Chichim, Lalung, Sangnam, Kiamo, Kyoto, Kaza, Kee, Lossar, and some of the smaller ones that are important for wildlife - Gete, Tashigang. Some works have been initiated in Demul, Langza and Tabo too.

Each micro plan was developed with the clear objective to minimise conflict and/or compensate losses incurred by locals. Some micro plans were also aimed at improving habitat quality for the benefit of wildlife in the landscape. Some of the micro plans developed are listed below:

1. **Grazing-free Reserves**: Snow leopard landscapes have wildlife values while human dependence on natural resources is also pervasive. The previous management plan for the Upper Spiti Landscape identified 15 areas in the landscape that had relatively higher values for wildlife—referred to as Core Landscape Units (CLU). Through the course of the implementation of this management plan, micro plans were implemented with individual village communities who control grazing in these lands, to keep them free of grazing. The village community was made an annual payment in keep these areas free of grazing. Also, a local was employed to ensure that free-ranging livestock (yak and horse) were kept out of these areas.

   Between 2012-17 6 village communities (Losar, Kiato, Chichim, Kibber, Langza and Lalung) have been set up, while one more (Kiamo) is proposed to start shortly (Spring 2017).

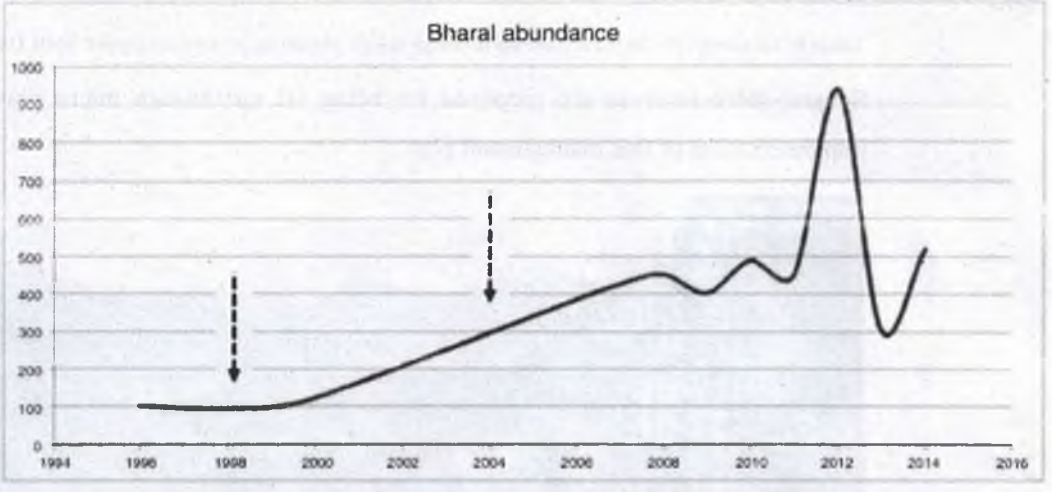
Village	Reserve Name	Area (km^2)	Started In
Chichim	Chichim	2	2006
Kiato	Takli Nalla	35	2015
Kibber	Kibber	27	1998
Lalung	Lingti Nalla	415	2015
Langza	Langza	22	2017
Losar	Losar	13	2010

Table 8: Grazing-free Reserves set up through micro planning process in Upper Spiti Landscape.

Several more reserves are proposed for being set up through micro plans during the implementation of this management plan.

Pic 15: Local community members monitoring a grazing-free reserve

The first of these reserves (Kibber) was set up in 1998, when villagers agreed to set up a village reserve on part of their grazing land where they voluntarily curtailed livestock grazing and other forms of resource extraction. The goal was to facilitate an increase in the bharal population. Estimates for bharal abundance in 1998 put their population in the range of 100 in the pastures surrounding Kibber (*see Figure; reproduced from Mishra et al. ed., (2016). The Role of Village Reserves in Revitalizing the Natural Prey Base of the Snow Leopard. In: Biodiversity of the World—Conservation from Genes to Landscapes*



Trends in abundance of bharal *Pseudois nayaur* in the Kibber region, Spiti Valley, India. The population was monitored one to several times each year during spring and autumn, periods when herds are congregated. Figures presented are maximum counts for a given year. Dashed arrow on the left indicates the establishment of a 500 ha village reserve or grazing set-aside in the area, which was then expanded to 2000 ha in 2004 (arrow on the right) to cover about 20% of the total grazing land of the village. The spike in bharal population seen in 2012 was possibly caused by the temporary movement of a few herds into the area from an adjoining region (separated from the Kibber region by a deep gorge and stream).

(Volume – Snow Leopards). New York, American Press, p. 184-187.). Today, due to the efforts of this community, it is around 400, and camera traps set up in locations within the reserve show much higher use of this prey hotspot by snow leopards compared to the surrounding landscape.

2. **Community-run Livestock Insurance Programmes**: Livestock killed by snow leopards and wolves can bring great financial loss to individual households in the landscape. While there have been few instances of retaliatory killing of carnivores by the local community in past, this is a constant threat in this landscape.

   A community-run livestock insurance programme in some villages helps to compensate losses for livestock killed by wild carnivores. In this programme, villagers decide a premium and compensation for the livestock killed by wild carnivores. The cost of participation in the programme is subsidised through a contribution from an external agency (HPFD and other agencies like Snow Leopard Trust). At the end of a year, the numbers of cases are evaluated by a committee appointed within the participants and claims are settled after confirmation that the case was genuine. Also, a carcass of an

animal killed by a wild carnivore is left for the carnivore to consume--a rule within the programme.

Pic 16: Community-run insurance programme meeting in Kibber

While the programme requires a continuous stimulus so that it can remain viable, it has succeeded in compensating losses for livestock lost to wild carnivores. Also, there have been no instances of retaliatory killing from the areas in which the programme is run.

From 2012-17 a total of 124 cases of livestock depredation by wild carnivores have been compensated with a compensation pay out of INR 487,985.

3. **Local guards to control crop damage by wild prey**: Crop predation by wild prey species (bharal and ibex) was on the rise in several villages. Village level surveys in 2011-12 showed that vulnerable fields could be spatial predicted—agricultural fields closer to cliffs were more likely to be attacked by wild prey. Seasonally these attacks happened early in spring and around the time of harvest.

   Based on this information, a local guard was deployed to keep wild prey species out of agricultural fields for a period of 4-5 months based on the vulnerability.

Village	No. of Guards	Period	Since
Demul	1	Jun-Sept (4 months)	2014
Gete	2	May-Sept (5 months)	2014
Kiato	1	May-Sept (5 months)	2014
Kibber	1	May-Sept (5 months)	2013
Tashigang	1	May-Sept (5 months)	2014

Table 9: Guards to control crop damage by bharal and blue sheep (2012-16)

4. **Sterlisation and vaccination of free-ranging dogs**: In the last management plan period, damage to livestock by free-ranging dogs was identified as an emerging threat. Annual data collected in 28 villages of the Upper Spiti Landscape showed that dogs were killing more livestock that wild carnivores.

Year	Livestock Killed by		
	Snow Leopard or Wolf	Dogs	Disease
2012	271	267	159
2013	208	271	89
2014	170	235	52
2015	193	284	127
2016	367	276	45

Table 10: Depredation of livestock in Upper Spiti Landscape (2012-16)

Since 2013, by developing micro plans with the local villagers and with support of the Animal Husbandry Department in Kaza, a programme to sterilise free-ranging dogs was started. The dogs were caught and cared for by the villagers, while the operation was carried out by veterinarians of the Animal Husbandry Department. Over 250 dogs have been sterilised in the landscape.

Year	Villages covered	No. of dogs sterilised
2013	Kaza, Kibber, Quiling, Morang	102
2014	Rangrik, Kaza, Kee	109
2016	Losar, Hansa, Morang, Quiling	35

Table 11: Sterlisation camps carried out in the Upper Spiti Landscape (2012-16)

Pic 17: Dog sterilisation camp in Kaza with support from local community, Animal Husbandry and Forest Departments

5. **Garbage management**: Part of the reason for the rise in free-ranging dog population is attributed to the lack of garbage management strategies. This problem is set to become an acute one, given that Spiti will see a rise in tourists and tourism related ventures (hotels, restaurants etc…).

   A project to build enclosures for garbage disposal was initiated. These were built by developing micro plans with villagers. Villagers contributed their efforts in labour to build an enclosure for their village. They also managed the responsibility of running the enclosure, often levying fines at the village-level for people defaulting on the disposal of garbage. Better garbage management should help reducing the availability of resources to dogs.

Year	Villages where enclosure was built
2013	Kibber
2014	Kee Monastery
2015	Kee, Sangnam

Table 12: Garbage enclosures built in the Upper Spiti Landscape (2012-16)

With Panchayats receiving funding from the government under the *Swach Bharat Abhiyan* these efforts can be scaled to cover more villages in the landscape.

Pic 18: Garbage enclosure built for Kee village

6. **Reinforcement of livestock corrals**: Snow leopards and wolves entering corrals, where livestock are held, present a threat to livestock. In instances where snow leopards enter a corral, the damage to livestock is much great as is the risk of physical harm being done to the snow leopard trapped inside the corral.

   Micro plans were developed with village communities in 3 villages to secure corrals that were at risk.

Year	Village	No. of corrals reinforces
2013	Salung	2
2016	Rama	11
2016	Lalung	12
2016	Chubrang	3

Table 13: Corrals reinforced in the Upper Spiti Landscape (2012-16)

7. **Artificial glaciers**: Many villages of Spiti face irrigation water shortage in the crucial sowing stage in spring season for the single crop of green peas and barley. This is a period when the weather is still cold and water from snowmelt is sparse. The scarcity is

likely to go up in near future due to climate change, with depleting glaciers, especially the smaller ones, which typically feed the streams used to tap irrigation water. Based on a similar situation, Padma Shri Mr Norphel from Ladakh has developed an innovative system of tapping freezing water in autumn and winter on mid-slopes, in 'artificial glaciers', which can then be harvested during spring for irrigation. Apart from assisting in combating water security and in climate change adaptation, there is an application of artificial glaciers in 'pasture development' by augmenting moisture in soils of selected blocks for enhanced plant growth.

Pic 19: An artificial glacier worked on by villager of Kibber

A capacity enhancement visit for key people from Spiti to Ladakh to see the functioning of the glaciers and then invited Mr Norphel to Spiti to assist in making two sample glaciers was conducted. These were prepared under a micro-plan with the Kibber community in August 2012 and followed up in November 2013. The artificial glacier is working well and helping to augment water for the village. There are two committees in Kibber that respectively manage the functioning of the glaciers and its maintenance.

3.13 Administrative Set Up

The Spiti subdivision is governed through a mechanism called the 'single-line administration' whereby all departments functioning there directly work under the Additional District Commissioner (ADC), who is aided by a Sub Divisional Magistrate (SDM) and Tehsildar. This system was

necessitated to streamline administration due to the poor connectivity and communication with the Divisional HQ in Keylong and state capital of Simla since the district was carved out in 1960's.

With regard to administration of the landscape, a landscape-level Society was constituted in March 2016. The Spiti Snow Leopard Conservation Society has the Chief Conservator of Forests (South) as the Chairperson, while the Divisional Forest Officer (Wildlife) Spiti is Member Secretary. Other members of the Society include the ADC, the SDM and heads of line departments in the sub-division: Police, Tourism, Agriculture, Animal Husbandry, Horticulture, Public Works, the Block Medical Officer and the Executive Engineer of the Electricity Board. The Society can invite representatives of locally active NGOs, of the Tribal Advisory Council and Panchayati Raj institutions and seek their participation in the Society's meetings.

The objective the Society is to help with the execution of the management plan while facilitating convergence between various line departments since several of the works proposed in the management plan could have overlapping interests with the line departments.

The Society meets at least once a year to allocate work and identify parties responsible for carrying them out, in the coming year. The meeting is convened by the DFO (Wildlife) Spiti.

3.14 Summary of threats to wildlife

A summary ranking the threats to wildlife is done in the following table. The threats are rated on a scale of 0 to 5.

Sl. No.	Threat categories & heads	Upper Spiti Landscape			
		Area	Intensity	Urgency	Total ranking
1	**Livestock grazing**				
1.1	Local livestock grazing	3	2	2	7
1.2	Migratory livestock grazing	2	5	4	11
2	**People wildlife conflicts**				
2.1	Livestock depredation by wild carnivores	4	3	4	11
2.2	Crop Damage	2	2	3	7
3	**Developmental Activities**				
3.1	Development – Roads and Channels	2	1	3	6
3.2	Development – Outside labour	5	3	4	12

Sl. No.	Threat categories & heads	Upper Spiti Landscape			
		Area	Intensity	Urgency	Total ranking
3.3	Development -- Poaching	1	2	2	5
3.4	Development – Free-ranging dogs	5	4	4	13
4	**Other Human Disturbances**				
4.1	Plant biomass extraction	1	1	3	5
4.2	Uncontrolled tourism	2	4	4	10
5	**Habitat Degradation**				
5.1	Habitat degradation & loss of habitat	2	2	2	6
6	**Disease**				
6.1	Livestock disease	2	3	3	8

Table 14: Threat ranking for current plan period (2018-28)

A summary of the threats to wildlife is on lines similar to the one made in the previous management plan prepared for the Upper Spiti Landscape. While the threats largely remain the same, there is a change in the areas of impact, their intensity, and the urgency required to dealing with them. As a result the current management plan factors in some of these threats and the need to respond to them. The key threats in the landscape are:

1. **Free-ranging dogs:** The proliferation of free-ranging dogs has been a major concern documented in the first management plan for USL. In the last five years, the livestock predation by free-ranging dogs is higher than that by snow leopards and wolves. There have been reports of dog packs hunting blue sheep and ibex, and also chasing snow leopards off their kill. There has been documented evidence of a free-ranging dog mating with a wolf which opens the risk of disease transmission to the wildlife inhabiting the landscape. In the last plan period, over 300 dogs were sterilised and garbage management measures were initiated in 4 locations. However, this problem prevails across the landscape and requires sustained action over the current plan period. For the short term, sustained efforts to ensure better garbage management and selective sterilisation of dogs will be important steps to carry out. In the long term there is a need to implement measures to remove unowned dogs, and focus on responsible dog ownership.
2. **Outside labour**: Given the thrust for the development and maintenance of roads, a large number of labour from other States spends a large part of summer in Spiti. Most labour is new

to the landscape and largely ill-equipped to weather the low temperatures. There have been reports of poaching and extraction of vegetation as fuel wood, by groups. There is a need to sensitively start proactive engagement with this group which forms a large part of the population in this landscape through the summer months. This problem prevails across the landscape and though it is low it is assumed that this is low in intensity and hence the need for proactive engagement.

3. **Migratory livestock grazing**: Migratory livestock herds continue to access several areas outside USL. However, degrading pasture quality forces them to explore new pastures for grazing in summer months. During the past plan period, migratory herds have accessed pastured of villages within the USL in 2015 (Lara) and 2016 (Kaza), where they have not had a traditional arrangement. The formation of core landscape units to mitigate the risk from migratory livestock has taken place in the first plan period, and will need to continue. So while this problem does not threaten the entire landscape and pockets that are threatened by this risk could see drastic deterioration in pasture quality.
4. **Livestock predation by wild carnivores**: Livestock predation becomes an important threat to monitor and mitigate. A revival in carnivore populations is likely to cause a rise in conflict from livestock predation. So any plans in this landscape will have to be prepared to swiftly tackle a rise in livestock predation by wild carnivores at a scale that it can be implemented across all impacted villages in the landscape.
5. **Uncontrolled Tourism:** While tourism in Spiti is still in a nascent stage, there has been a sharp rise in winter tourism centered on wildlife viewing. While this is an encouraging sign, there are risks of mismanagement that present threats to wildlife. While there is a need to build capacity within local communities to benefit from tourism, there is also a need for the Forest Department to ensure that tourism is carried out in a responsible manner that does not negatively impact the landscape or the wildlife.

4. The Protected Area and the Interface Land Use Situation

4.1 The Existing Situation in the Zone of Influence

The Upper Spiti Landscape includes Kibber Wildlife Sanctuary, as also it covers a large part of Spiti which does not come under any Protected Area network. Hence the zone of influence varies in its nature from that what is typically considered for an area surrounding a protected area.

Human population across the landscape is sparse and both humans and wildlife access resources across the landscape in a pervasive manner. In terms of wildlife values, there are areas across the landscape that support wildlife, though these may fall outside a protected area—also the reason for adopting a landscape approach to conservation.

Agro-pastoral communities inhabiting the landscape have depended on pastures to support their way of life. One critique has been that overstocking and fodder extraction had a likely effect on wild prey populations due to restricted availability of fodder species. The dependence of local communities on pastures continues. However, the scale of dependence of local communities on pastures appears to have roughly halved and also stopped completely in several villages. Especially extraction of fodder species from winter pastures for stall-feeding livestock.

Village	Fodder collected from pastures per HH (2016) (kg)	Fodder collected from pastures per HH (2008) (kg)	Rise/Fall in fodder collection from pastures per HH (%)
Chichim	200	-	-
Chubrang	1000	-	-
Demul	1300	300	333%
Gete	700	-	-
Hansa	0	1189	-100%
Hikkim	1500	800	87.5%
Hull	0	713	-100%
Kee	0	1650	-100%
Khurik	0	738	-100%
Kiamo	0	210	-100%
Kiato	0	1137	-100%
Kibber	100	550	-82%
Komic	3000	425	606%
Kwang	1800	-	-
Lalung	0	525	-100%
Langza	500	1000	-50%
Lara	2000*	775	-

Village	Fodder collected from pastures per HH (2016) (kg)	Fodder collected from pastures per HH (2008) (kg)	Rise/Fall in fodder collection from pastures per HH (%)
Lidang	1000*	900	-
Lingti	2100	-	-
Losar	0	413	-100%
Morang	0	673	-100%
Nakchung	0	-	-
Pangmo	0	625	-100%
Quiling	0	-	-
Rama	0	800	-100%
Rangrik	0	737	-100%
Salung	400	-	-
Shego	0	-	-
Sumling	0	733	-100%
Tashigang	300	-	-

*signifies villages where collection was done from vegetation around agricultural fields

Table 15: Change in fodder collection from village pastures in winter between 2008 and 2016

In terms of livestock rearing too, stocking densities have reduced from the levels they were at in 2010. Composition of livestock holdings have also changed with a rise in the numbers of yaks and cows being reared and with a reduction in numbers of sheep and goat, across the landscape. A comparison of livestock numbers across 25 villages in the Upper Spiti Landscape in 2010 and 2016 show that there has been a drop of over 20% in the overall livestock numbers. However, this drop is not consistent across Panchayats. Villages in the Panchayats of Kibber and Langza, which have access to the largest pastures, have shown a rise in livestock populations from 2010 levels.

Panchayat	Total Livestock* (2016)	Total Livestock (2010)	Rise/Fall in absolute livestock (%)
Demul	885	1306	-32%
Hull	233	625	-63%
Kaza (includes on Quiling)	99	209	-53%
Khurik	288	681	-58%
Kibber	1761	1432	23%
Lalung	928	1168	-21%
Langza	1251	1080	16%
Losar	554	1084	-49%
Total	**5999**	**7585**	**-21%**

*Total livestock include yak, dzo, dzomo, cow, donkey, horse, sheep and goat

Table 16: Change in overall livestock numbers at Panchayat level 2010 and 2016

To check for livestock holding patterns we can convert the livestock numbers to equivalent Sheep Units (SU). This is done by using data on forage consumption by each livestock species from Foose (1998) to convert abundance of each livestock species into sheep units.

Livestock Type	Body wt. (kg)	Metabolic equivalent (Body weight 0.75)	SU (ratio with sheep)
Sheep/Goat	35	14.39	1
Yak	298	71.724	5
Cow	200	53.183	4
Horse	248	62.494	4
Donkey	90	29.22	2

Table 17: Factor to convert to Sheep Units (Foose—1998)

The shocking in Sheep Unit equivalents is as below:

Panchayat	Average Sheep Units equivalent (2016)	Average Sheep Units equivalent (2010)	Change (%)
Demul	662	762	-13%
Hull	299	420	-29%
Kaza (includes on Quiling)	360	443	-19%
Khurik	393	524	-25%
Kibber	993	722	38%
Lalung	668	731	-9%
Langza	963	761	27%
Losar	538	714	-25%
Average	**609**	**634**	**-4%**

Table 18: Change in average livestock holding at Panchayat level 2010 and 2016 measure in Sheep Units (SU)

The drop in average livestock holding when measured in sheep unit equivalents does to correspond to a similar drop. So while the absolute drop in livestock across 25 villages in 8 Panchayats is a

reduction of 21% in terms of SU it is only a drop of 4%. This indicates a reduction in absolute numbers, with a rise in large-bodies shock (especially cow) and a fall in small-bodies livestock (sheep and goat).

The general trend thus is towards a reduction in resource extraction from community-held pastures. This combined with conservation measures to free certain areas from livestock grazing have helped in revival of wild prey population. Revival in wild prey populations is likely to help snow leopard numbers, as their density is governed by the abundance of wild prey within the landscape. So, while these changes augur well for wildlife conservation and especially for snow leopards, these raise pertinent point from the perspective of wildlife management. A rise in snow leopard population could lead to a corresponding rise in predation of livestock by them and hence a possible rise in conflict.

Any conservation planning that needs to be done in the landscape will have to be done bearing in mind this dynamics.

4.2 Development of programmes and conservation issues

A possible rise in conflicts arising from depredation of livestock by carnivores is an impending possibility. There is also a rise in the number of complaints of crop depredation by wild prey species. Programmes and conservation interventions will have to account for these conditions. Broadly the approach to developing conservation programmes will have to include:

1. **Sustain and extend ongoing wildlife monitoring and conservation efforts**: It will be important to sustain and continue the work that has been initiated with the implementation of the first management plan for Upper Spiti Landscape. This would require building capacity within ground staff who can engage with the local community to develop and implement micro plans centred on conservation. What will also need focus is the efforts to cover all villages within the Upper Spiti Landscape. Currently the coverage is limited to roughly half the villages in the landscape. The ultimate target from these efforts will be to foster coexistence between the local community and the wildlife with which they share their landscape.
2. **Develop proactive interventions to address species conservation goals**: Several of the conservation interventions developed so far are aimed at compensating losses that arise from a negative interaction that the local community has with wildlife. In the long term, it will be important to also put in place measures that can help them see the benefit of protecting wildlife. In line the possibility of setting up Enterprises (also explored through the 4E approach in the first plan period) that centred on wildlife values of the landscape could help in this direction.

3. **Aim towards convergence within administrative departments in the Sub-Division:** Several of the work, thus proposed will require active coordination with various government departments within the District and the State. Close coordination with offices of the Additional District Collector and the Sub Divisional Magistrate of Spiti will be vital to ensuring this. Under the guidance of their offices, it will be important to involve other Department Heads—in additions to the Divisional Forest Officer (Wildlife), Spiti—to ensure that work is planned and executed.

PART – II

Proposed Management

5. Vision, Objectives and Problems

5.1 The Vision

The long-term vision for managing Upper Spiti Landscape continues from the one developed at the start of the first management plan period:

We envision the Upper Spiti Landscape supporting a large, secure, breeding population of snow leopards, along with wolves, and abundant functionally viable populations of wild ungulate prey. We envision a landscape where an economically and culturally prosperous local community is sensitized, empowered, and involved actively and directly in conserving the snow leopard and other wildlife along with the Wildlife Department and other Government agencies and NGOs. Finally, we envision the Upper Spiti Landscape to become a globally outstanding example of endangered species conservation through good scientific research, research-based adaptive management, and strong community-involvement.

5.2 Objectives of Management

Goal 1: Sustain and extend ongoing wildlife monitoring and conservation efforts

Context: The previous management plan period allowed the evaluation of important baseline information on carnivore and wild prey abundance across the landscape, through annual surveys. This allowed the nature and extent of human-wildlife conflict reported from villages within the landscape to be understood. Interventions through micro plans have been initiated to manage losses arising from conflict and to manage people's attitudes. These interventions were initiated in 19 villages in the landscape—multiple interventions were started in some of these villages. A lot of effort was also spent in training staff of the Forest Department in two vital aspects: orienting them towards participatory models of conservation through exposure visits and techniques in wildlife monitoring and training that were conducted in Spiti.

The management objective remains to continue monitoring wildlife in order to have long-term data on wildlife populations in this landscape. The objective will also be to ensure extension of the work to cover all villages within the Upper Spiti Landscape.

Alignment to 17 Sustainable Development Goals: This goal is aligned to the following SDGs:

1. SDG #3 – Ensure Healthy Lives and Promote Well-Being for All at All Ages.
2. SDG #8 – Promote Inclusive and Sustainable Economic Growth, Employment and Decent Work for All.

3. SDG #13 – Take Urgent Action to Combat Climate Change and Its Impacts.
4. SDG #15 – Sustainably Manage Forests, Combat Desertification, Halt and Reverse Land Degradation, Halt Biodiversity Loss.
5. SDG #16 – Promote Just, Peaceful and Inclusive Societies.

Objectives:

1. Continue monitoring abundance of wildlife populations in the Upper Spiti Landscape using robust scientific methods.
2. Continue developing micro plans adopting participatory techniques and by involving local community members to manage conflicts and people's attitudes towards wildlife.
3. Build capacity within forest staff and local community members and expose them to successful examples of community-based conservation from across the country and provide the necessary tools to facilitate community-based conservation in the Upper Spiti Landscape.

Goal 2: Develop proactive interventions to address species-specific conservation goals

Context: With the view to proactively engage with the local community and address concerns that are relevant to them in the landscape, the 4E approach to focus on Energy, Ecology, Education and Enterprise, was developed during the first management plan period.

In the next plan period, the impetus would have to be on identifying clear targets to be achieved and bringing on the right institutions to support with these targets.

Such measures could help the local community attribute direct value in conserving high altitude wildlife species and affect their attitudes positively in favour of conservation.

Objectives:

1. Identify relevant stakeholders and agencies to plan and lead work under the 4E – Energy, Ecology, Education and Enterprise. Bring the identified agencies within the Spiti Snow Leopard Conservation Society.
2. Develop micro plans through the Spiti Snow Leopard Conservation Society while working with the local community that can help them attribute direct value in conserving high altitude wildlife species—for example promoting wildlife-based tourism etc…

Goal 3: Aim towards convergence within administrative departments in the Sub-Division

Context: The Spiti Snow Leopard Conservation Society was instituted in March 2016 with a view of bringing in efficiency in the implementation of the work identified under the Management Plan. This follows along the recommendations made under Project Snow Leopard to form Society at the level of the landscape to moderate funds and oversee work of implementation carried out under the management plan.

One of the important aspects of work in the current management plan would be to identify relevant stakeholders to be brought on board for the Society from the local community and pertinent organisations working in Spiti. Representation from line departments within the administrative set up of Spiti sub-division is also important to ensure that all developmental work planned in the area is integrated and is done in an ecologically sensitive manner with no overlaps in the planning process.

Objectives:

1. Strengthen the Spiti Snow Leopard Conservation Society with representation from local community members, representative of locally active NGOs and representatives from line departments within the District Administration. Provide them the adequate exposure and training to affect integrated planning at the local level in a manner that is ecologically sensitive.

5.3 Development of Micro plans

A large part of the work proposed will have to be carried out through the process of developing micro plans. Such micro plans will be developed by representatives of the Forest Department, aided at time by locally active agencies working in their areas of expertise, along with the stakeholders that will participate in the implementation of the plans.

Micro-plans have gained importance in the context of participatory planning and action from a realisation that planning carried out away from the village/stakeholders tends to reflect planners' personal experiences, impressions and assumptions rather than realities on the ground. Another rationale for the need to involve the primary stakeholder from the outset is to help ensure ownership of the process and, therefore, the output (i.e. micro-plan) which, in turn, ensures support in the implementation and monitoring of the micro-plan.

The main stages of micro-planning for purposes of ecodevelopment are as follows:

1. Identify a conceptual model for a target applicable within the local, geographic context.
2. Identify and develop the capacity of members of Facilitation Team that will be responsible for developing micro plans with stakeholder groups.
3. Develop micro-plans in accordance with established micro-planning principles and practices, taking care to focus on identifying dependencies on forest resources and their alleviation through a range of activities. This stage includes the establishment, reinstitution or re-vitalisation of the Eco-Development Committee (EDC) and its Executive Committee. A lot of this can be done through the Spiti Snow Leopard Conservation Society.
4. Develop a set of agreed strategic interventions, which will provide appropriate levels of resourcing for the implementation of priority activities.
5. Identify reciprocal commitments from stakeholders and establish mechanisms for sharing the benefits of income-generating activities.
6. Develop mechanisms for monitoring implementation of village micro-plans and cluster Ecodevelopment Action Plans at local level, preferably at the Panchayat level.

5.4 Problems in achieving objectives

Some of the potential problems in achieving the objectives are:

1. Parts of the Upper Spiti Landscape are cut-off for close to six months in a year, due to heavy snowfall. As a result, the potential working season is limited to the remaining six months during spring and summer (May-October).
2. Maintaining continuity with implementation of the management plan given that the tenure of executing officers is shorter than the plan period of 5 years—in most cases, there could be multiple transfers of officers within any department who work on executing this plan.

6. Ecotourism, Conservation Education and Ecodevelopment

6.1 General

Despite the remoteness of this area and challenges around reaching Spiti, the region has tremendous tourism potential. This is partly reflected by the rise in number of homestays and taxis (Table 5) in some villages that have seen an exponential growth since 2008. Tourism is concentrated around a few village clusters: Kibber-Kee, Langza-Komic, Demul, Lalung, Dhankhar, Tabo and Mudh (Pin Valley). The town of Kaza and Rangrik form the base for all tourists and hence have seen the greatest rise in tourist inflow and tourism related infrastructure.

Tourist inflow is highest through summer (June-October) when most tourism remains focussed on local culture and lifestyle. There are a growing number of tourists visiting Spiti on trekking and mountaineering expeditions. Spiti offers a number of peaks and trek routes that can be attempted by novice climbers with adequate acclimatisation and with assistance of local guides.

Spiti is also seeing a rise in winter tourism (December-March) in the past 2-3 years. Currently tourism in winter is centred around wildlife viewing---specifically snow leopards. Trips organised by local tourism operations have been very successful despite the challenges faced in bringing in tourists and the uncertainty of connectivity to Spiti which is largely dependent on weather conditions. There is potential for tourism to be centred on other themes too, in winter.

The rise in tourism in coming years is inevitable, with the duration of tourism likely to rise from the current 5 month period to a year-round inflow. Predictability in accessing the area will remain the most important bottleneck, but this is likely to improve with time. It is, thus, important for this management plan to factor in this aspect and facilitate the process such that tourism can happen in a manner that is responsible and which brings benefits to the local community.

6.2 Objectives

The main objectives for the Upper Spiti Landscape involve:

1. Identify key themes to focus on for tourism in Spiti and develop a strategy for each
2. Promote local capacity building and exposure to responsible ecotourism through the Spiti Snow Leopard Conservation Society
3. Increase environmental awareness of all stakeholders and visitors coming to Spiti

4. Equip local communities to participate and run ecotourism thus promoting ecodevelopment and making them allies in conserving the landscape

Pic 20: Snow leopard sightings are on the rise in Spiti, especially in winter

6.3 Community-based Ecotourism

The rise in tourism coupled with the fragile nature of this landscape; make it essential to put in place a strategy to develop ecotourism for Spiti. Such a strategy could be centred on multiple themes such as local culture and lifestyle, trekking and mountaineering, local rock art and petroglyphs, wildlife tourism, winter sports etc…

A pioneer in this area has been the Khangchendzonga Conservation Committee (KCC) which was set up in 1996 out of shared concern for the sensitive biodiversity of the rich Khangchendzonga mountain ecosystem. This community-based effort was born in Yuksam in west Sikkim. A tight, solid team of wildlife enthusiasts, community leaders, students and teachers, KCC works to protect and conserve the ecosystem with a well thought out, multi-pronged approach. They organize environmental education programmes to educate the rural masses and the youth, the future flag bearers of the community. They also provide training, capacity building exercises and most importantly work to provide sustainable livelihoods that will make the locals less dependent on the resources of the Mt. Khangchendzonga landscape.

Similar models of community-based ecotourism have been put in place by the Snow Leopard Conservancy—India Trust in Ladakh which focuses on winter tourism in a landscape much similar to that of Spiti.

1. Identify themes for tourism and evaluate carrying capacity given the facilities available.
2. Develop a strategy to facilitate community-based tourism under each theme.
3. List infrastructure development requirements to ensure basic support required for tourists under each theme.
4. Identify areas that require capacity-building and organise them through the Spiti Snow Leopard Conservation Society.
5. Monitor and evaluate annual tourist activity and implement changes based on evaluation report.
6. Assess the need to appoint a local tourism officer who ensures smooth running of the affairs in the designated tourist zone.

Pic 21: Nature tourism focusing on wildlife values of the landscape, rather than snow leopard sighting

An assessment of the above mentioned points has to be carried out by a competent department like the Himachal Pradesh Tourism Development Corporation, or a group of agencies that can make recommendations that are implemented through the period of the management plan.

6.4 Interpretation

Nature interpretation is important to engage with tourists and make them aware of the uniqueness of this trans-Himalayan region. Some of the aspects to implement in order to improve nature interpretation are:

1. Create publicity materials such as signage, brochures, pamphlets, a website and short audio-visuals that can be used to share information about the landscape and aspects unique to it with tourists.
2. Organise daily nature trails, birding walks and treks for visiting tourists that expose them to information of local flora and fauna. These can be carried out by locally trained youth in coordination with the local tourism department under the Sub Divisional Magistrate.
3. Similar activities can be planned and executed around other themes that include local culture and lifestyle, trekking and mountaineering, local rock art and petroglyphs, ancient monasteries of the region etc…

6.5 Conservation Education

There are close to 20 government schools in the Spiti sub-division of district Lahaul & Spiti. Currently, a 2-day residential eco-camp is carried out every year in which an average of 150 students participate. There is scope, however, to increase coverage to encompass other groups like local youth, and migrant labour through module specifically designed for them.

6.6 Eco development

The Upper Spiti Landscape is a challenging area to administer given its size and terrain. The lack or absence of basic amenities while adding to this challenge also present scope for eco-development. Integrated planning for eco-development carried out jointly by the Spiti Snow Leopard Conservation Society with line departments while seeking local participation, presents tremendous opportunity.

In this section some of the pertinent ideas that were discussed and brought out through a series of conversations with local community members in the previous plan period are being presented. This culminated into what was referred to as a 4-E approach which was formalised at a meeting on 15 November 2014. While these are reproduced here to provide a sense of continuity of the work that has been under consideration, the actual work need not be limited to these alone. Also adopting such an approach would require the participation of several agencies with expertise in specific areas. It is

recommended these efforts be planned and coordinated through the Spiti Snow Leopard Conservation Society.

6.6.1 The Four-E Approach to Ecodevelopment

The importance of approaching environmental conservation along with strengthened education, energy and enterprise was discussed. The entire group completely agreed that such an approach would help the cause of environmental conservation but also sustain people's interest due to the additional benefits derived from the education, energy and enterprise needs of Spiti.

The discussions were then opened for individual members to react and comment, on the issues and the possible course of action. The first to be discussed was Education followed by Energy and then Environment. Enterprise was discussed in the context of education and energy but can be also dealt with as a separate head.

Education

All agreed that the levels of education are not good in Spiti. There are just a few schools that are performing moderately well, there are many dropouts, there are just a handful students who have been able to seek admission in good colleges, and that in the present scenario, it doesn't appear that Spiti will be able to produce many good professionals who can compete at a national and global level. In discussions about the present state, many of the teachers and others present felt that the quality of the primary school education, handled primarily by the Junior Basic Trainees (JBT), was rather poor. These teachers need training and motivation to give their best to their job. Children who are in their middle to senior secondary school had almost no advice on options before them based on their interests and avenues. The few students who complete their plus-two tests often were left in Bachelor courses that had little job opportunity or were not of their interest. There was thus need for professional counselling in the schools to enable students to make wise choices. With this background the group agreed to pursue the following:

1. Provide exposure visits for JBTs to places such as Ladakh and to professional institutions to help enhance their skills and motivate them. Example of such trips includes a tour to SECMOL in Ladakh.
2. A suggestion was also made to form an apolitical Spiti teachers association formed by local teachers, which can assist in improving education in Spiti.
3. Conduct training workshops through motivational speakers in Spiti and other professional institutions
4. Establish a system of awards for local teachers in recognition of their excellence in teaching

5. Conduct counselling for students from middle to senior secondary school on a regular basis, that are conducted by among the best counsellors in the country. A Guidance Centre can also be considered.
6. Consider starting a motivational local magazine that includes articles by Spitians who have succeeded in their education and career and others who would like to build the future of the region
7. Establish scholarships to enable a substantial number of local meritorious and needy students who get admission in good educational institutions

Energy

All participants agreed that reliable electric supply was a huge problem affecting development, options for enterprise as well as education in the region. The group agreed on the following:

1. Along with the positive efforts of the Government to generate and provide power from central sources, make attempts to provide renewable energy at household, village or panchayat level, on an experimental basis. The production and management, including its maintenance should be under the control of local people.
2. The HPFD has been providing fuelwood to the local residents at subsidized rates to tide over the severe and long winters at the rate of 10 to 20 quintals per household since many years. This practice has become untenable for the department and it may not be possible to continue this practice for long. It was further noted that such a scheme is absent in similar areas such Ladakh and Sikkim. There is thus urgent need to promote other technologies for warmth in winter such as the use of solar passive structures. This is being already tried by an NGO, Ecosphere, in Spiti, but the demand outstrips supply and a more concerted and larger scale operation will be useful to complement the on-going work.
    a. It was felt that solar passive structures need to be promoted in some villages and Government buildings, for which awareness programmes need to be taken up. Preparing and spreading awareness through a customized video in local language and Hindi can help in this process.
    b. In old buildings at least one solar passive room or an attached greenhouse can be added on priority
    c. For new buildings compliance to solar passive norms can be stressed through either a rule or with a positive incentive.

Environment

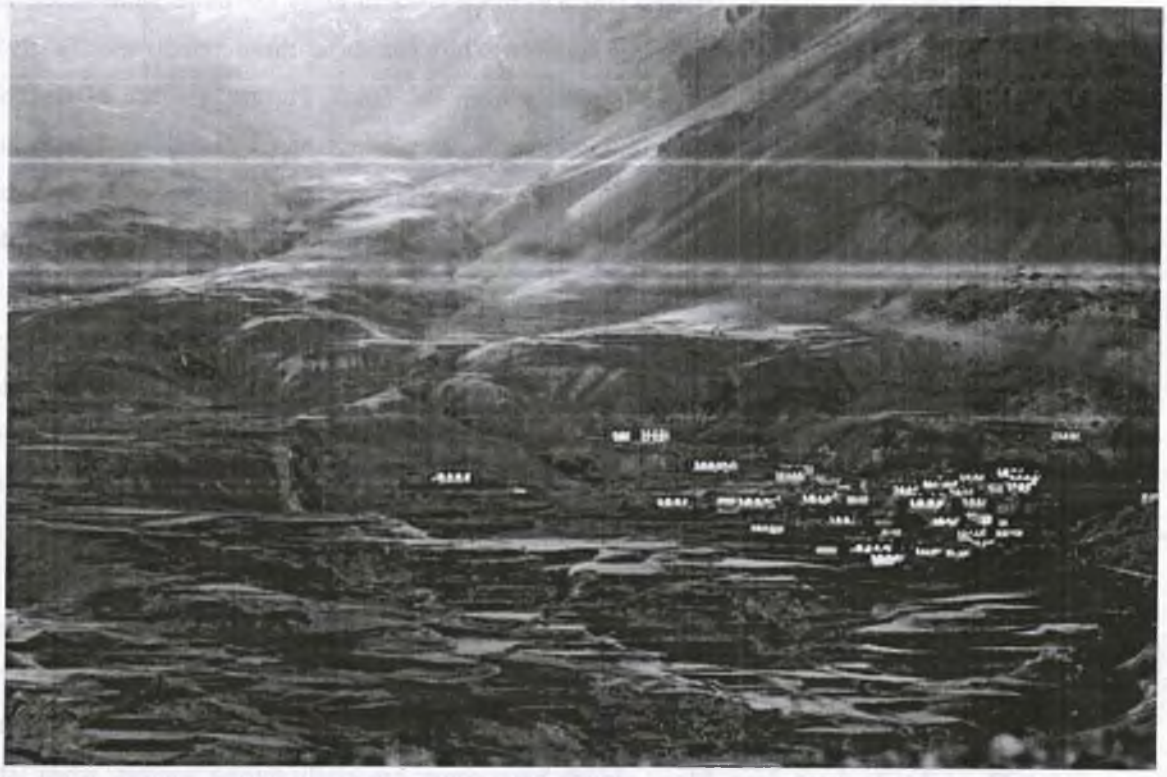
As discussed above, the continuation and promotion of harmonious coexistence between local people and wildlife is an important goal of the USL Plan. With the large interface of people

and wildlife in the region this can be achieved primarily through mitigation of crop and livestock losses of people on one side, and of detrimental activities of people on the other. It was agreed that the following should be taken up:

1. Conflicts due to crop damage: This has increased after green peas were adopted as a major cash crop in Spiti. There are however, clear patterns in depredation in terms of time of year, time of day, type of field affected (for e.g. those close to cliffs are more vulnerable), and crops sown. With this knowledge it is possible to hire guards for those months specifically so that they can drive away the wild animals from the fields. Further, the use of flageries (deterrents in the form of shining objects and those emitting sounds that are tied on strings and used as a loose fence around the fields) along approach routes and vulnerable fields can be used. In some cases fencing of fields can also be taken up. The feedback however is that the fences are high cost, high maintenance structures, and often animals are able to jump in taking advantage of slope.
2. Conflicts due to livestock depredation: Livestock depredation too has a pattern that is related to season or pasture where most losses occur. After understanding this, better herding practices and predator-proof corrals can minimize losses. Any loss that does take place can then be compensated through community managed insurance programmes.
3. Damage to livestock and wildlife due to free ranging dogs: Free ranging dog populations in Spiti have grown by leaps and bounds in the past decade and are now causing considerable mortality of livestock (especially sheep-goats) and wildlife. Many villages in the main Spiti Valley claim to have stopped herding sheep-goats due to the tremendous losses they had suffered due to these dogs. Many reports have come, especially during winters, when large packs have been seen attacking wild ungulates and even snow leopards. The primary reason for this increase in dog populations is expected to be the large amounts of garbage available around towns and villages often related to unorganized tourism and poor garbage disposal. Various attempts have been made for garbage management in Kaza and other villages, with mixed success. It was realized that a multi-pronged approach should be used to control the dog population that should include garbage management and ABC (animal birth control) programmes. The ABC programmes were a joint effort of the Animal Husbandry Dept., Forest Dept., local and National NGOs and most importantly, the local people. In spite of tremendous efforts, there has been mixed success in sterilizations due to the difficulty of capturing dogs, facilities for carrying out the operations and availability of trained vets. Further, since the sterilized dogs remain in the population, the people do not get a sense of any achievement in the ABC program. The group proposed to progress on these lines:
    a. Continue efforts to sterilise dogs

b. There has to be a concerted effort to make the public aware about garbage management and the efforts for controlling the dog population so that there is continued support from them.

c. Proposals should be written soon to enable the kind of funding such a large programme will require.



Pic 22: Chichim village of Spiti

7. Research, Monitoring and Training

7.1 Research & Monitoring

The key aspects of research include:

1. Population estimation of snow leopards and wild ungulates
2. Systematic ecological explorations and documentation of flora and fauna
3. Changing socio-ecological conditions of the local community
4. Perceptions of local community towards wildlife and their conservation
5. Evaluation of threats to wildlife
6. Evaluation of threats from wildlife to local communities
7. Impacts of rising tourism
8. Benefits and drawbacks of increased connectivity

7.2 Training

Some of the training required on a continuous basis for staff of the forest department includes:

1. Wildlife techniques and wildlife monitoring
2. Techniques in participatory planning and action
3. Exposure to other parks and protected areas with community involvement
4. Handling and reporting wildlife crimes and orientation to Wildlife (Protection) Act
5. Handling outdoor medical emergencies

The list of research topics and trainings is dynamic and could increase over the course of the implementation of the management plan.

This list is independent of the training that will have to be taken as part of capacity building within the local community. A list of topics for such trainings is best worked out through discussions that are held with the local community members across villages.

8. Climate Change Mitigation Strategies

A study on Climate Change and its effects in Spiti was carried out during the last management plan period in 2012. Some of the methods employed, key findings and suggestions are captured in this chapter.

8.1 Summary of Study Methodology

- Meteorological data analysis to establish evidence of climate change.
    - Snowfall, Temperature time series analysis using moving averages to arrive at trends and use the trends in snowfall, maximum temperature and minimum temperature to show compounded effect on the livelihoods and day-to-day activities of the agro pastoral community of Spiti.
    - Annual average snowfall data so as to see the increase or decreasing trend with seasonal variations in tact in the data.
    - Maximum temperature frequency method, to see consistency over the last years in maintaining day temperatures in March above maximum temperature. In order to comment on the expansion of the summer season and show the shift in months.
- Survey of perceptions within the local community to establish evidence of climate change and its impacts on them
    - Snowfall changes, rainfall pattern changes and temperature changes to highlight the evidence of climate change felt by the local community. As the community is agro pastoral the effects of climate variables are discernible to them.
    - Impact of climate change has been measured for the following changes in the variables of livelihood and lifestyle: harvest of barley, sowing time, grazing time, number of livestock, construction material used in houses and drinking water availability.
    - Paired sample z test to report that there has been a significant change in harvest of barley, sowing time, grazing time (after winter stall feeding) and number of livestock.
- In the initial part of the research remote sensing to establish decrease in biomass in the pastures and decrease in size of the pastures was to be used. But the approach has been discarded after seeing that climate change doesn't have a consistent effect on pastures throughout the region. Some pastures might have increased in size or bio mass because of increased glacial melt and some pastures might show a decrease due to less snowfall. Thus this approach was leading to in conclusive results, and therefore has been discarded.

8.2 Salient Findings

The salient findings in the research are as follows:

- Decrease in precipitation in the form of snowfall is tangible throughout the region as established through meteorological data and local perception survey. The decrease as per the respondent survey is on an average of -57.8% and according to the meteorological data analysis the decrease in the four stations Kaza, Lossar, Tabo and Malling Dogri is: -52%, -15%, -98% and -69%.
- Increase in maximum temperature and minimum temperature. The rate of increase is 0.099 C per yr in maximum temperature and 0.035 C per yr in minimum temperature from 1984 to 2009 at Kaza. The rate of increase at Malling Dogri over a period of 1991 to 2009 is 0.68 C per yr. Both the stations have shown very high rates of warming in comparison to global rates of warming. This trend has been observed in other literature as well, that is the Himalayan region has shown higher rates of warming than the global rates. (International Centre for Integrated Mountain Development, 2011). Winter months are showing higher temperatures and lower snowfall resulting in non-accumulation of snow that affects the livelihoods of the agro pastoral community.
- There is a shift in the summer season. The shift is actually an expansion in to the spring season. The month of March is reported to have higher average monthly temperature and there has been a consistency in the trend over the past 6 years (2004-2009).
- There is a local perception evidence for increase in the temperature and decrease in snowfall. Furthermore, there is a change in the rainfall pattern, with intensity of rain increasing in the month of September, which in the past was a month devoid of any precipitation in the form of rainfall in this region. This affects post-harvest activities of the farmers as the autumn season is used for fodder extraction and collection.
- There is an advance in the grazing season (after winter stall feeding of cattle) as per the local perception survey: 3.3 weeks (ahead).
- There is an advance in the sowing week as per the local perception survey: 1.3 weeks (ahead).
- There is a decrease in harvest and higher frequency of pest infestation due to decrease in snowfall and increase in temperature.
- Lesser availability of manure, due to decrease in livestock.
- Changes in construction of houses are reported to be influenced by the changes in rainfall. This is due to higher intensity rains and hail which are reported to cause damage to the sun baked mud brick houses. Use of plastic to prevent seepage from heavy rains has also been reported.

- There is a decrease in availability of irrigation water and drinking water in the villages. Villages with water holding structures and more number of springs have not felt the affect of lesser drinking water yet.
- Decrease in livestock is reported to be due to decrease in grass that is a result of decrease in snowfall. Decrease in snowfall affects both harvest and pasture grass thus affecting the winter stall feeding.
- The changes in the harvest of barley per unit land, beginning of sowing season, beginning of grazing season and number of livestock over past 25 years are very significant. The high negative z score values from the paired sample z test confirm this finding and confirm the decrease in harvest and livestock, and advance in the grazing and sowing season. And the reasons reported in the perception survey by the respondents confirm the influence of climate variables in bringing about the significant change.
- The increase in maximum and minimum temperatures in the region is a reason for production of good quality apples in this region. The movement of apple cultivation to higher altitudes is because of the warming affect which gives rise to the adequate number of chilling hours needed by apple. Grafting and better seed qualities are also influencing production and quality but the main reason is increase in temperature. The finding is confirmed by key informant interview of horticulture department Kaza and Kullu.
- The anthropogenic effect on water is much lesser in this region, especially the villages in the plateau, because the rate of increase in population is not very high.
- There is a change in the quantity of water used in the fields because of the change in crop from black peas to green peas. But, it has been established that the amount of water needed in black peas and green peas is almost the same as mentioned by the respondents of the survey. Thus, any reduction in irrigation water cannot be attributed to change in crop.

8.3 Suggestions for the Future

The recommendations from the research are as follows:

- Adaptation techniques need to be adopted by the local community to mitigate effect of climate change. Building of water holding structures and artificial glaciers should be adopted by all the villages in the region. Artificial glacier experiment has been extended by the Kibber village after seeing its successful implementation in Leh, Ladakh. These are only mitigation steps to cope with the current decrease in snowfall and increase in temperature.
- With increase in precipitation in the form of rainfall, soil conservation techniques need to be adopted to prevent soil run off.
- Solar passive structures for housing would help adapt to changing weather conditions and reduce dependency on fuel wood for winter.

- Research studies to assess the impact of climate change on the bio diversity of the region should be carried out to find out the influence on flora and fauna.
- Research study to establish the causal reason behind climate change should be carried out as this region is showing much higher rates of warming than the global rate. And the impacts of the climate change in this region show alarming trends on all the four criteria to assess vulnerability of high altitude mountain communities of Asia: magnitude, timing, persistence, low adaptive capacity, distribution.
- Currently only Kaza station has adequate data on all the four climate variable parameters such as: snowfall, maximum temperature, minimum temperature and rainfall. If meteorological data from more number of villages is available then the research findings will be even more concrete.

9. Organisation & Administration

9.1 Structure and Responsibilities

The Upper Spiti Landscape including the Kibber Wildlife Sanctuary cover an area of c. 4,000 km^2 and fall under the jurisdiction of the Spiti Wildlife Division. The Spiti Wildlife Division is headed by the Divisional Forest Officer who reports to the Additional District Magistrate of Spiti sub-division, since Spiti has a single-line administration. The working of the Spiti Wildlife Division is also overseen by the Chief Conservator of Forests (South) who is based in Shimla. The current staff pattern includes:

1. One Range Officer, one Beat Officer and one Forest Guard. They all report to the Divisional Forest Officer (Wildlife), Spiti.

9.2 Proposed Staff Pattern

The proposed staffing pattern for the landscape includes:

Sr. No.	Designation	Existing Posts	Proposed Posts	Justification
1	Beat Officer	1	1	-
2	Forest Guard	1	1	-
3	Permanent Watchers	-	3	To support work, especially during tourism season in winters

Table 19: Proposed Staff Structure for Upper Spiti Landscape including Kibber WLS

9.3 Amenities

Some of the basic amenities that ought to be provided to teams guarding these areas include:

1. Walking shoes, wind-proof jacket and head torch
2. Sleeping bag for sub-zero temperatures
3. Solar powered lamps for basic lighting
4. Adequately stocked medical kits for basic medical emergencies

Besides this, some basic amenities can be planned for the staff such as:

1. Regular health check up
2. Heath insurance and hospitalisation cover
3. Special allowances should be provided to the field staff for working in difficult area.

10. Budget

Currently, the Upper Spiti Landscape receives funding through funds allocated under Project Snow Leopard which is funded under Integrated Development of Wildlife Habitats (IDWH) which is a centrally sponsored scheme launched during the 11th Plan period to provide technical and financial assistance to States and Union Territories for protection of wildlife habitats. The activities covered under the scheme include staff development and capacity building, wildlife research and evaluation, anti-poaching activities, wildlife veterinary care, address man-animal conflicts and promoting ecotourism.

Increased funding is required for strengthening of infrastructure, development of eco-tourism, awareness generation and education activities etc. The budgetary requirement for the next ten years, i.e, from 2018-19 to 2027-28 has been categorized as explained in the following table.

An annual fund requisition will be raised by DFO (Wildlife) Spiti on behalf of the Spiti Snow Leopard Conservation Society. Once approved, the funds will be received by the Society and specific tasks could be undertaken by the Spiti Wildlife Division or competent authorities identified for the completion of specific work. **The proposed budget for this management plan will be funded under two programs: CSS and Koldam**.

Year-wise break up of Financial Target for Management of USL including Kibber WLS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021- 22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
I	Development of USL including Kibber Wildlife Sanctuary											
A	Vehicle	10.00	2.00	-	-	-	2.00	-	-	-	2.00	16.00
B	Purchase of field equipment	0.75	0.75	0.50	0.75	0.75	0.50	1.00	1.00	0.75	1.00	7.75
C	Staff amenities	1.00	2.00	1.00	1.25	2.25	1.25	1.50	2.75	1.50	2.00	16.50
	Sub Total	11.75	4.75	1.50	2.00	3.00	3.75	2.50	3.75	2.25	5.00	40.25
II	Protected Area Management											
A	Boundary protection	5.75	1.75	1.75	2.00	2.00	6.00	2.25	2.25	2.25	2.50	28.50
B	Maintenance of road network	6.00	2.50	2.75	3.75	8.00	2.40	3.90	4.65	5.25	5.50	44.70
	Sub Total	11.75	4.25	4.50	5.74	10.00	8.40	6.15	6.90	7.50	8.00	73.20
III	Development of Responsible Eco Tourism											
A	Manage tourism at Upper Spiti Landscape including Kibber WS	12.00	17.50	6.50	5.00	6.50	13.75	11.00	6.00	5.75	10.75	94.75
	Sub Total	12.00	17.50	6.50	5.00	6.50	13.75	11.00	6.00	5.75	10.75	94.75
IV	Eco-Development											
	Sub Total	9.00	10.00	11.00	12.00	13.00	14.00	15.00	17.00	17.00	20.00	138.00

Year-wise break up of Financial Target for Management of USL including Kibber WLS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021- 22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
V	Research, Monitoring and Training											
Sub Total		7.00	7.50	8.00	9.50	10.00	11.00	12.00	12.00	13.00	13.00	103.00
VI	Publicity & Awareness											
Sub Total		2.00	2.75	2.00	3.25	2.50	3.50	3.00	4.00	3.00	4.25	30.25
VII	Establishment Costs											
Sub Total		10.50	11.50	12.75	13.75	15.50	16.50	17.75	18.75	20.00	21.00	158.00
VIII	Maintenance of Permanent Assets at USL including Kibber Wildlife Sanctuary											
Sub Total		7.00	7.00	7.00	7.00	7.50	10.00	10.50	10.50	11.00	11.00	88.50
Grand Total		71.00	65.25	53.25	58.25	68.00	80.90	77.90	78.90	79.50	93.00	725.95

Table 20: Summary of budgeted expenses over plan period (2018-28)

A broad activity-wise break-up of these budgeted expenses is provided in the following table.

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
I	Development of Upper Spiti Landscape including Kibber WS											
A	Vehicle											
1	Purchase of vehicle and motorcycles to facilitate visits to Upper Spiti Landscape including Kibber WS	10.0	2.0	-	-	-	2.0	-	-	-	2.0	16.0
Sub Total		10.0	2.0	-	-	-	2.0	-	-	-	2.0	16.0
B	Purchase of field equipment											
1	Digital cameras	0.75	-	-	0.75	-	-	1.0	-	-	1.0	3.5
2	Binoculars	-	0.75	-	-	0.75	-	-	1.0	-	-	2.5
3	GPS and other equipment required for wildlife surveys and census	-	-	0.5	-	-	0.5	-	-	0.75	-	1.75
Sub Total		0.75	0.75	0.5	0.75	0.75	0.5	1.0	1.0	0.75	1.0	7.75
C	Staff amenities											

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
1	Purchase of field equipment— walking shoes, jackets, head torches and sleeping bags.	1.0	1.0	1.0	1.25	1.25	1.25	1.5	1.5	1.5	2.0	13.25
2	Purchase of solar powered lanterns and dedicated solar unit for Forest Hut	-	1.0	-	-	1.0	-	-	1.25	-	-	3.25
Sub Total		**1.0**	**2.0**	**1.0**	**1.25**	**2.25**	**1.25**	**1.5**	**2.75**	**1.5**	**2.0**	**16.5**
II	**Protected Area Management**											
A	**Boundary protection**											
1	Survey and demarcation of wildlife sanctuary, beats, grazing pastures, enclosures etc	0.75	0.75	0.75	1.0	1.0	1.0	1.25	1.25	1.25	1.5	10.5
2	Installation and upkeep of general	5.0	1.0	1.0	1.0	1.0	5.0	1.0	1.0	1.0	1.0	18.0

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
	signage and boards											
	Sub Total	**5.75**	**1.75**	**1.75**	**2.0**	**2.0**	**6.0**	**2.25**	**2.25**	**2.25**	**2.5**	**28.5**
B	**Maintenance of road network**											
1	Maintenance of road to USL and Kibber Wildlife Sanctuary	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	15.5
2	Maintenance of existing patrolling paths	1.0	-	1.0	-	1.0	-	1.0	-	1.0	-	5.0
3	Construction of culverts/ causeways	1.0	-	-	1.5	-	-	-	1.75	-	-	4.25
4	Identify and mark vantage points	-	1	0.25	0.25	1.5	0.4	0.4	0.4	1.75	0.5	6.45
5	Set up garbage collection and disposal arrangement in the Sanctuary	3.0	0.5	0.5	0.5	4.0	0.5	0.5	0.5	0.5	3.0	13.5
	Sub Total	**6.0**	**2.5**	**2.75**	**3.75**	**8.0**	**2.4**	**3.9**	**4.65**	**5.25**	**5.5**	**44.7**

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
III	Development of Responsible Nature-based Eco Tourism											
A	**Manage tourism at Upper Spiti Landscape including Kibber WS**											
1	Commission a study to assess tourism carrying capacity, and develop responsible ecotourism strategy for Upper Spiti Landscape including Kibber WS	5.0	-	-	-	-	6.0	-	-	-	-	11.0
2	Maintenance of gate	-	-	2.0	-	-	-	5.0	-	-	-	7.0
3	Construction of a reception centre cum security	-	12.0	0.5	0.5	0.5	0.5	0.75	0.75	0.75	0.75	**17.0**

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
	watchmen shed at the gate											
4	Demarcate areas for licenced operators to set up camp sites	1.0	-	-	1.0	-	-	1.0	-	-	1.0	**4.0**
5	Create nature trails for nature interpretation such as bharal trail, bird watching etc	-	1.0	-	-	1.0	-	-	1.0	-	1.0	**4.0**
6	Formation of trekking paths	1.0	-	1.0	-	-	1.0	-	-	1.0	-	**4.0**
7	Maintenance of trekking path	-	-	-	0.5	0.5	-	0.5	0.5	-	0.5	**2.5**
8	Lay out a waste disposal system around camp sites	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**10.0**
9	Establish boards, signages for identification of flora and fauna	-	2.0	0.5	0.5	0.5	3.0	0.5	0.5	0.5	3.5	**11.5**

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
10	Procure souvenirs for the visitors such as t-shirts, caps etc	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	2.0	13.0
11	Set up website for the Sanctuary	3.0	0.5	0.5	0.5	2.0	0.75	0.75	0.75	1.0	1.0	10.75
Sub Total		12.0	17.5	6.5	5.0	6.5	13.75	11.0	6.0	5.75	10.75	94.75
IV	Eco-Development											
1	Capacity building for staff in participatory techniques	3.0	3.0	3.0	3.0	4.0	4.0	4.0	5.0	5.0	5.0	39.0
2	Capacity building as tourist guides for local youth	2.0	3.0	3.0	4.0	4.0	4.0	5.0	5.0	5.0	6.0	41.0
3	Development of micro plans with stakeholders seeking their ownership to conserve the	4.0	4.0	5.0	5.0	5.0	6.0	6.0	7.0	7.0	9.0	58.0

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
	landscape											
Sub Total		9.0	10.0	11.0	12.0	13.0	14.0	15.0	17.0	17.0	20.0	138.0
V	Research, Monitoring and Training											
1	Conduct basic research such as survey of biological diversity, socio-economic conditions of the migrant herders grazing livestock in the buffer zone etc	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	15.5
2	Study on ranging of snow leopards by collaring them	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	35.0
3	Train staff in wildlife techniques, Ecotourism,	2.0	2.5	3.0	3.5	4.0	4.0	4.0	4.0	5.0	5.0	37.0

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
	wildlife laws etc with field visits											
4	Annual monitoring of biological diversity in the Sanctuary	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	15.5
Sub Total		**7.0**	**7.5**	**8.0**	**9.5**	**10.0**	**11.0**	**12.0**	**12.0**	**13.0**	**13.0**	**103.0**
VI	**Publicity & Awareness**											
1	Preparation of brochures, banners, publicity materials etc…	-	0.75	-	0.75	-	1.0	-	1.0	-	1.25	**4.75**
2	Nature Education Camps for local school children	2.0	2.0	2.0	2.5	2.5	2.5	3.0	3.0	3.0	3.0	**25.5**
Sub Total		**2.0**	**2.75**	**2.0**	**3.25**	**2.5**	**3.5**	**3.0**	**4.0**	**3.0**	**4.25**	**30.25**
VII	**Establishment Costs**											
1	Salaries and allowances for the proposed staff	7.5	8.0	8.5	9.0	10.0	10.5	11.0	11.5	12.0	12.5	**100.5**

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
2	TA, Medical expenses, of the staff	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	**42.5**
3	Office expenses on site	1.0	1.0	1.25	1.25	1.5	1.5	1.75	1.75	2.0	2.0	**15.0**
Sub Total		**10.5**	**11.5**	**12.8**	**13.8**	**15.5**	**16.5**	**17.8**	**18.8**	**20.0**	**21.0**	**158.0**
VIII	**Maintenance of Permanent Assets at Upper Spiti Landscape including Kibber WS**											
1	Civil maintenance of structures built for management of Upper Spiti Landscape including Kibber WS	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	**25.0**
2	Maintenance of vehicles	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	**12.5**
3	Diesel/Petrol expenses	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	**12.5**
4	Supply of uniform to the staff	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	**12.5**
5	Immunization of livestock in the	2.0	2.0	2.0	2.0	2.5	2.5	3.0	3.0	3.5	3.5	**26.0**

Year-wise break up of Financial Target for Management of Upper Spiti Landscape including Kibber WS (2018-2028)												
Sr. No.	Particulars of Work	Rs. In Lakhs										
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
	buffer zone											
Sub Total		7.0	7.0	7.0	7.0	7.5	10.0	10.5	10.5	11.0	11.0	88.5
Grand Total		**71.00**	**65.25**	**53.25**	**58.25**	**68.00**	**80.90**	**77.90**	**78.90**	**79.50**	**93.00**	**725.95**

Table 21: Details of budgeted expenses over plan period (2018-28)

Annexure 1: Notification of Kibber Wildlife Sanctuary

Annexure 2: Identifying high-priority snow leopard conservation landscapes in northern India

All planned field work has been completed and project objectives met. The distribution of snow leopard, ibex, and bharal has been determined across 56% of snow leopard habitat in the state as well as key threats, of which migratory livestock herding has emerged as a focal area for research and conservation interventions. This project has enabled us to refine methodology for surveying in such a large study area, and to effectively target resources towards areas of high need within the state. The following is a preliminary report summarizing our project activities and results while we continue to work on formal recommendations and publications for stakeholders and policy-makers.

Background

The elusive and large ranging snow leopard Panthera uncia is the top-predator of the Central and South Asian mountains and is the 'flagship' for conservation of the Indian Himalaya. Experts estimate only 4000-6500 snow leopards remain in the wild. They are classified as Endangered by IUCN and are considered a species "threatened with extinction" by CITES. The Indian Himalaya and Trans-Himalaya form the southern limits of snow leopard distribution and are home to roughly 10% of the global snow leopard population.

Owing to the remoteness and high-altitude (3,200m-5,200m) rugged terrain of snow leopard habitat, information on occurrences, distribution and threats to snow leopard and primary prey, bharal Pseudois nayaur and Asiatic ibex Capra sibirica, remain limited across India's snow leopard range. At the same time, resource use and development in India's high altitudes is increasing rapidly as traditional subsistence-level agro-pastoralism is shifting to a cash-based and market oriented economy, replete with road construction, hydroelectric dam projects, and an influx of immigrant labor. Alongside long-standing threats (e.g. resident and migratory livestock grazing, retribution killing and hunting), newer and more devastating threats (e.g. hydro-electric projects, road construction, commercial use of natural resources) are emerging (Snow Leopard Network, 2014; USL, 2011; PSL, 2008). Intense resident and migratory livestock grazing has resulted in out competition of wild-prey of snow leopard (Bagchi, Mishra & Bhatnagar, 2004;

Mishra et al., 2004). Hunting of wild ungulates continues to be a threat to snow leopard and wild-prey in certain parts (Bhatnagar et al., 2008; Kaul, Jandrotia & McGowan, 2004). The snow leopard habitat is also vulnerable to the impacts of climate change (Forrest et al., 2012).

Most wildlife in the Himalaya and Trans-Himalaya region occurs outside existing protected areas (Mishra et al., 2010; PSL, 2008), and considering these emerging devastating threats, there is an urgent need to find and secure the most important snow leopard landscapes in the country.

Location

This project took place in the state of Himachal Pradesh. Himachal Pradesh has some of the best habitat for snow leopard, blue sheep and Asiatic ibex in India. The area of Himachal Pradesh within potential snow leopard range is roughly 28,000 km2, which is almost 50% of the state's total geographical area, and 22% of the total potential snow leopard distribution range in India. We focused on 6-7 large geographical landscapes (1000-2000 sq km each) within Himachal Pradesh with good potential for snow leopards and their prey, occurring across three districts: Pangi/Chamba, Lahaul & Spiti, and Kinnaur. PAs cover only 17% of the available snow leopard habitat in the study area. A map of the study area is included below in Figure 1.

Project Goals and Objectives

The goal of this project was to identify priority sites for snow leopard conservation within Himachal Pradesh.

Our objectives were to

1. Estimate the proportion of landscape occupied by snow leopard and its primary prey species;
2. Assess the main threats affecting the occurrence of snow leopards and wild prey within landscapes.

Methods and Results

Towards objective i) estimate the proportion of landscape occupied by snow leopard and its primary prey species:

During the first half of the project, we attempted to refine occupancy survey (site use) methods within two landscapes of Himachal Pradesh to assess the occurrences and relative abundance of snow leopard and prey species using primary data through a rigorous framework at a fine spatial scale. We surveyed in the Parilungbi-Shila-Lingti and Pin landscapes to assess the efficacy of field sampling protocol (Figure 1.1). Square grids of 5km X 5km were overlaid on the landscapes. Through simulation using the GENPRES software program, we identified the number of grids required to be sampled in each landscape to get unbiased occupancy estimates. Simulation results indicated that 40 grids are needed to be sampled per landscape. A minimum of 8 km have to be walked in each grid.

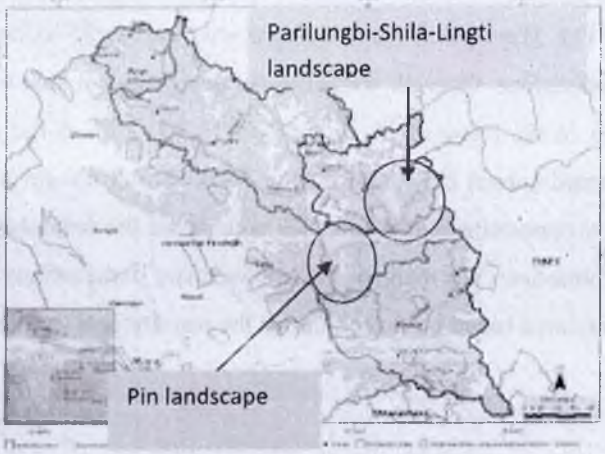


Figure 1.1: Project area in Himachal Pradesh. Surveyed sites marked with red circles.

During this period, we experienced a significant challenge: we discovered that trying to rely on direct evidences (sighting) yielded inadequate detection of prey species owing to the low densities at which bharal and ibex usually occur. Often, even after walking for 14-15 km in a 25 km^2 grid, along trails with multiple vantage points and repeated scanning through binoculars, we were not able to record a single sighting.

We subsequently explored developing a protocol to use indirect signs (pellets/dropping), since pellets are more easily detectable along trails. During May-June of the project period, we collected 111 pellet samples of bharal, 52 of ibex, 80 of goat and 85 of sheep (a total of 328 pellet samples) to attempt to develop a method for distinguishing wild prey from livestock pellets. We attempted to use landmark-based geometric morphometrics to identify domestic livestock pellet from that of wild-herbivore. This basically tries to separate known groups of samples (e.g. anatomical features) based on shape/geometry. Using this method, we were able to acquire 65% precision in correctly identifying livestock from wild-prey pellets (i.e. out of every 100 unknown samples, 65 were correctly classified). While this rate is not yet good enough to employ in field at large scale and needs further improvement, this is a significant step forward in development of a new cost-effective prey detection methodology relevant throughout snow leopard range.

Due to these constraints, and upon careful review of methods available to our project, we ultimately decided to rely on in-depth key informant interviews with structured questionnaire to document occurrences of snow leopard and prey over the past 30 years following Pillay et al. (2011). We carried out 385 interviews across 75 villages/hamlets covering 41 valleys in three subdivisions. Overall, we covered a geographical area of 16,593 km^2 out of the total 21,887 km^2 area of the three subdivisions, and 11,300 km^2 of the total 19,985 km2 area of potential snow leopard habitat in Himachal (i.e. 56% of total habitat in the state). We also covered 244 km on foot, opportunistically, to better understand the natural history of the landscape and validate local information. We mapped the approximate distributions of snow leopard, bharal and ibex in the study area based on detections by the respondents (Figure 2).

Results

Prey distribution

Of the 41 catchments surveyed, ibex detections were recorded from 29 catchments. Approximate distribution of ibex covers an area of 9,143 km^2 (Figure 2). The right bank of the Sutlej River and the left bank in the Upper Spiti Valley form the eastern limit of ibex distribution. Respondents reported the range of ibex to have shrunk locally over the last three decades in the eastern and western extremities of Lahaul, in Pangi (Sach and Sural valleys), the Upper Spiti Valley in Spiti, and in Kinnaur (Salaring and Kashang valleys).

Of the 41 catchments surveyed, bharal detections were recorded from 23 catchments. Approximate distribution of bharal covers an area of 4,904 km^2 (Figure 2). Bharal distribution is essentially restricted to the eastern Spiti and Sutlej valleys. The Takling nala, near Kiato village in Spiti, appears to be the western limit of bharal distribution within the surveyed area, although bharal might be occurring in the Tsarap Chu valley, but remains unsubstantiated. The range of bharal was reported by the respondents to be stable locally over the last three decades.

In Himachal, bharal and ibex show largely distinct distribution ranges (Figure 2). Their ranges overlap marginally on the right bank of the Sutlej River in Kinnaur and in a few places on both banks of the Spiti River in Spiti.

Snow leopard distribution

Snow leopard detections were recorded from 36 of the 41 catchments surveyed, indicating widespread occurrence. Snow leopard distribution essentially encompasses the distribution ranges of bharal and ibex, put together (ca.14,615 km^2) (Figure 2). The range of snow leopard was reported by the respondents to be stable locally over the last three decades across Spiti and large parts of Kinnaur. The range of snow leopard was reported to be expanding locally in parts of Kinnaur including Baspa, Bhaba and Taiti Garang valleys and Sissu nala in the Lower Chandra Valley in Lahaul. The range of snow leopard was reported to have shrunk locally in the Sainchu Valley in Pangi, in parts of the Bhaga Valley and parts of the Chandra Valley in Lahaul. Within the study area, there appears to be a 'gap' in snow leopard distribution in Upper Chandra Valley, thus, broadly separating western Lahaul and Pangi from the rest of the snow leopard range in Spiti and Kinnaur.

Towards objective ii) assess the main threats (including level of natural resource extraction) affecting the occurrence of snow leopards and wild prey within landscapes:

We used focus group discussions and open-ended informal interviews to document extant threats. We ranked the threats based on area, intensity and urgency (Margoluis & Salafsky, 2001) and mapped the key conservation issues. Based on occurrences of snow leopard, bharal and ibex, perceptions of the respondents on 'good' areas for these species, a combination of direct and indirect evidences and prevalence and degree of conservation threats, we identified potential strongholds for the three species.

It seems natural resource use is ubiquitous in the landscape. Locals and immigrants both depend on natural resources. Resource use is persistent not only near villages, but extends deep into snow leopard and prey habitat, especially through expansion of agricultural area due to gradually changing climatic conditions and grazing of large stock e.g. yak and horse.

The threat assessment (Table 1) showed that long-standing threats, such as, resident and migratory livestock grazing, retaliatory killing of snow leopard, wild-prey hunting, fodder/fuel-wood and medicinal plant collection and presence of military are pervasive in the study area. In certain areas such as majority of Kinnaur, Lahaul and Pangi (these areas also happen to be dominated by Hindus) hunting of wild-prey, including community hunting during winter, continues to be a persistent threat. In Spiti and parts of Kinnaur, upper areas of Lahaul and Pangi (these areas happen to be dominated by Buddhists), hunting has apparently been negligible owing to their age-old tolerance toward sentient beings.

The emerging conservation issues include threats from free-ranging dog and developmental pressures, e.g. road construction and maintenance, immigration of labourers and their dependence on snow leopard habitat and hydro-electric projects. Developmental pressures seem to be intense especially in Kinnaur, but also escalating in western Lahaul and Pangi. The key conservation issues are migratory livestock grazing and guard dog, free-ranging/feral dog, hydro-electric project, road construction/maintenance and immigration of labourers (Table 1).

We mapped these threats (Figure 3) and found migratory grazing is prevalent in ca. 51% of the snow leopard habitat available within the study area, covering 21 of the 41 catchments surveyed, of which relatively intense migratory livestock grazing (ca. 90 livestock/km2) covers ca. 40% of the same, especially in Bhaga and Chandra valleys in Lahaul (Fig. 3). Thus, migratory livestock

grazing is possibly the most serious and widespread conservation issue in Himachal Pradesh. Additionally, between 1997 and 2007, resident livestock population in Kinnaur increased by 2.8 %, in Lahaul & Spiti decreased by 0.3 %, while in Chamba it increased by 24.4% (Livestock Census, 1997, 2007).

Overall, dependence on natural resource use by local people appears to have declined. This is potentially because of increasing short-term and long-term livelihood options (mainly in construction and tourism sector). Many locals today are employed in government or private sector as permanent or contractual staff. This, in addition to regular agricultural activities, has rendered local people to have meagre time for natural resource extraction. However, owing to increased cash income from green-pea and apple cultivation over the past two decades, local people are regularly hiring immigrant labourers. Immigrant labourers are brought into Spiti primarily through agents and/or contractors to work in the towns and villages of Spiti. Labourers are mainly involved in road and building construction and repairing, agricultural, livestock grazing and household related works and hydro-power projects. Most local people were of the opinion that while immigrant labourers have immense role to play in the improving economy of the region as the primary source of manpower, they also bring in certain livelihood and conservation issues. Immigrant labourers were reported to be consistently involved with wildlife hunting. Labourers associated with livestock grazing, construction and repairing of roads and irrigation channels in remote and higher areas hunt bharal, small mammals (e.g. Himalayan woolly hare) and occasionally ibex for subsistence. In villages, they were reported to hunt yellow-billed chough in large numbers for consumption. Apparently, some immigrant labourers supply fossils, medicinal plants and other herbs of commercial use to agents in Rampur (Shimla District), Mandi, Manali and Kullu in Kullu District. The agents reportedly operate as traders. Thus, the scenario appears to be such that while dependence by locals on natural resources may appear to have declined, the impact of immigrant labourers seems to be on the rise.

Outcomes

Towards our goal of identifying priority sites for snow leopard conservation within Himachal Pradesh, we identified areas promising for ibex, bharal and snow leopard across the study area (Figure 4). These areas include parts of western Lahaul and Pangi, south-western Spiti and parts of Kinnaur on right bank of the Sutlej River. For bharal, promising areas include parts of left and right bank of the Sutlej River in Kinnaur and parts of middle and lower Spiti River. Promising

areas for snow leopard include a combination of areas with better potential for bharal and/or ibex on both banks of Sutlej and Spiti rivers in Kinnaur, both banks of the Spiti River and western Lahaul. In total, of 41 catchments surveyed, 16 catchments covering 5,410 sq km were found as promising for snow leopards (Table 2).

Some key findings are:

- Bharal and ibex use mutually exclusive area; while this has largely been observed on a global scale across their distributions, our project reinforced this trend at a relatively finer scale.
- Across Lahaul and Upper Spiti, ibex is the only large wild-prey of snow leopard, and also appears rare.
- Bharal might not have been able to penetrate and establish population in Lahaul and Upper Spiti, potentially owing to a combination of resistance (competition) from established ibex populations, topographic constraints, and now more recently competition with migratory livestock.
- Bharal is found extensively and at relatively high densities in the left bank areas of the Spiti Valley, where terrain is relatively gentle and ibex and migratory livestock are largely absent.
- Ibex seem to precariously persist in intensely grazed areas of Lahaul and Upper Spiti, but at much lower density, in the very steep areas, which are rarely accessed by livestock.
- The combination of intense migratory livestock grazing and sparse occurrence of wild-prey may already have rendered the Lahaul valley and parts of Upper Spiti unsuitable for snow leopard, though apparently extensive tracts of potential snow leopard habitat exists
- Such 'gaps' in the otherwise contiguous habitat of snow leopard may reduce the potential for genetic exchange between snow leopard populations inhabiting areas to the west and east of Lahaul and Upper Spiti.

In addition, our research shows there is an urgent need for ecologists, conservationists and wildlife managers to engage with the migratory herder community and other stakeholders associated directly or indirectly with the livestock production system to assess their role and ways of convergence with mandates of snow leopard conservation. Migratory livestock grazing in snow leopard habitat caters to the local, regional and national markets for wool, milk and meat (Bhasin, 2011; Axelby, 2007). The strong linkage between trade-driven livestock production

Maps

Figure 1: The study area in Himachal Pradesh, India, includes Kinnaur, Lahaul & Spiti, and Pangi sub-division of Chamba District. The region is drained by three major rivers, namely Satluj, Spiti, and Chandra-Bhaga or Chenab. (PA layer is from the International Database maintained by the IUCN and lacks some PAs)

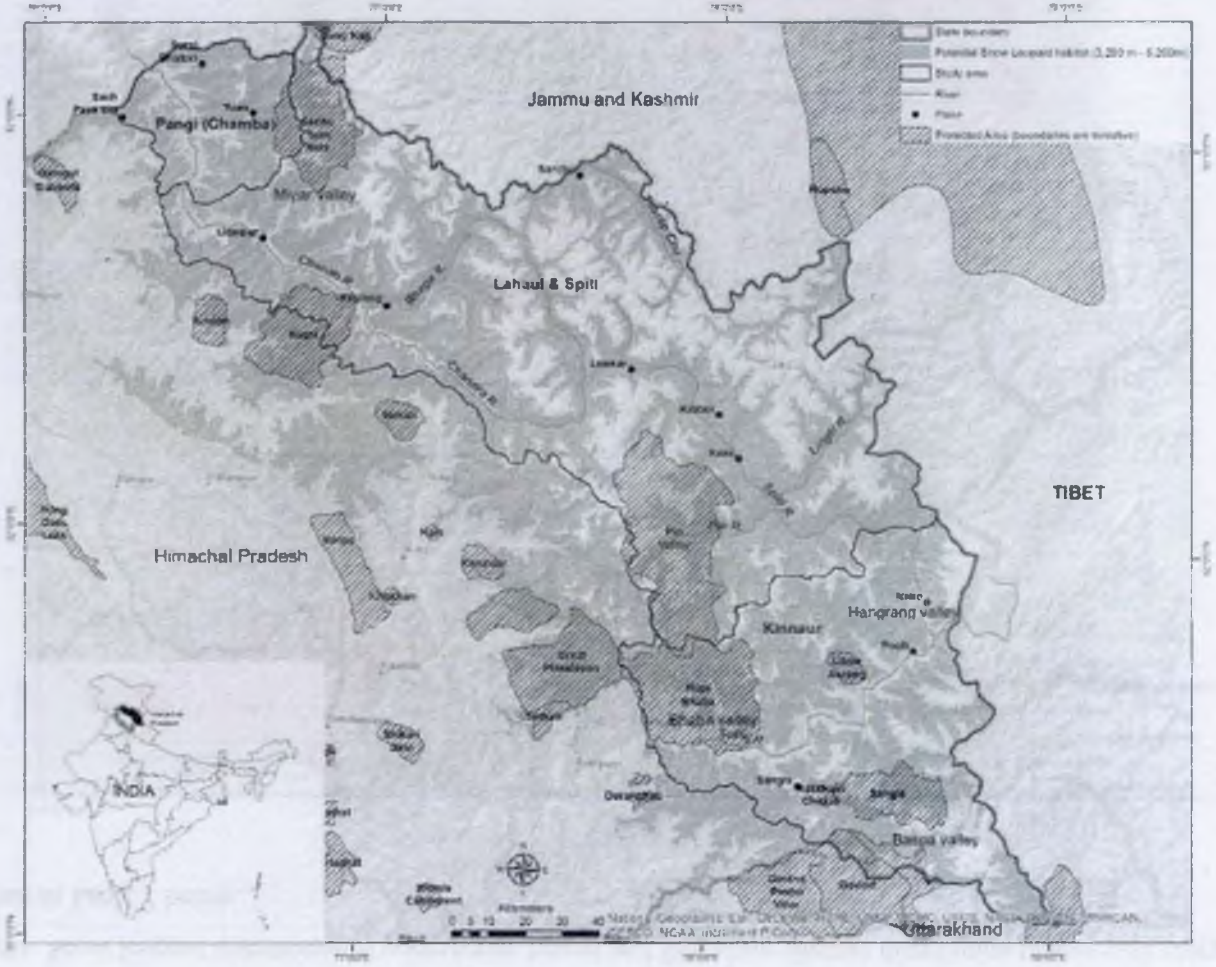


Figure 2: Approximate distribution of snow leopard, bharal and ibex across Kinnaur, Lahaul & Spiti and Pangi sub-division of Chamba District, Himachal Pradesh, India. Snow leopard distribution is widespread, bharal and ibex show distinct distribution ranges with marginal overlap. Survey catchment number given in Table 2 below.

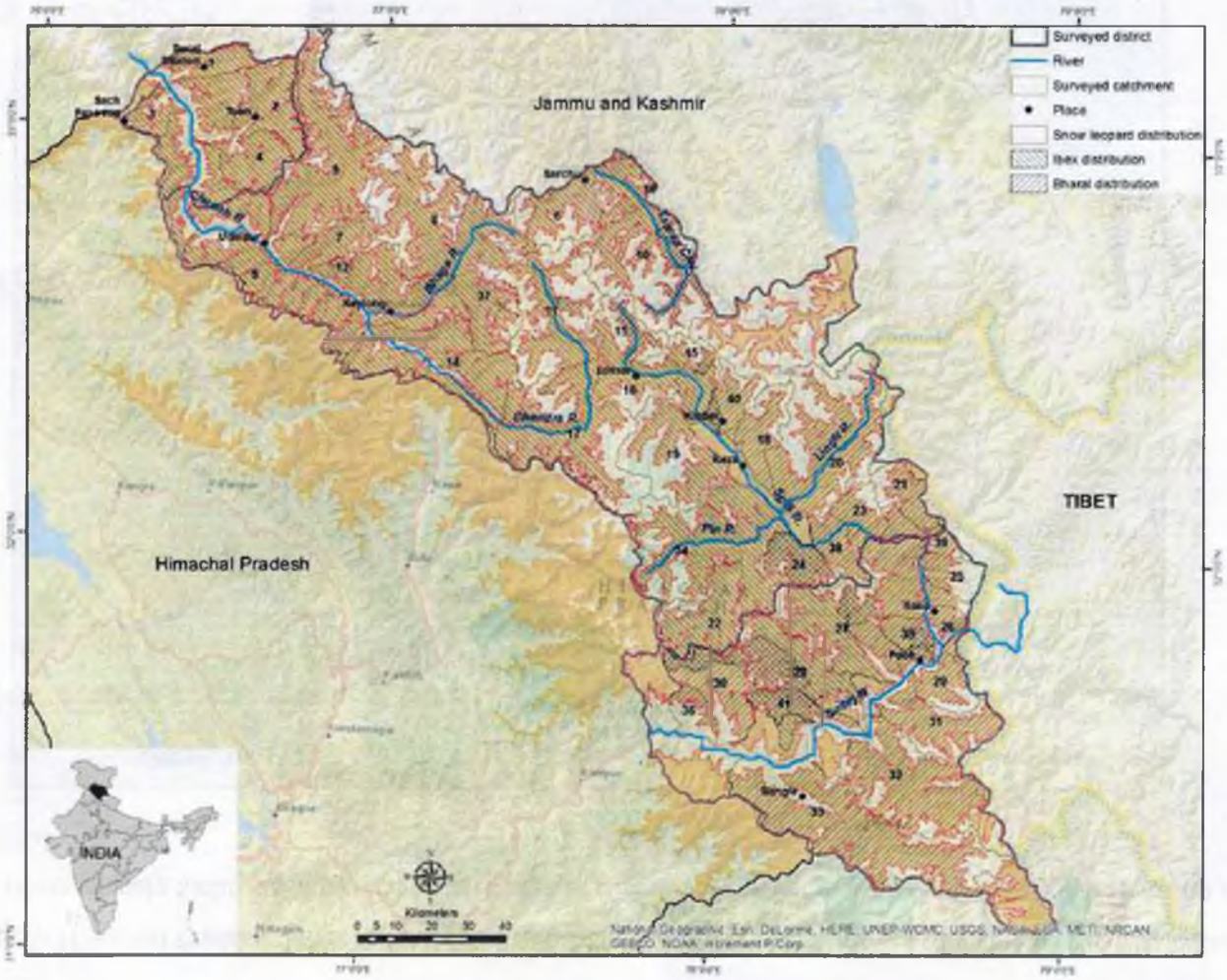


Figure 3: Map showing the extent and relative intensity of the primary conservation issues identified in the snow leopard habitat across Kinnaur, Lahaul & Spiti and Pangi sub-division of Chamba District, Himachal Pradesh, India. Survey catchment number given in Table 2 below.

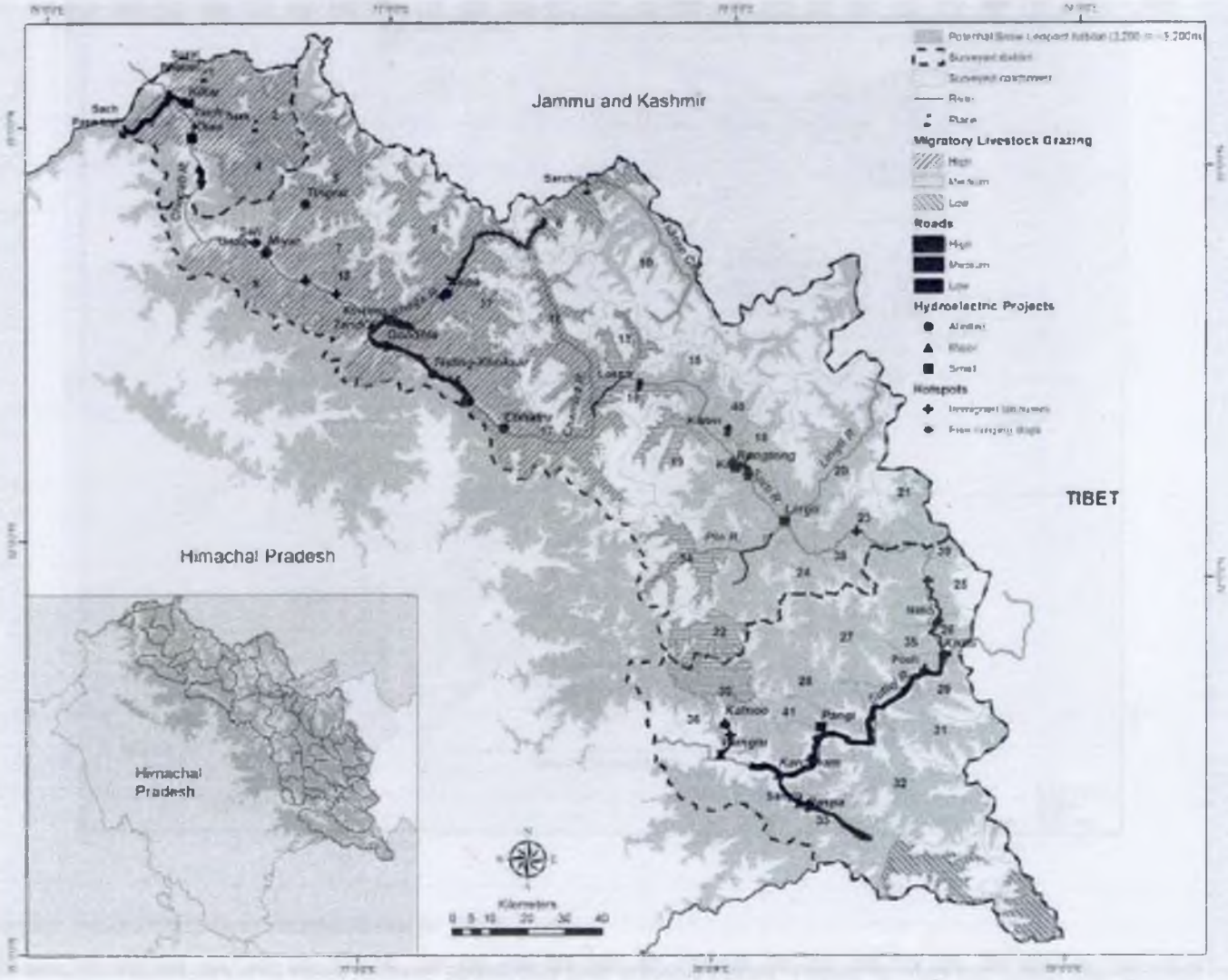
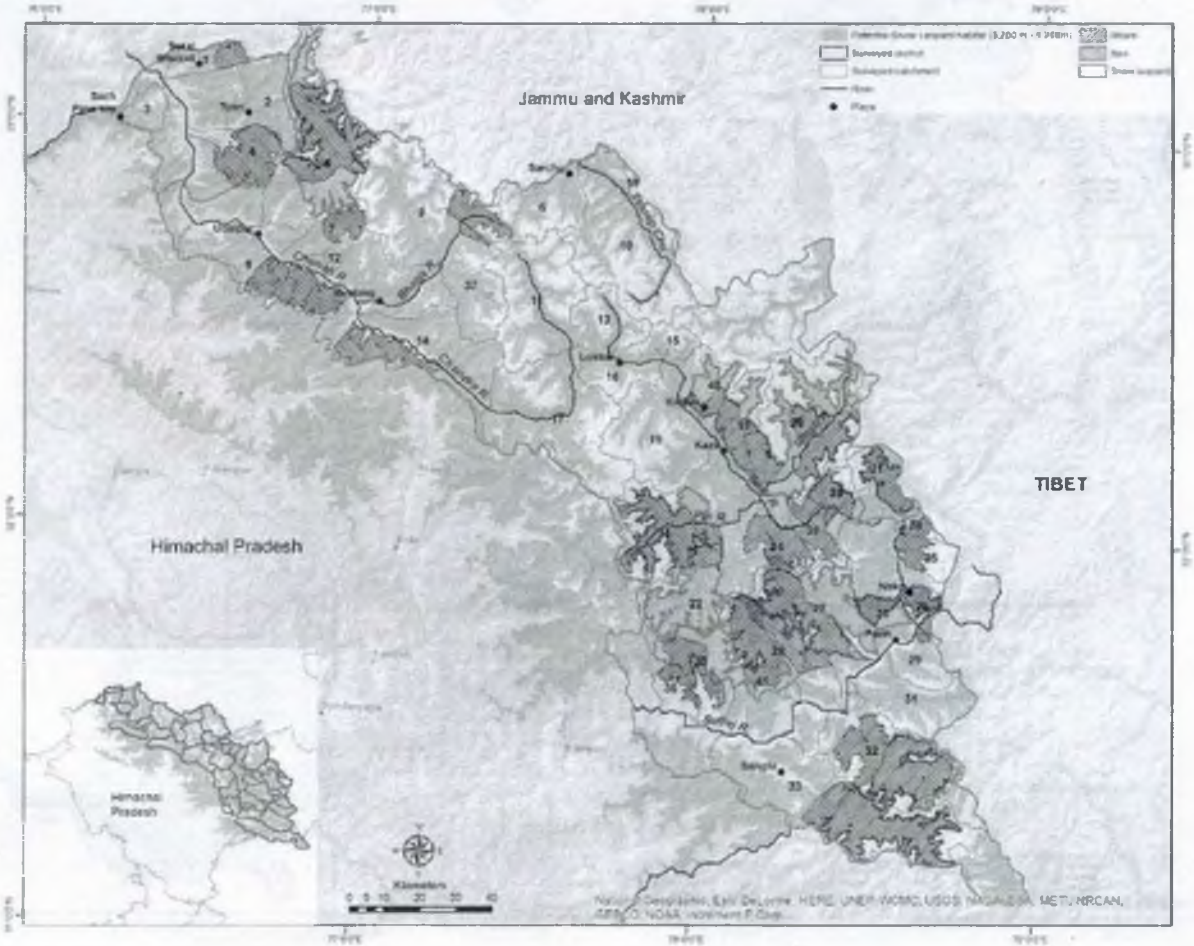


Figure 4: Key areas for conservation of snow leopard, bharal and ibex across Kinnaur, Lahaul & Spiti and Pangi sub-division of Chamba District, Himachal Pradesh. Survey catchment number given in Table 2 below.



systems and decimation of natural prey-base of snow leopard has been established in the Trans-Himalayan and Central Asian steppe (Berger, Buuveibaatar & Mishra, 2013; Bhatnagar & Singh, 2011). A 24.4% rise in livestock populations between 1997-2007 in Chamba District, a known stronghold for migratory herders, further indicates the drastic increase in livestock grazing in snow leopard habitat. Thus far, the ecological consequences of migratory livestock grazing have largely been overlooked in India, especially its impact on rangeland quality and on population density and fecundity of wild-prey. The nature and impacts of changing herding practices also remain unknown. Migratory herders are now increasingly penetrating into new areas (e.g. interiors of the Spiti Valley) in search of pastures (apparently owing to perceived pasture degradation in traditionally grazed areas of Lahaul) and recruiting non-native labourers to assist in grazing.

Outputs achieved

As planned, this project has produced:

- An updated distribution map of snow leopard, bharal and ibex in Himachal Pradesh (Figure 2)
- A map showing threats and natural resource extraction 'hotspots' (Figure 3)
- A map identifying high-priority conservation areas for snow leopards and their prey (Figure 4)

We also underscore and reiterate the need to consider alternatives to the conventional PA-centric conservation approach for a large-ranging species, such as the snow leopard. A landscape-level participatory conservation framework called Project Snow Leopard (PSL, 2008), has been adopted by the Government of India and this project further reinforces and contributes towards this plan.

We are working on formal reports and publications that can be used or awareness and make conservation recommendations to stakeholders at a national and local level.

Conclusion

Our understanding of snow leopard, ibex and bharal distribution in Himachal Pradesh has greatly improved. We have already covered close to 80 % of potential snow leopard range in the State, and hope to cover the areas south of the Himalaya in due course. During the course of this project, we made significant advancement towards adapting new survey methods. Prior to this project, no other studies had attempted such rigorous, grid-based surveys in the region, and methodological issues for work at such a scale in general are not well known and tested in literature. Our efforts resulted in a better understanding of data collection across such a vast region, and we made advances towards morphometric pellet analyses to aid in identification of wild prey species. While our project is focused in Himachal Pradesh state, the cost-effective methods we evolve will be of high value throughout the Greater and Trans Himalaya for monitoring endangered species such as the snow leopard. The current understanding on distribution of snow leopard and prey, and the information on threats that are emerging, is the first of its kind in the context of Indian snow leopafd habitat, as there were no attempts to document occurrences at the scale we have attempted. Based on findings from this existing work, we are now repositioning our conservation focus to address a single key threat (migratory livestock grazing) at high priority areas.

Tables

Table 1: Threat ranking based on area, intensity and urgency following Margoluis & Salafsky (2001) for Kinnaur, Lahaul, Spiti and Pangi, Himachal Pradesh, India. Dark grey: high threat level; grey: medium threat level; light grey: low threat level; white: no threat.

		Kinnaur				Spiti				Lahaul				Pangi/Chamba			
	Threat categories	Area	Intensity	Urgency	Total ranking	Area	Intensity	Urgency	Total ranking	Area	Intensity	Urgency	Total ranking	Area	Intensity	Urgency	Total ranking
1.0	**Livestock grazing**																
1.1	Livestock grazing (by locals)	5	3	2	10	4	3	2	9	4	3	2	9	4	4	2	10
1.2	Livestock grazing (by migratory herder)	3	2	2	7	3	4	3	10	5	5	2	12	5	4	2	11
2.0	**Developmental activities**																
2.1	Road	4	4	4	12	3	3	3	9	3	4	4	11	3	5	5	13
2.2	Migrant labour	5	4	5	14	4	3	3	10	4	5	5	14	4	5	5	14
2.3	Hydro-electric project	3	5	3	11	0	0	0	0	2	4	4	10	2	4	4	10
3.0	**People-wildlife conflict**																
3.1	Retaliatory killing	3	3	2	8	1	1	3	5	3	4	3	10	2	3	3	8
4.0	**Hunting**																
4.1	Hunting (subsistence)	3	4	2	9	1	1	3	5	4	3	3	10	3	2	2	7
4.2	Hunting (market/commercial)	3	4	3	10	0	0	0	0	3	2	3	8	3	4	3	10

		Kinnaur				Spiti				Lahaul				Pangi/Chamba			
	Threat categories	Area	Intensity	Urgency	Total ranking	Area	Intensity	Urgency	Total ranking	Area	Intensity	Urgency	Total ranking	Area	Intensity	Urgency	Total ranking
5.0	**Direct/indirect human disturbances**																
5.1	Fodder/fuel wood collection	3	2	2	7	4	3	2	9	2	2	1	5	4	2	2	8
5.2	Medicinal plant collection	4	3	2	9	3	3	2	8	2	4	1	7	3	3	2	8
5.3	Guard dog	2	1	3	6	2	3	3	8	5	4	4	13	5	3	3	11
5.4	Military/BRO/GREF*	3	2	2	7	2	2	4	8	3	3	2	8	1	1	2	4
5.5	Tourism	2	4	3	9	3	3	4	10	4	3	2	9	1	2	2	5
5.6	Free-ranging dog	3	2	2	7	5	3	3	11	3	2	2	7	3	2	2	7
6.0	**Disease**																
6.1	Livestock disease	0	0	0	0	2	3	3	8	0	0	0	0	0	0	0	0

* BRO – Border Roads Organisation; GREF – General Reserve Engineer Force.

Table 2: Surveyed valleys and effort of the survey across Kinnaur, Lahaul & Spiti and Pangi sub-division of Chamba District in Himachal Pradesh, India

District	Catchments surveyed (identification # on maps)	Promising for bharal	Promising for ibex	Promising for snow leopard	Area of potential snow leopard habitat (sq.km)
Kinnaur	Salaring (36)	b			44
	Bhaba (30)	b		s	308
	Kashang (41)	b		s	115
	Taiti Garang (28)	b	i	s	410
	Ropa (27)		i	s	446
	Hango (35)	b		s	92
	Baspa (33)	b		s	974
	Tidong (32)	b		s	540
	Gyamthing (31)				269
	Hojis (29)				113
	Upper Sutluj - Nako (26)	b		s	71
	Chango (25)	b			67.5
Lahaul & Spiti (Spiti)	Mane (24)	b			158
	Pin (22)		i	s	313
	Parahio (34)		i	s	352
	Gyuindi-Ratang (19)				319
	Shutha (16)				115
	Pare Chu (39)				49
	Giu (21)	b		s	120
	Tabo (23)	b		s	107

District	Catchments surveyed (identification # on maps)	Promising for bharal	Promising for ibex	Promising for snow leopard	Area of potential snow leopard habitat (sq.km)
	Poh (38)	b			134.5
	Lingti (20)	b		s	557
	Shila (18)	b		s	208
	Parilungbi (40)	b	i	s	124
	Taklik-Thuna (15)		i		43
	Kabji-Palung (13)				145
Lahaul & Spiti (Lahaul)	Upper Chandra (11)				340
	Middle Chandra (17)				595
	Lower Chandra (14)		i		558
	Bhaga-left bank (37)		i		300
	Bhaga-right bank (8)		i		546
	Thirot (7)		i		160
	Jahlma (12)				25
	Yobrang/Kugti (9)		i		415
	Sarchu (6)				208
	Tsarap Chu (10)				571
	Miyar (5)		i	s	673
Chamba (Pangi)	Sural (1)		i		128
	Sach (3)				85
	Sainchu-right bank (2)				314
	Sainchu-left bank (4)		i		226
Totals		16	14	16	

Annexure 3: Protocol for capture, immobilization, and radio-collaring of wild snow leopards

Introduction

Capture and chemical immobilization of wild animals requires a blend of exceptional field ecology skills and veterinary anesthesia, conducted under the difficult circumstances. Anesthetic drugs are usually not devoid of toxicity and induction of anesthesia carries a certain risk to the animals, even under zoo conditions. In addition, several immobilizing drugs are toxic to humans. Although the risk of side effects, injuries and death can never be completely eliminated, the potential for adverse impacts to both animals and humans can be greatly reduced through careful adherence to approved animal handling guidelines and by utilizing drugs with a wide margin of safety. It is obvious that capture and immobilisation of wild snow leopards be carried out by the most qualified and experienced team.

Our partner, the Snow Leopard Trust, has the best, internationally acknowledged expertise and widest experience in capture and immobilisation of wild snow leopards. This team, led by the world's most successful snow leopard trapper, Orjan Johansson, has successfully captured and radio collared snow leopards on more than 45 occasions, with no instances of capture related mortality. The team has standardised a safe combination of drugs and dosage, and, for the first time, published a paper describing the combination and the physiological responses of sedated wild snow leopards (Appendix). They have been advising and training personnel involved in radio collaring snow leopards in other parts of Asia. In addition to assisting in the capture operation they are ready to share their knowledge and build local capacity of veterinarians, forest officials and researchers.

The proposed capture team in Spiti will include:

- Orjan Johansson (Field Researcher and Trapper, Snow Leopard Trust) as the lead trapper
- Dr Gustaf Samelius (Assistant Director for Science, Snow Leopard Trust), experienced in capturing, immobilising, radio collaring snow leopards, lynx, and arctic foxes
- Dr Kulbhushansingh Suryawanshi (Director India Programme, Snow Leopard Trust and Scientist, Nature Conservation Foundation), who has assisted snow leopard capture operations in Mongolia, and has more than 5 years of experience working in Spiti

- Dr Yash Veer Bhatnagar (Senior Scientist, Nature Conservation Foundation) with more than 20 years of experience working in the mountains, who also led the first and only radio collaring project on ibex in Spiti in 1992
- Dr Charudutt Mishra (Trustee And Senior Scientist, NCF, and Science and Conservation Director, Snow Leopard Trust), with more than 15 years of experience, who leads the Snow Leopard Trust's international programs including the highly successful snow leopard radio collaring project.
- A qualified vet will be engaged in the project to provide veterinary support throughout the capture operations.

Captures

Snaring

Snaring is the safest way of capturing wild snow leopards. Snaring is a highly skilled exercise but comes with many advantages. It allows one to choose the terrain where the animal will be sedated and later wake up, making it much safer than other means of capture.

It is vital that the total length of the snare and anchor cable be as short as possible to minimize the cat's exposure to rocks and other sharp objects and the possibility of entanglement. Avoiding places with dangerous objects that may injure the animal and areas with ledges or cliffs that the cat could fall off is very important. We will use a checklist to ensure all the steps in the snare building process are correctly followed.

Monitoring

The risk of injuries increases with the time that the animal spends in the trap site. We will use VHF-transmitters, together with a specially designed and fabricated trap alarm system called the Irbis system© developed to listen to the trap transmitters 24x7. The system sounds an alarm as soon as either communication from one of the traps breaks, or signals a capture. This ensures that the stress to the captured animal is minimied.

We will visit the trapping sites periodically to ensure they have not been disturbed.

Any triggered trap will be approached slowly, cautiously and quietly, and the lead trapper will use binoculars to ascertain the sex/size of the trapped animal and whether it is securely caught. All preparations for the immobilization will be conducted from an area that is as far as

possible, outside the visual range of the captured cat. Every effort will be made to prevent both visual and aural stimuli from exciting the captured cat.

Chemical immobilization

Snow leopards stay still when approached at distances between 30 and 10 meters, and tend to get excited when one approaches closer. Therefore, we will prefer to use a CO2 powered dart gun and administer the drugs from c. 10 meters distance. Daninject guns have been successful in Mongolia and these are available with the HPFD.

We prefer to aim for the proximal region of the hind limb to avoid hitting the head if the animal makes a sudden move. A blowpipe may be used if needed, though the gun is preferable.

The darting is done quickly, but only when the animal is stationary and looking away. Every effort is made to place the dart in the caudal-most aspect of the muscle mass, thereby avoiding both the femoral bone and the sciatic nerve.

We observe the cat closely, without any disturbance, to ensure that, as it falls asleep, nothing obstructs breathing, and to ensure lateral recumbancy. The immobilized cat is approached from behind and gently poked with a blow-pipe or stick to ensure complete immobilization. The cat is then removed from the snare and carried to a predetermined close by site where the collaring will take place.

Dart placement sites for cats. Preferred muscle groups are marked *

We use 1.5 ml darts with 1.5 x 30 mm collared needles. A standard drug dose is used for all individuals due to difficulties in estimating size when the snow leopard lies down. This also allows us to preload the dart in camp, which further reduces the time the snow leopard has to spend in the trap site. The dosage may be adjusted if a captured animal is exceptionally smaller/ bigger than normal (25-45 kg).

Recommended dosage and the other details are given in Appendix. It includes 0.72 mg medetomidine (Zalopine® or Domitor®) (c. 0.02 mg/kg body weight) and 80 mg (c. 2 mg/kg body weight) zolazepame and tiletamine (Telazol® ,Zoletil®).

Handling and monitoring of immobilized snow leopards

The immobilized animal is approached slowly, quietly and from outside of its visual range. An immediate assessment is made as to whether the animal is in a proper anesthetic plane. The immobilized animal is then moved to the designated site for marking. To prevent aspiration of saliva or vomitus, immobilized animals are kept in lateral recumbency with the mouth and head low relative to the body. We will place the animal on an insulating cover in wintertime. If the recorded body temperature rises above 39 o C (102 o F), any insulation material will be removed and the cat allowed to lie on the bare ground. An eye gel (Viscotears®) will be applied to the cornea to prevent drying. Animals will be protected from direct sunlight into the eyes by the use of a blind-fold. To avoid stress reactions from headlamps the eyes will be covered at night too. Movement is minimized and every attempt made to eliminate auditory stimuli. Once the animal is safely recumbent and monitored, the dart will be collected and placed in a safe place by the lead trapper.

Cardiorespiratory function will be monitored using a pulseoximeter (Nellcor®) with the sensor (VetSat®) applied to the tongue or ear (see Appendix). A relative arterial oxygen saturation (SpO2) > 90% is considered to be clinically acceptable in a field situation. A decreasing trend or SpO2 < 90% indicates hypoxemia. The color of the mucous membranes in the mouth and the capillary refill time (CRT) will also be used to assess peripheral circulation. Normal CRT is 2 sec or less.

Respiratory rate and heart rate will be monitored constantly and confirmed within normal limits (Respiratory rate 10-14 breaths/minute, Heart rate 70-140 beats/minute). These parameters will be monitored using a thermometer, visual observation of chest wall expansion and counting the thoracic movements during 15-second intervals.

Frequent measurements (every tenth minute) of temperature and breathing will be done and recorded on the capture form. Thermoregulation will be monitored by rectal temperature (RT). "Normal" RT is thought to be 38.0-39.0°C. Pulse will be checked by palpation of the femoral pulse and from the display on the pulseoximeter.

The normal physiologic parameters for a snow leopard:

Temperature: 37 – 39 oC

Respiratory Rate: 10– 14 breathes/minute

Heart Rate: 70 – 140 beats/minute (?)

Tagging, sampling and documentation

Capture data and body measurements would be recorded according to SLT's capture form. Radiocollars will be fitted according to the size, age and sex of the animal. It will be ensured that the weight of the radio collar will not exceed 3% of the animal's body mass. The collar will be fitted so that it can't be pulled off over the head while ensuring that there is enough space for two fingers between the collar and the neck. Drop-off collars with breakaway mechanisms will be used. A microchip will be implanted subcutaneously above the shoulder blades at the base of the neck.

External parasites will collected from one ear by swabbing with a sterile cotton swab. Blood for disease screening and DNA will be sampled from the jugular, cephalic, or the femoral vein using a sterilized syringe and needle.

Reversal of immobilization

After fixing the collar, all gear will be removed. Medetomidine will be reversed by giving 5 mg of atipamezole (Antisedan® 5mg/ml) for each milligram of Medetomidine. Half the dose will be administered intramuscularly and half subcutaneously. Due to the long elimination time of tiletamine-zolazepam, atipamezole will be given at least 50-60 min after darting, unless there is an emergency, when it may be administered earlier. The team will move away from the animal and watch it from a distance. The animal will be monitored closely after recovery based on the locations obtained.

Complications

The extreme climate in snow leopard habitat poses a potential risk that the animals will suffer from hyperthermia in summer and hypothermia in winter.

Hyperthermic animals (RT > 40.0°C) will be cooled by applying snow or water to the axilla, groin, stomach, and/or tongue. In emergencies, antidote may be administered and the animal fanned.

Hypothermic animals (RT < 36.0°C) will be protected from wind and cold surfaces to avoid further cooling using a Wolverine Bag® or a sleeping bag. Warm (but not hot) Hot water bottles may be used inside the sleeping bag. In emergencies, reverse the sedation will be reversed, and the animal gently rubbed to increase the blood flow.

For further reading, please see Biomedical protocols for carnivores, Arnemo et. al 2008, http://www4.nina.no/skandulv/SKANDULV%20NEW/Publikasjoner/English%20pdf%20files/Biomedical%20protocols%20carnivores%20210807.pdf

Annexure 4: Guidelines for Contractors Concerning Wildlife* and Environmental Safeguards Office of the SDM/ADC, Spiti Division, Dist. Lahaul-Spiti, Himachal Pradesh

Contractors who undertake work with the administration of the Spiti Sub-Division of Dist. Lahaul-Spiti or work within its boundaries under contract from other agencies are required to follow these guidelines. They are expected to communicate the relevant parts of these guidelines to the labourers, including repercussions for non-compliance. They shall be permitted to commence work only after this document is signed in the office of the SDM/ADC. Clarifications/concessions (if any) to this must be obtained before starting work in writing with clearly stated reasons and signed by concerned authorities (SDM/ADC).

Site Selection and Infrastructure for Labour Camps:

- Locate the camp in an open, visible spot, (at least 25 to 50 m) away from the nearest fresh/flowing water source. Existing rocks/mountain sides can be used without causing damage/disfiguration or modification so as to not cause disturbance to the local flora/fauna.
- No vegetation shall be removed for setting the camp.
- If the work is taking place inside/nearby any village, the camp must be located at a place agreeable to the local residents after consulting them.
- Proper, adequate, local-style (dry) toilets must be provided (one toilet/five labourers). Defecation in open is discouraged.
- Install a proper sized dustbin and ensure disposal of dry and wet waste after it is segregated. All dry, non-biodegradable waste needs to be burnt on a regular/weekly basis.
- Clothes and utensils should be washed at the labourers' camp and not in the stream/river. Hence a water drum/tank that can be regularly refilled should be provided to them.
- Adequate LPG or kerosene should be provided for cooking. Use of plants/wood to be avoided completely.
- Arrangements need to be made for maintaining warmth in the shelters, so fuel is not collected from the surroundings.
- A chimney needs to be kept in the shelters to avoid choking hazard.

- Labourers and other staff should co-operate when FD, Police, local people's committees etc. come for inspection.
- Thorough cleaning and removal of any waste or other material is a must when the camp is evacuated.

Wildlife* & Habitat Protection Measures:

- The following activities that could harm flora-fauna of the area are not permitted: hunting of wild animals (this is a punishable offence), fishing, trampling/damage/collection/removal of vegetation, collection/trapping/capturing wildlife, feeding/harassing wild animals, handling of caracass/kill of wild animals, making fire in the natural vegetation/pastures or using vegetation as fuel, and providing information/cues to others about local wild flora and fauna that would lead to collection/hunting/trapping/capture/damage etc.
- Inform police/forest dept. about any of the above activities taking place around/nearby their camps (Contact nos. of relevant individuals to be given).**
- Local people's sentiments are to be respected, especially in terms of their concern and care for natural and cultural heritage.
- Vehicle should be driven only on specified roads/trails; off-road/cross-country driving is not allowed.
- When dynamite blasting is to be carried out, care needs to be taken about avoiding harm to wildlife, natural habitats and specific features of the habitat such as springs/streams/rock art/fossils where possible.
- Contractors establishing camps for more than three months would need to grow flowering plants and those operating for more than six months shall plant local trees around the camp.
- When the camp is located inside or close to a village, the contractor shall make sure that the village panchayat is aware of the number and identity of all the labourers.
- Fines/Punishment for Non-compliance:
- Contractor cannot bid for the next one/two years
- Labourers to be sent back and not allowed to work here for a year(?)
- Cash fine and imprisonment as applicable vide Wildlife (Protection) Act, 1972 and its amendments, for any crime concerning wildlife
- Confiscation of vehicles/equipment
- In extreme cases, confiscate the contractor's license

I/We agree to abide by the above guidelines. I hereby declare that the above has been/shall be communicated with the labourers and they too shall comply with the same.

Sign of the Contractor/ Seal of the Company (where applicable)

***Wildlife includes both animal and plants.**

****Report any unauthorized / illegal activity to any one or all of the following officer / staff: Divisional Forest Officer (DFO), Kaza; Range Forest Officer (RFO), Kaza; Block Officers / Forest Guards / Beat Guards; Sub-divisional Magistrate (SDM), Kaza; Police Department, Kaza. [Provide tel nos.]**

References

Anon. (2002). *The Indian Wildlife (Protection) Act 1972. 2001 Amendment*. Natraj Publishers, Dehradun

Anon. (2007). *Indicative Plan for the Biodiversity Conservation & Rural Livelihoods Improvement Programme, Upper Indus (Changthang) Landscape*. PEACE Institute, New Delhi. Report submitted to the NTCA, GOI & World Bank.

Anon. 2008. The Project Snow Leopard. Ministry of Environment & Forests, Government of India, New Delhi.

Bagchi, S, C Mishra, & Y. V. Bhatnagar. (2004). Conflicts between traditional pastoralism & conservation of Himalayan ibex (*Capra sibirica*) in the Trans-Himalayan mountains. *Anim. Conserv.* 7, 121-128.

Bagchi, S. (2009). *Ecology of the Trans-Himalayan grazing ecosystem*. PhD thesis, Syracuse University, Syracuse, USA.

Bhatnagar, Y.V. (1997) *Ranging & habitat utilization by the Himalayan ibex (Capra ibex sibirica) in Pin Valley National Park*. PhD thesis, Saurashtra University, Rajkot, India.

Champion, H. & Seth, S. (1968). *A revised survey of forest types in India*, Manager of publications, GOI.

Ghoshal A. (2017). *Determinants of occurrence of snow leopard and its prey species in the Indian Greater and Trans Himalaya*. PhD thesis, Saurashtra University, Rajkot, India.

Ghoshal, A., Bhatnagar, Y. V., Mishra, C., & Suryawanshi, K. (2016). *Response of the red fox to expansion of human habitation in the Trans-Himalayan mountains*. European Journal of Wildlife Research, 62(1), 131-136.

Home, C., Pal, R., Sharma, R.K., Suryawanshi, K.R., Bhatnagar, Y.V. & Vanak, A.T. (2017) *Commensal in conflict: Livestock depredation patterns by free-ranging domestic dogs in the Upper Spiti Landscape, Himachal Pradesh, India*. Ambio.

Mishra, C., Redpath, S.R. & Suryawanshi, K.R. (2016) *Livestock Predation by Snow Leopards: Conflicts and the Search for Solutions*. In Snow Leopards pp. 59–67. Elsevier.

Mishra, Charudutt (2016) The Partners Principles for community-based conservation. Snow Leopard Trust, Seattle, USA.

Mishra C. (2001). *High altitude survival: conflicts between pastoralism & wildlife in the Trans-Himalaya*. PhD thesis, Wageningen University, The Netherlands.

Mishra C., Prins H.H.T. & van Wieren S.E. (2001). Overstocking in the trans-Himalayan rangelands of India. *Environmental Conservation*. 28, 279-283.

Murali, R., Redpath, S. & Mishra, C. (2017) *The value of ecosystem services in the high altitude Spiti Valley, Indian Trans-Himalaya*. Ecosystem Services, 28, 115–123.

Pal, R. (2013*) Estimates of dog abundance and livestock predation along a gradient of village sizes in the Spiti Valley, Himachal Pradesh*. MSc Thesis. Guru Gobind Singh Indraprastha University, New Delhi.

PSL (Project Snow Leopard). (2006). *Towards project snow leopard*: National workshop on Project Snow Leopard. Ministry of Environment & Forests, Government of India, Department of Wildlife Protection, Jammu & Kashmir, Nature Conservation Foundation, & International Snow Leopard Trust, Mysore, India.

Sharma R. K. (2018). *A multi scale study of habitat use and abundance of snow leopard (Panthera uncia)*. PhD thesis. Manipal University, India.

SLN (2014). *Snow Leopard Survival Strategy*. Revised 2014 Version Snow Leopard Network, Seattle, Washington, USA.

Suryawanshi, K.R., Bhatia, S., Bhatnagar, Y.V., Redpath, S. & Mishra, C. (2014) *Multiscale Factors Affecting Human Attitudes toward Snow Leopards and Wolves: Attitudes toward Snow Leopards and Wolves*. Conservation Biology, 28, 1657–1666.

Suryawanshi, K.R., Bhatnagar, Y.V., Redpath, S. & Mishra, C. (2013) *People, predators and perceptions: patterns of livestock depredation by snow leopards and wolves*. Journal of Applied Ecology, 50, 550–560.

Suryawanshi K. (2013). *Human-Carnivore Conflicts: understanding predation ecology and livestock damage by snow leopards*. PhD thesis. Manipal University, India.

USL (2011). *Management plan for Upper Spiti Landscape including the Kibber Wildlife Sanctuary*. Himachal Pradesh Forest Department, Shimla and Nature Conservation Foundation, Mysore.

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 1009] नई दिल्ली, बृहस्पतिवार, अप्रैल 28, 2016/वैशाख 8, 1938
No. 1009] NEW DELHI, THURSDAY, APRIL 28, 2016/VAISAKHA 8, 1938

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 27 अप्रैल, 2016

का.आ. 1566 (अ).– निम्नलिखित अधिसूचना का प्रारूप, जिसे केन्द्रीय सरकार, पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप-धारा (2) के खंड (v) और खंड (xiv) तथा उपधारा (3) के साथ पठित उप-धारा (1) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, जारी करने का प्रस्ताव करती है, पर्यावरण (संरक्षण) नियम, 1986 के नियम 5 के उपनियम (3) की अपेक्षानुसार, जनसाधारण, जिनके उससे प्रभावित होने की संभावना है, की जानकारी के लिए, प्रकाशित की जाती है ; और यह सूचना दी जाती है कि उक्त प्रारूप अधिसूचना पर, उस तारीख से, जिसको इस अधिसूचना को अंतर्विष्ट करने वाले भारत के राजपत्र की प्रतियां जनसाधारण को उपलब्ध करा दी जाती हैं, साठ दिन की अवधि की समाप्ति पर या उसके पश्चात् विचार किया जाएगा ;

ऐसा कोई व्यक्ति, जो प्रारूप अधिसूचना में अंतर्विष्ट प्रस्तावों के संबंध में कोई आक्षेप या सुझाव देने में हितबद्ध है, इस प्रकार विनिर्दिष्ट अवधि के भीतर, केन्द्रीय सरकार द्वारा विचार किए जाने के लिए, आक्षेप या सुझाव सचिव, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, इंदिरा पर्यावरण भवन, जोर बाग रोड, अलीगंज, नई दिल्ली-110003 या ई-मेल पते: esz-mef@nic.in पर लिखित रूप में भेज सकेगा ।

प्रारूप अधिसूचना

किब्बर वन्यजीव अभयारण्य, हिमाचल प्रदेश के लाहौल और स्पीति जिले में 32°50' और 32° 30'उ अक्षांश और 78°1'से 78° पू देशांतर तक स्थित है और वह 1353.12 वर्ग किलोमीटर क्षेत्र में फैला हुआ है । किब्बर वन्यजीव अभयारण्य के निर्देशांक **उपाबंध I** के रूप में उपाबद्ध है ;

और, इस अभयारण्य में मुख्य प्रजातियों में बर्फ तेंदुआ, जंगली बकरा, गरूड, लाल लोमडी, ब्लू भेड़, भूरा हीयर, भेडिया पाए जाते है;

और, किब्बर वन्यजीव अभयारण्य, के चारों ओर के क्षेत्र को, जिसका विस्तार और सीमाएं इस अधिसूचना के पैरा 1 में विनिर्दिष्ट हैं, पर्यावरण की दृष्टि से पारिस्थितिक संवेदी जोन के रूप में सुरक्षित और संरक्षित करना तथा उक्त पारिस्थितिक संवेदी जोन में उद्योगों या उद्योगों के वर्गों के प्रचालन तथा प्रसंस्करण करने को प्रतिषिद्ध करना आवश्यक है;

अतः, अब, केन्द्रीय सरकार, पर्यावरण (संरक्षण) नियम, 1986 के नियम 5 के उपनियम (3) के साथ पठित पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप-धारा (1), उप-धारा (2) के खंड (v) और खंड (xiv) और उप-धारा (3) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, हिमाचल प्रदेश राज्य में किब्बर वन्यजीव अभयारण्य, की सीमा से 160 मीटर तक के विस्तारित क्षेत्र को किब्बर वन्यजीव अभयारण्य, पारिस्थितिक संवेदी जोन (जिसे इसमें इसके पश्चात् पारिस्थितिक संवेदी जोन कहा गया है) के रूप में अधिसूचित करती है, जिसका विवरण निम्नानुसार है, अर्थात् :--

1. **पारिस्थितिक संवेदी जोन का विस्तार और उसकी सीमाएं**--(1) पारिस्थितिक संवेदी जोन का विस्तार किब्बर वन्यजीव अभयारण्य की पश्चिमी और दक्षिण पश्चिमी सीमा के चारों ओर 160 मीटर के विस्तार के साथ 310 वर्ग किलोमीटर के क्षेत्र तक होगा अन्य दिशाओं में, जहां अधिकांश क्षेत्र जमा हुआ या पहुंच से परे है, किसी पारिस्थितिक संवेदी जोन का प्रस्ताव नहीं है ।

(2) पारिस्थितिक संवेदी जोन के अंतर्गत आने वाले ग्रामों की सूची **उपाबंध II** के रूप में उपाबद्ध है ।

(3) पारिस्थितिक संवेदी जोन का मानचित्र और इसके अक्षांश और देशान्तर **उपाबंध III** के रूप में उपाबद्ध है ।

2. पारिस्थितिक संवेदी जोन के लिए आंचलिक महायोजना – (1) राज्य सरकार, पारिस्थितिक संवेदी जोन के प्रयोजनों के लिए राजपत्र में इस अधिसूचना के अंतिम प्रकाशन की तारीख से दो वर्ष की अवधि के भीतर, स्थानीय व्यक्तियों के परामर्श से, और इस अधिसूचना में दिए गए अनुबंधों का पालन करते हुए आंचलिक महायोजना तैयार करेगी ।

(2) आचंलिक महायोजना का अनुमोदन राज्य सरकार में सक्षम प्राधिकारी द्वारा किया जाएगा ।

(3) पारिस्थितिक संवेदी जोन के लिए आंचलिक महायोजना राज्य सरकार द्वारा ऐसी रीति जैसा इस अधिसूचना में विनिर्दिष्ट है और सुसंगत केन्द्रीय और राज्य विधियों तथा केन्द्रीय सरकार द्वारा जारी मार्गदर्शक सिद्धांतों, यदि कोई हो, के अनुरूप भी तैयार की जाएगी ।

(4) आंचलिक महायोजना सभी संबद्ध राज्य विभागों के साथ परामर्श से पर्यावरणीय और पारिस्थितिक विचारणों को उसमें एकीकृत करने के लिए तैयार की जाएगी, अर्थात्:--

(i) पर्यावरण ;
(ii) वन ;
(iii) नगर विकास ;
(iv) पर्यटन ;
(v) नगरपालिक ;
(vi) राजस्व ;
(vii) कृषि ;
(viii) हिमाचल प्रदेश राज्य प्रदूषण नियंत्रण बोर्ड ;
(ix) सिंचाई;
(x) लोक निर्माण विभाग;

(5) आंचलिक महायोजना अनुमोदित विद्यमान भू-उपयोग, अवसंरचना और क्रियाकलापों पर कोई निर्बंधन अधिरोपित नहीं करेगी जब तक कि इस अधिसूचना में विनिर्दिष्ट न हो और आचंलिक महायोजना सभी अवसंरचना और क्रियाकलापों में और अधिक दक्षता और पारिस्थितिक अनुकूलता का संवर्धन करेगी ।

(6) आंचलिक महायोजना में अनाच्छादित क्षेत्रों के जीर्णोद्धार, विद्यमान जल निकायों के संरक्षण, आवाह क्षेत्रों के प्रबंधन, जल-संभरों के प्रबंधन, भूतल जल के प्रबंधन, मृदा और नमी संरक्षण, स्थानीय समुदायों की आवश्यकताओं तथा पारिस्थितिक और पर्यावरण से संबंधित ऐसे अन्य पहलूओं, जिन पर ध्यान देना आवश्यक है, के लिए उपबंध होंगे ।

(7) आंचलिक महायोजना सभी विद्यमान पूजा स्थलों, ग्रामों और नगरीय बंदोबस्तों, वनों के प्रकार और किस्मों, कृषि क्षेत्रों, ऊपजाऊ भूमि, हरित क्षेत्र जैसे उद्यान और उसी प्रकार के स्थान, उद्यान कृषि क्षेत्र, फलोधान, झीलों और अन्य जल निकायों का अभ्यकन करेगी ।

(8) आंचलिक महायोजना स्थानीय समुदायों की जीवकोपार्जन को सुनिश्चित करने के लिए, पारिस्थितिक संवेदी जोन में विकास को पारिस्थितिक अनुकूल विकास के लिए विनियमित करेगी ।

3. राज्य सरकार द्वारा किए जाने वाले उपाय– राज्य सरकार इस अधिसूचना के उपबंधों को प्रभावी करने के लिए निम्नलिखित उपाय करेगी, अर्थात् :-

(1) **भू-उपयोग** - पारिस्थितिक संवेदी जोन में वनों, उद्यान-कृषि क्षेत्रों, कृषि क्षेत्रों, आमोद-प्रमोद के प्रयोजन के लिए चिन्हित किए गए पार्कों और खुले स्थानों का वाणिज्यिक और औद्योगिक संबद्ध विकास क्रियाकलापों के लिए उपयोग या संपरिवर्तन नहीं होगा :

परंतु पारिस्थितिक संवेदी जोन के भीतर कृषि भूमि का संपरिवर्तन के अधीन मानीटरी समिति की सिफारिश पर और राज्य सरकार के पूर्व अनुमोदन से, स्थानीय निवासियों की आवासीय जरूरतों को पूरा करने के लिए और पैरा 4 की सारणी के स्तंभ (2) के अधीन मद सं0 12, 22, 30, 34 और 35 के सामने सूचीबद्ध क्रियाकलापों को पूरा करने के लिए अनुज्ञात होंगे, अर्थात् :-

(i) पारिस्थितिक अनुकूल पर्यटन क्रियाकलापों के लिए पर्यटकों के अस्थायी आवासन के लिए पारिस्थितिक अनुकूल आरामगाह जैसे टेंट, लकड़ी के मकान आदि ;

(ii) विद्यमान सड़कों को चौड़ा और सुदृढ़ करना ;

(iii) प्रदूषण उत्पन्न न करने वाले लघु उद्योग;

(iv) कुटीर उद्योग, जिसके अंतर्गत ग्रामीण उद्योग, सुविधा भंडार और स्थानीय सुविधाएं सम्मिलित हैं;

(v) हिम और वर्षा जल संचय।

परंतु यह और कि राज्य सरकार के पूर्व अनुमोदन और संविधान के अनुच्छेद 244 तथा तत्समय प्रवृत्त विधि के उपबंधों के अनुपालन के बिना, जिसके अंतर्गत अनुसूचित जनजाति और अन्य परंपरागत वन निवासी (वन अधिकारों की मान्यता) अधिनियम, 2006 (2007 का 2) भी है, वाणिज्यिक या उद्योग विकास क्रियाकलापों के लिए जनजातीय भूमि का उपयोग अनुज्ञात नहीं होगा :

परंतु यह और भी कि पारिस्थितिक संवेदी जोन के भीतर भू-अभिलेखों में उपसंजात कोई त्रुटि मानीटरी समिति के विचार प्राप्त करने के पश्चात् राज्य सरकार द्वारा प्रत्येक मामले में एक बार संशोधित होगी और उक्त त्रुटि के संशोधन की केन्द्रीय सरकार के पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय को सूचना देनी होगी ।

परंतु यह और भी कि उपर्युक्त त्रुटि का संशोधन में इस उप पैरा के अधीन यथा उपबंधित के सिवाय किसी भी दशा में भू-उपयोग का परिवर्तन सम्मिलित नहीं होगा ।

परंतु यह और भी कि जिससे हरित क्षेत्र में जैसे वन क्षेत्र, कृषि क्षेत्र आदि में कोई पारिणामिक कटौती नहीं होगी और अनप्रयुक्त या अनुत्पादक कृषि क्षेत्रों में पुन: वनीकरण करने के प्रयास किए जाएंगे ।

(2) **प्राकृतिक जल स्रोतों** - आंचलिक महायोजना में सभी प्राकृतिक जल स्रोतों की पहचान की जाएगी और उनके संरक्षण और पुनरुद्भूतकरण के लिए योजना सम्मिलित होगी और राज्य सरकार द्वारा ऐसे क्षेत्रों पर या उनके निकट विकास क्रियाकलाप प्रतिषिद्ध करने के लिए ऐसी रीति से मार्गनिर्देश तैयार किए जाएंगे ।

(3) **पर्यटन –** (क) पारिस्थितिक संवेदी जोन के भीतर पर्यटन संबंधी क्रियाकलाप पर्यटन महायोजना के अनुसार होंगे जो कि आंचलिक महायोजना के भाग रूप में होगी ।

(ख) पर्यटन महायोजना, पर्यटन विभाग द्वारा वन और पर्यावरण विभाग, राज्य सरकार के परामर्श से तैयार होगी

(ग) पर्यटन संबंधी क्रियाकलाप निम्नलिखित के अधीन विनियमित होंगे, अर्थात् :-

(i) पारिस्थितिक संवेदी जोन के भीतर सभी नए पर्यटन क्रियाकलापों या विद्यमान पर्यटन क्रियाकलापों का विस्तार केंद्र सरकार के पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय के मार्गदर्शक सिद्धांतों के द्वारा तथा राष्ट्रीय व्याघ्र संरक्षण प्राधिकरण,

द्वारा जारी पारिस्थितिक पर्यटन (समय-समय पर यथा संशोधित) मार्गदर्शक सिद्धांतों के अनुसार, पारिस्थितिक पर्यटन, पारिस्थितिक शिक्षा और पारिस्थितिक विकास को महत्व देते हुए पारिस्थितिक संवेदी जोन की वहन क्षमता के अध्ययन पर आधारित होगा;

(ii) पारिस्थितिक अनुकूल पर्यटक क्रियाकलापों के संबंध में अस्थायी अधिभोग के लिए वास सुविधा के सिवाय किब्बर वन्यजीव अभयारण्य की सीमा से एक किलोमीटर भीतर होटल और रिसोर्टों का नया संनिर्माण अनुज्ञात नहीं होगा ;

(iii) आंचलिक महायोजना का अनुमोदन किए जाने तक, पर्यटन के लिए विकास और विद्यमान पर्यटन क्रियाकलापों के विस्तार को वास्तविक स्थल विनिर्दिष्ट संवीक्षा तथा मानीटरी समिति की सिफारिश पर आधारित संबंधित नियामक प्राधिकरणों द्वारा अनुज्ञात किया होगा।

(4) **नैसर्गिक विरासत** - पारिस्थितिक संवेदी जोन में महत्वपूर्ण नैसर्गिक विरासत के सभी स्थलों जैसे सभी जीन कोश आरक्षित क्षेत्र, शैल विरचनाएं, जल प्रपातों, झरनों, घाटी मार्गों, उपवनों, गुफाएं, स्थलों, भ्रमण, अश्वरोहण, प्रपातो आदि की पहचान की जाएगी और उन्हें संरक्षित किया जाएगा तथा उनकी सुरक्षा और संरक्षा के लिए इस अधिसूचना के अंतिम प्रकाशन की तारीख से छह मास के भीतर, उपयुक्त योजना बनाएगी और ऐसी योजना आंचलिक महायोजना का भाग होगा।

(5) **मानव निर्मित विरासत स्थल** - पारिस्थितिक संवेदी जोन में भवनों, संरचनाओं, शिल्प-तथ्य, ऐतिहासिक, कलात्मक और सांस्कृतिक महत्व के क्षेत्रों की पहचान करनी होगी और इस अधिसूचना के अंतिम प्रकाशन की तारीख से छह माह के भीतर उनके संरक्षण की योजनाएं तैयार करनी होगी तथा आंचलिक महायोजना में सम्मिलित की जाएगी।

(6) **ध्वनि प्रदूषण** - पारिस्थितिक संवेदी जोन में ध्वनि प्रदूषण के नियंत्रण के लिए राज्य सरकार का पर्यावरण विभाग, वायु (प्रदूषण निवारण और नियंत्रण) अधिनियम, 1981 (1981 का 14) और उसके अधीन बनाए गए नियमों के उपबंधों के अनुसरण में मार्गदर्शक सिद्धांत और विनियम तैयार करेगा।

(7) **वायु प्रदूषण** - पारिस्थितिक संवेदी जोन में, वायु प्रदूषण के नियंत्रण के लिए राज्य सरकार का पर्यावरण विभाग, वायु (प्रदूषण निवारण और नियंत्रण) अधिनियम, 1981 (1981 का 14) और उसके अधीन बनाए गए नियमों के उपबंधों के अनुसरण में मार्गदर्शक सिद्धांत और विनियम तैयार करेगा।

(8) **बहिस्राव का निस्सारण** -- पारिस्थितिक संवेदी जोन में उपचारित बहिस्राव का निस्सारण, जल (प्रदूषण निवारण तथा नियंत्रण) अधिनियम, 1974 (1974 का 6) और उसके अधीन बनाए गए नियमों के उपबंधों के अनुसार होगा।

(9) **ठोस अपशिष्ट** - ठोस अपशिष्टों का निपटान निम्नलिखित रूप में होगा -

(i) पारिस्थितिक संवेदी जीन में ठोस अपशिष्टों का निपटान भारत सरकार के तत्कालीन पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय की समय-समय पर यथा संशोधित अधिसूचना सं. का.आ. 1357(आ), तारीख 8 अप्रैल, 2016 नगरपालिक ठोस अपशिष्ट प्रबंध नियम, 2016 के उपबंधों के अनुसार किया जाएगा ;

(ii) स्थानीय प्राधिकरण जैव निम्नीकरणीय और अजैव निम्नीकरणीय संघटकों में ठोस अपशिष्टों के संपृथक्कन के लिए योजनाएं तैयार करेंगे ;

(iii) जैव निम्नीकरणीय सामग्री को अधिमानतः खाद बनाकर या कृमि खेती के माध्यम से पुनःचक्रित किया जाएगा ;

(iv) अकार्बनिक सामग्री का निपटान पारिस्थितिक संवेदी जोन के बाहर पहचान किए गए स्थल पर किसी पर्यावरणीय स्वीकृत रीति में होगा और पारिस्थिनिक संवेदी जोन में ठोस अपशिष्टों को जलाना या भष्मीकरण अनुज्ञात नहीं होगा।

(10) **जैव चिकित्सीय अपशिष्ट**- पारिस्थितिक संवेदी जोन में जैव चिकित्सीय अपशिष्टों का निपटान भारत सरकार के पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय की समय-समय पर यथासंशोधित अधिसूचना जि.एस. आर 343 (अ) तारीख 28 मार्च, 2016 द्वारा प्रकाशित जैव चिकित्सीय अपशिष्ट प्रबंध नियम, 2016 के उपबंधों के अनुसार किया जाएगा।

(11) **यानीय परिवहन** - परिवहन की यानीय गतिविधियां आवास के अनुकूल विनियमित होंगी और इस संबंध में आंचलिक महायोजना में विशेष उपबंध अधिकथित किए जाएंगे और आंचलिक महायोजना के तैयार होने और राज्य सरकार के सक्षम प्राधिकारी के द्वारा अनुमोदित होने तक, मानीटरी समिति प्रवृत्त नियमों और विनियमों के अनुसार यानीय गतिविधियों के अनुपालन को मानीटर करेगी।

(12) औद्योगिक इकाइयां-

(क) प्रस्तावित पारिस्थितिक संवेदी जोन में विधि के अनुसार स्थापित विद्यमान काष्ठ आधारित उद्योगों के सिवाए नए काष्ठ आधारित उद्योगों की स्थापना को अनुज्ञात नहीं किया जाएगा ।

(ख) जल, वायु, मृदा, ध्वनि प्रदूषण कारित करने वाले किसी नए उद्योग की प्रस्तावित पारिस्थितिक संवेदी जोन में स्थापना को अनुज्ञात नहीं किया जाएगा ।

4. पारिस्थितिक संवेदी जोन में प्रतिषिद्ध और विधियमित क्रियाकलापों की सूची - पारिस्थितिक संवेदी जोन में सभी क्रियाकलाप पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) के उपबंधों द्वारा शासित होंगे और नीचे दी गई तालिका में विनिर्दिष्ट रीति में विनियमित होंगे, अर्थात् :-

सारणी

क्रम सं.	क्रियाकलाप	टीका-टिप्पणी
(1)	(2)	(3)
	प्रतिषिद्ध क्रियाकलाप	
1.	वाणिज्यिक खनन, पत्थर की खदान और उनको तोड़ने की इकाइयां ।	(क) सभी नए और विद्यमान खनन (लघु और वृहत खनिज), पत्थर उत्खनन और उनको तोड़ने की इकाइयां प्रतिषिद्ध हैं, सिवाय निवासियों की सद्भावपूर्ण घरेलू आवश्यकताओं के नहीं होंगी, जिसके अंतर्गत गृहों के संनिर्माण या मरम्मत के लिए मिट्टी की खुदाई और व्यक्तिक उपभोग के लिए गृहों के निर्माण के लिए देशी टाइलों या ईंटों का संनिर्माण भी है । (ख) खनन संक्रियाएं, माननीय उच्चतम न्यायालय की रिट याचिका (सिविल) सं. 1995 का 202 टी.एन. गौडाबर्मन थिरुमूलपाद बनाम भारत संघ के मामले में आदेश तारीख 4 अगस्त, 2006 और रिट याचिका (सी) सं. 2012 का 435 गोवा फाउंडेशन बनाम भारत संघ के मामले में तारीख 21 अप्रैल, 2014 के अंतरिम आदेश के अनुसरण में सर्वदा प्रचालन होगा ।
2.	आरा मीलों की स्थापना ।	पारिस्थितिक संवेदी जोन के भीतर नई और विद्यमान आरा मशीनों का विस्तार अनुज्ञात नहीं होगा ।
3.	किसी परिसंकटमय पदार्थों का उपयोग या उत्पादन ।	लागू विधियों के अनुसार प्रतिषिद्ध (अन्यथा उपबंधित के सिवाय) ।
4.	जल या वायु या मृदा या ध्वनि प्रदूषण कारित करने वाले उद्योगों की स्थापना ।	पारिस्थितिक संवेदी जोन के भीतर नए और विद्यमान प्रदूषण कारित करने वाले का विस्तार अनुज्ञात नहीं होगा ।
5.	यांत्रिक उपायों द्वारा मछली पकडना ।	लागू विधियों के अनुसार प्रतिषिद्ध (अन्यथा उपबंधित के सिवाय) ।
6.	नए वृहत तापीय और जल-विद्युतीय परियोजना ।	लागू विधियो के अनुसार प्रतिषिद्ध (अन्यथा उपबंधित के सिवाय) ।
7.	पहाड़ी ढालों और नदी तटों का संरक्षण।	1 से 10 से अधिक ढलानों वाली पहाड़ी पर और किसी नदी और प्राकृतिक नालों के किनारों से 100 मीटर तक आंचलिक महायोजना के अधीन अनुज्ञात के सिवाए कोई सन्निर्माण क्रियाकलाप नहीं किया जाएगा ।
8.	जलावन लकड़ी का वाणिज्यिक उपयोग।	लागू विधियों के अनुसार प्रतिषिद्ध (अन्यथा उपबंधित के सिवाय) ।
9.	प्लास्टिक बैग का उपयोग।	लागू विधियों के अनुसार प्रतिषिद्ध (अन्यथा उपबंधित के सिवाय) ।
10.	पर्यटन से संबंधित क्रियाकलाप जैसे रोप-वे, गर्म वायु गुब्बारों आदि द्वारा राष्ट्रीय उद्यान क्षेत्र के ऊपर से उड़ना जैसे क्रियाकलाप करना।	लागू विधियों के अनुसार प्रतिषिद्ध (अन्यथा उपबंधित के सिवाय) ।
11.	प्राकृतिक जल निकायों या सतही क्षेत्र में उपचारित बहिर्स्राव का निस्सारण।	लागू विधियों के अनुसार प्रतिषिद्ध (अन्यथा उपबंधित के सिवाय) ।

	विनियमित क्रियाकलाप	
12.	होटल और विश्राम स्थलों का स्थापना।	पारिस्थितिक अनुकूल पर्यटन क्रियाकलापों से संबंधित पर्यटकों के अस्थायी अधिभोग के लिए आवास के सिवाय संरक्षित क्षेत्र की सीमा से 1 किलोमीटर के भीतर किसी नए वाणिज्यिक होटलों और विश्रामस्थलों की अनुज्ञा नहीं दी जाएगी; लेकिन संरक्षित क्षेत्र की सीमा के एक किलोमीटर से पारिस्थितिक संवेदी जोन के विस्तार तक होटल और विश्रामस्थलों की स्थापना आंचलिक महायोजना के अनुसार की जा सकती है।
13.	सन्निर्माण क्रियाकलाप।	(क) संरक्षित क्षेत्र की सीमा से एक किलोमीटर के भीतर किसी भी प्रकार के नए वाणिज्यिक सन्निर्माण की अनुज्ञा नहीं दी जाएगी। परन्तु स्थानीय लोगों को पैरा 3 के उप पैरा (1) में सूचीबद्ध क्रियाकलापों सहित अपने रिहायशी उपयोग के लिए अपनी भूमि पर सन्निर्माण करने की अनुज्ञा दी जाएगी। (ख) परन्तु यह और कि प्रदूषण न कारित करने वाले लघु उद्योगों से संबंधित सन्निर्माण क्रियाकलापों को विनियमित किया जाएगा और लागू नियमों और विनियमों, यदि कोई हैं, के अनुसार सक्षम प्राधिकारी में पूर्व अनुज्ञा के साथ न्यूनतम तक रखा जाएगा। (ग) पारिस्थितिक संवेदी जोन में संनिर्माण क्रियाकलाप आंचलिक महायोजना के अनुसार होगे।
14.	प्राकृनिक जल निकायों में बहिस्राव और ठोस अपशिष्ट का निस्सारण।	लागू विधियों के अधीन विनियमित होंगे।
15.	वायु और यानिक प्रदूषण।	लागू विधियों के अधीन विनियमित होंगे।
16.	ध्वनि प्रदूषण।	लागू विधियों के अधीन विनियमित होंगे।
17.	भूमिगत जल का निष्कर्षण।	लागू विधियों के अधीन विनियमित होंगे।
18.	वृक्षों की कटाई।	(क) राज्य सरकार में सक्षम प्राधिकारी की पूर्व अनुमति के बिना वन, सरकारी या राजस्व या निजी भूमि पर या वनों में किंही वृक्षों की कटाई नहीं होगी। (ख) वृक्षों की कटाई संबंधित केंद्रीय या राज्य अधिनियम या उसके अधीन बनाए गए नियमों के उपबंध के अनुसार विनियमित होगी। (ग) आरक्षित वनों और संरक्षित वनों की दशा कार्ययोजना में दिए गए विवरण का अनुसरण किया जाएगा।
19.	जल परिवहन।	लागू विधियों और आंचलिक महायोजना के अनुसार विनियमित होंगे।
20.	विद्यमान स्थापना।	लागू विधियों के अधीन विनियमित होंगे।
21.	इलैक्ट्रिक लाइनों का रोधन।	भूमिगत लाईनों को बिछाने का संवर्धन करना।
22.	विद्यमान सड़कों को चौड़ा करना और उन्हें सुदृढ़ करना।	उचित पर्यावरण समाचार निर्धारण और न्यूनीकरण उपाय यथा लागू अनुसार होंगे।
23.	होटलों और लॉज के विद्यमान परिसरों में बाड लगाना।	लागू विधियों के अधीन विनियमित होगा। वन्यजीव के मुक्त संचलन को अनुज्ञात करने के लिए पारिस्थितिक संवेदी जोन के भीतर होटलों या अन्य वाणिज्यिक स्थापन अपनी परिसंपत्तियों में काटेदार से बाड नहीं लगाएंगे और कोई भी बाड़ एक मीटर से ऊंची नहीं होगी। कोई विद्यमान बाड़, जो इस उपदर्श का अनुपालन नहीं करती है, को आंचलिक महायोजना में वर्णित समय-सीमा के अनुसार उपांतरित किया जाएगा।
24.	कृषि प्रणालियों में आमूल परिवर्तन।	लागू विधियों के अधीन विनियमित होंगे।
25.	विदेशी प्रजातियो को लाना।	लागू विधियों के अधीन विनियमित होंगे।
26.	रात्रि में यानिक यातायात का संचलन।	लागू विधियो के अधीन वाणिज्यिक प्रयोजन के लिए विनियमित होंगे।

(क) जिला कलक्टर, लाहौल और स्पीति -अध्यक्ष

(ख) पर्यावरण के क्षेत्र में (जिसके अंतर्गत विरासत संरक्षण भी है) कार्य करने वाले गैर सरकारी संगठन का हिमाचल प्रदेश राज्य सरकार द्वारा नामनिर्दिष्ट किया जाने वाला एक प्रतिनिधि -सदस्य

(ग) पारिस्थितिक और पर्यावरण क्षेत्र में एक वर्ष की अवधि के लिए हिमाचल प्रदेश सरकार द्वारा नामनिर्दिष्ट किया जाए -सदस्य

(घ) क्षेत्रीय अधिकारी, हिमाचल प्रदेश प्रदूषण नियंत्रण बोर्ड -सदस्य

(ङ) क्षेत्र का वरिष्ठ नगर योजनाकार -सदस्य

(च) प्रभागीय वन अधिकारी, वन्य जीव स्पीति -सदस्य सचिव

6. निर्देश निबंधन

(1) पारिस्थितिक संवेदी जोन समिति इस अधिसूचना के उपबंधों के अनुपालन को मानीटर करेगी।

(2) पारिस्थितिक संवेदी जोन में भारत सरकार के तत्कालीन पर्यावरण और वन मंत्रालय की अधिसूचना सं. का.आ. 1533(अ) तारीख 14 सितंबर, 2006 की अनुसूची में के अधीन सम्मिलित क्रियाकलापों और इस अधिसूचना के पैरा 4 के अधीन प्रतिषिद्ध गतिविधियों के सिवाय आने वाले ऐसे क्रियाकलापों की दशा में वास्तविक विनिर्दिष्ट स्थलीय दशाओं पर आधारित मानीटरी समिति द्वारा संवीक्षा की जाएगी और उक्त अधिसूचना के उपबंधों के अधीन पूर्व पर्यावरण निकासी के लिए केन्द्रीय सरकार के पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय को निर्दिष्ट की जाएगी।

(3) इस अधिसूचना के पैरा 4 के अधीन यथा विनिर्दिष्ट प्रतिषिद्ध क्रियाकलापों के सिवाय, भारत सरकार के पर्यावरण और वन मंत्रालय की अधिसूचना संख्यांक का.आ. 1533(अ) तारीख 14 सितंबर, 2006 की अधिसूचना के अनुसूची के अधीन ऐसे क्रियाकलापों, जिन्हें सम्मिलित नहीं किया गया है, परंतु पारिस्थितिक संवेदी जोन में आते हैं, ऐसे क्रियाकलापों की वास्तविक विनिर्दिष्ट स्थलीय दशाओं पर आधारित मानीटरी समिति द्वारा संवीक्षा की जाएगी और उसे संबद्ध विनियामक प्राधिकरणों को निर्दिष्ट किया जाएगा।

(4) मानीटरी समिति का सदस्य-सचिव या संबद्ध उपायुक्त, ऐसे व्यक्ति के विरूद्ध, जो इस अधिसूचना के किसी उपबंध का उल्लंघन करता है, पर्यावरण (संरक्षण) अधिनियम, 1986 की धारा 19 के अधीन परिवाद फाइल करने के लिए सक्षम होगा।

27.	वाणिज्यिक साइनबोर्ड और होर्डिंग ।	लागू विधियों के अधीन विनियमित होंगे ।
28.	प्रवासी चारागाह ।	लागू विधियों के अधीन विनियमित होंगे ।।
29.	टीडी अधिकार ।	लागू विधियों के अधीन विनियमित होंगे ।
30.	प्रदूषण उत्पन्न न करने वाले लघु उद्योग ।	पारिस्थितिक संवेदी जोन से गैर प्रदूषण, गैर परिसंकटमय, लघु और सेवा उद्योग, कृषि, पुष्प कृषि, उद्यान कृषि या कृषि आधारित देशीय माल से औद्योगिक उत्पादों का उत्पादन उद्योग और जो पर्यावरण पर कोई विपरीत प्रभाव नहीं डालते हैं, को अनुज्ञात किया जाएगा ।
31.	लघु चारे का संग्रहण ।	लागू विधियों के अधीन विनियमित होंगे ।
	संवर्धित क्रियाकलाप	
32.	जैविक कृषि ।	सक्रिय रूप से बढावा दिया जाएगा ।
33.	सभी गतिविधियों के लिए हरित प्रौद्योगिकी को ग्रहण करना ।	सक्रिय रूप से बढावा दिया जाएगा ।
34.	कुटीर उद्योगों जिसके अंतर्गत ग्रामीण कारीगर आदि भी हैं।	सक्रिय रूप से बढावा दिया जाएगा ।
35.	हिम और वर्षा जल संचयन।	सक्रिय रूप से बढावा दिया जाएगा ।
36.	नवीकरणीय ऊर्जा स्रोत का उपयोग ।	सक्रिय रूप से बढावा दिया जाएगा ।

5. मानीटरी समिति- (1) केंद्रीय सरकार, पारिस्थितिक संवेदी जोन के प्रभावी मानीटरी के लिए एक मानीटरी समिति का गठन करेगी जो निम्नलिखित से मिलकर बनेगी, अर्थात् :-

(5) मानीटरी समिति मुद्दा दर मुद्दा के आधार पर अपेक्षाओं पर निर्भर रहते हुए संबद्ध विभागों के प्रतिनिधियों या विशेषज्ञों, औद्योगिक संगमों या संबद्ध पणधारियों के प्रतिनिधियों को अपने विचार-विमर्श में सहायता के लिए आमंत्रित कर सकेगी ।

(6) मानीटरी समिति प्रत्येक वर्ष की 31 मार्च तक की राज्य के मुख्य वन्यजीव वार्डन को अपनी वार्षिक कार्रवाई रिपोर्ट **उपाबंध IV** पर उपाबद्ध रूप विधान के अनुसार उक्त वर्ष के 30 जून तक प्रस्तुत करेगी ।

(7) केन्द्रीय सरकार का पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय मानीटरी समिति को अपने कृत्यों के प्रभावी निर्वहन के लिए समय-समय पर ऐसे निदेश दे सकेगा, जो वह ठीक समझे ।

7. इस अधिसूचना के उपबंधों को प्रभाव देने के लिए केंद्रीय सरकार और राज्य सरकार अतिरिक्त उपाय, यदि कोई हों, विनिर्दिष्ट कर सकेंगे ।

8. इस अधिसूचना के उपबंध, भारत के माननीय उच्चतम न्यायालय या उच्च न्यायालय या राष्ट्रीय हरित प्राधिकरण द्वारा पारित कोई आदेश या पारित होने वाले किसी आदेश, यदि कोई हों, के अधीन होंगे ।

[फा.सं. 25/172/2015-ईएसजेड/आरई]

डॉ. टी. चांदनी, वैज्ञानिक 'जी'

उपाबंध – I

किब्बर वन्यजीव अभयारण्य के निर्देशांक

	देशांतर	**अक्षांश**
उत्तर	78°22'41.71"पू	32°45'39.903"उ
पूर्व	78°31'29.452"पू	32°24'40.306"उ
दक्षिण	78°17'37.195"पू	32°12'4.149"उ
पश्चिम	78°2'48.683"पू	32°26'1.122"उ

उपाबंध – II

किब्बर वन्यजीव अभयारण्य के पारिस्थितिक संवेदी जोन के अंतर्गत आने वाले राजस्व ग्रामों का वर्णन

क्र.सं	ग्राम के नाम	जी.पी.एस निर्देशांक
1	किब्बर	32*19'55"उ 78*00'30.55"पू
2	लांग्जा	32*16'31.96"उ 78*05'05.22"पू
3	देमुल	32*10'10.71"उ 78*10'43.79"पू
4	लैलुंग	32*08'49.62"उ 78*14'03.61"पू

उपाबंध – III

अक्षांश और देशांतर के साथ किब्बर वन्यजीव अभयारण्य के पारिस्थितिक संवेदी जोन का मानचित्र

उपाबंध IV

पारिस्थितिक संवेदी जोन मानीटरी समिति -की गई कार्रवाई की रिपोर्ट का रुप विधान

1. बैठकों की संख्या और तारीख ।
2. बैठकों का कार्यवृत : कृपया मुख्य उल्लेखनीय बिंदुओं का वर्णन करें। बैठक के कार्यवृत्त को एक पृथक अनुबंध में उपाबद्ध करें ।
3. आंचलिक महयोजना की तैयारी की प्रास्थिति जिसके अंतर्गत पर्यटन महायोजना भी है
4. भू-अभिलेख में सदृश्य त्रुटियों के सुधार के लिए ब्यौहार किए गए मामलों का सारांश ब्यौरों को उपाबंध के रूप में संलग्न किया जा सकेगा ।
5. ईआईए अधिसूचना, 2006 के अधीन आने वाली क्रियाकलापों की संवीक्षा के मामलों का सारांश ईआईए के अधीन न आने वाली क्रियाकलापों की संवीक्षा के मामलों का सारांश।
6. ब्यौरों को उपाबंध के रूप में संलग्न किया जा सकेगा ।
7. पर्यावरण (संरक्षण) अधिनियम, 1986 की धारा 19 के अधीन दर्ज की गई शिकायतों का सारांश
8. महत्ता का कोई अन्य विषय ।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 27th April, 2016

S.O. 1566(E).—The following draft of the notification, which the Central Government proposes to issue in exercise of the powers conferred by sub-section (1), read with clause (v) and clause (xiv) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) is hereby published, as required under sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, for the information of the public likely to be affected thereby; and notice is hereby given that the said draft notification shall be taken into consideration on or after the expiry of a period of sixty days from the date on which copies of the Gazette containing this notification are made available to the public;

Any person interested in making any objections or suggestions on the proposals contained in the draft notification may forward the same in writing, for consideration of the Central Government within the period so specified to the Secretary, Ministry of Environment, Forests and Climate Change, Indira Paryavaran Bhawan, Jorbagh Road, Aliganj, New Delhi-110003, or send it to the e-mail address of the Ministry at: - esz-mef@nic.in

Draft Notification

WHEREAS, the Kibber Wild Life Sanctuary situated in the Lahoul and Spiti District of Himachal Pradesh between $32^{0}50'$ and $32^{0}30'$N latitude and $78^{0}1'$ to 78^{0} E longitude and spread over an area of 1353.12 square kilometres. The co-ordinates of Kibber Wildlife Sanctuary is appended as Annexure-I.

AND WHEREAS, the main species found in this sanctuary are snow leopard, Ibex, golden eagle, red fox, blue sheep, brow bear and wolf;

AND WHEREAS, it is necessary to conserve and protect the area the extent and boundaries of which is specified in paragraph 1 of this notification around the protected area of Kibber Wildlife Sanctuary as Eco-sensitive Zone

from ecological, environmental and biodiversity point of view and the prohibit industries or class of industries and their operations and processes in the said Eco-sensitive Zone;

NOW THEREFORE, in exercise of the powers conferred by sub-section(1) and clauses (v) and (xiv) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) read with sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies the area to an extent of 160 meter around the boundary of Kibber Wildlife Sanctuary in the State of Himachal Pradesh as the Kibber Wildlife Sanctuary Eco-sensitive Zone (herein after referred to as the Eco-sensitive Zone) details of which are as under, namely:-

1. **Extent and boundaries of Eco-sensitive Zone.-** (1) The Eco-sensitive Zone shall be over an area of 310 square kilometres with an extent of 160 meter around the Western and South Western boundary of Kibber Wildlife Sanctuary. No Eco-sensitive Zone is proposed in other directions where most of the area is permafrost or inaccessible.

(2) The list of villages falling in Eco-sensitive Zone is appended as **Annexure-II.**

(3) The map of the Eco-sensitive Zone along with boundary details and latitudes and longitudes is appended as **Annexure-III**.

2. **Zonal Master Plan for the Eco-sensitive Zone.-** (1) The State Government shall, for the purpose of the Eco-sensitive Zone prepare, a Zonal Master Plan, within a period of two years from the date of publication of final notification in the Official Gazette, in consultation with local people and adhering to the stipulations given in this notification.

(2) The Zonal Master Plan shall be approved by the competent authority in the State Government.

(3) The Zonal Master Plan for the Eco-sensitive Zone shall be prepared by the State Government in such a manner as is specified in this notification and also in consonance with the relevant Central and State laws and the guidelines issued by the Central Government, if any.

(4) The Zonal Master Plan shall be prepared in consultation with all concerned State Departments, namely:-

(i) Environment,

(ii) Forest,

(iii) Urban Development,

(iv) Tourism,

(v) Municipal,

(vi) Revenue,

(vii) Agriculture,

(viii) Himachal Pradesh State Pollution Control Board,

(ix) Irrigation,

(x) Public Works Department;

for integrating environmental and ecological considerations into it.

(5) The Zonal Master Plan shall not impose any restriction on the approved existing land use, infrastructure and activities, unless so specified in this notification and the said Master Plan shall factor in improvement of all infrastructure and activities to be more efficient and eco-friendly.

(6) The Zonal Master plan shall provide for restoration of denuded areas, conservation of existing water bodies, management of catchment areas, watershed management, groundwater management, soil and moisture conservation, needs of local community and such other aspects of the ecology and environment that needs attention.

(7) The Zonal Master Plan shall demarcate all the existing worshipping places, village and urban settlements, types and kinds of forests, tribal areas, agricultural areas, fertile lands, green area, such as, parks and like places, horticultural areas, orchards, lakes and other water bodies.

(8) The said Master Plan shall regulate development in Eco-sensitive Zone so as to ensure eco-friendly development for livelihood security of local communities.

(9) The State Government of Himachal Pradesh shall prepare separate Zonal Master Plans for area under their jurisdiction.

3. **Measures to be taken by State Government.-**The State Government shall take the following measures for giving effect to the provisions of this notification, namely:-

(1) **Land use.-** Forests, horticulture areas, agricultural areas, parks and open spaces earmarked for recreational purposes in the Eco-sensitive Zone shall not be used or converted into areas for commercial or industrial related development activities:

Provided that the conversion of agricultural lands within the Eco-sensitive Zone may be permitted on the recommendation of the Monitoring Committee, and with the prior approval of the State Government, to meet the residential needs of local residents, and for the activities listed against serial numbers 12,22,30, 34,35 in column (2) of the Table in paragraph 4, namely:-

(i) Eco-friendly cottages for temporary occupation of tourists, such as tents, wooden houses, etc. for eco-friendly tourism activities,

(ii) Widening and strengthening of existing roads and construction of new roads.

(iii) Small scale industries not causing pollution,

(iv) Rainwater harvesting, and

(v) Cottage industries including village industries, convenience stores and local amenities:

Provided further that no use of tribal land shall be permitted for commercial and industrial development activities without the prior approval of the State Government and without compliance of the provisions of article 244 of the constitution or the law for the time being in force, including the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (2 of 2007):

Provided also that any error appearing in the land records within the Eco-sensitive Zone shall be corrected by the State Government after obtaining the views of Monitoring Committee, once in each case and the correction of said error shall be intimated to the Central Government in the Ministry of Environment, Forest and Climate Change:

Provided also that the above correction of error shall not include change of land use in any case except as provided under this sub-paragraph:

Provided also that there shall be no consequential reduction in green area, such as forest area and agricultural area and efforts shall be made to reforest the unused or unproductive agricultural areas.

(2) **Natural springs.-**The catchment areas of all natural springs shall be identified and plans for their conservation and rejuvenation shall be incorporated in the Zonal Master Plan and the guidelines shall be drawn up by the State Government in such a manner as to prohibit development activities at or near these areas which are detrimental to such areas.

(3) **Tourism.-** (a) The activity relating to tourism within the Eco-sensitive Zone shall be as per Tourism Master Plan, which shall form part of the Zonal Master Plan.

(b) The Tourism Master Plan shall be prepared by Department of Tourism, in consultation with Department of Forests and Environment of the State Government.

(c) The activity of tourism shall be regulated as under, namely:-

(i) all new tourism activities or expansion of existing tourism activities within the Eco-sensitive Zone shall be in accordance with the guidelines issued by the Central Government in the Ministry of Environment, Forest and Climate Change and the eco-tourism guidelines issued by National Tiger Conservation Authority, (as amended from time to time with emphasis on eco-tourism, eco-education and eco-development and based on carrying capacity study of the Eco-sensitive Zone;

(ii) new construction of hotels and resorts shall not be permitted within one kilometer from the boundary of the Kibber Wildlife Sanctuary except for accommodation for temporary occupation of tourists related to eco-friendly tourism activities:

Provided that, beyond the distance of one kilometre from the boundary of the protected areas till the extent of the Eco-sensitive Zone, the establishment of new hotels and resorts shall be permitted only in pre-defined and designated area for eco-tourism facilities as per Tourism Master Plan;

(iii) till the Zonal Master Plan is approved, development for tourism and expansion of existing tourism activities shall be permitted by the concerned regulatory authorities based on the actual site specific scrutiny and recommendation of the Monitoring Committee.

(4) **Natural heritage.-** All sites of valuable natural heritage in the Eco-sensitive Zone, such as the gene pool reserve areas, rock formations, waterfalls, springs, gorges, groves, caves, points, walks, rides, cliffs, etc. shall be identified and preserved and plan shall be drawn up for their protection and conservation, within six months from the date of publication of this notification and such plan shall form part of the Zonal Master Plan.

(5) **Man-made heritage sites.-** Buildings, structures, artefacts, areas and precincts of historical, architectural, aesthetic and cultural significance shall be indentified in the Eco-sensitive Zone and plans for their conservation shall be prepared within six months from the date of publication of this notification and incorporated in the Zonal Master Plan.

(6) **Noise pollution.-** The Environment Department of the State Government or Himachal Pradesh State Pollution Control Board shall draw up guidelines and regulations for the control of noise pollution in the Eco-sensitive Zone in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981(14 of 1981) and the rules made thereunder.

(7) **Air pollution.-** The Environment Department of the State Government or Himachal Pradesh State Pollution Control Board shall draw up guidelines and regulations for the control of air pollution in the Eco-sensitive Zone in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and the rules made thereunder.

(8) **Discharge of effluents.-** The discharge of treated effluent in Eco-sensitive Zone shall be in accordance with the provisions of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974)and the rules made thereunder.

(9) **Solid wastes. -** Disposal of solid wastes shall be as under:-

(i) the solid waste disposal in Eco-sensitive Zone shall be carried out as per the provisions of the Solid Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number S.O. 1357 (E), dated the 8th April, 2016 as amended from time to time;

(ii) the local authorities shall draw up plans for the segregation of solid wastes into biodegradable and non-biodegradable components;

(iii) the biodegradable material shall be recycled preferably through composting or vermiculture;

(iv) the inorganic material may be disposed in an environmentally acceptable manner at site(s) identified outside the Eco-sensitive Zone and no burning or incineration of solid wastes shall be permitted in the Eco-sensitive Zone.

(10) **Bio-medical waste.-** The bio-medical waste disposal in the Eco-sensitive Zone shall be carried out as per the provisions of the Bio-Medical Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number G.S.R 343 (E), dated the 28th March, 2016, as amended from time to time.

(11) **Vehicular traffic**. - The vehicular movement of traffic shall be regulated in a habitat friendly manner and specific provisions in this regard shall be incorporated in the Zonal Master Plan and till such time as the Zonal Master Plan is prepared and approved by the competent authority in the State Government, Monitoring Committee shall monitor compliance of vehicular movement under the relevant Acts and the rules and regulations made thereunder.

(12) **Industrial units.-** (a) No establishment of new wood based industries within the proposed Eco-sensitive Zone shall be permitted except the existing wood based industries set up as per the law.

(b) No establishment of any new industry causing water, air, soil, noise pollution within the proposed Eco-sensitive Zone shall be permitted.

4. **List of activities prohibited or to be regulated within the Eco-sensitive Zone.-** All activities in the Eco sensitive Zone shall be governed by the provisions of the Environment (Protection) Act, 1986 (29 of 1986) and the rules made thereunder, and be regulated in the manner specified in the table below, namely:-

TABLE

S.No.	Activity	Remarks
(1)	(2)	(3)
Prohibited activities		
1.	Commercial mining, stone quarrying and crushing units.	(a) All new and existing mining (minor and major minerals), stone quarrying and crushing units shall be prohibited except for the domestic needs of *bona fide* local residents with reference to digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing for personal use. (b) The mining operations shall strictly be in accordance with the orders of the Hon'ble Supreme Court dated the 4th August, 2006 in the matter of T.N. Godavarman Thirumulpad Vs. Union of India in Writ Petition (Civil) No.202 of 1995 and order of the Hon'ble Supreme Court dated the 21st April, 2014 in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.435 of 2012.
2.	Setting up of saw mills.	No new or expansion of existing saw mills shall be permitted within the Eco-sensitive Zone.
3.	Use or production of any hazardous substances.	Prohibited (except as otherwise provided) as per applicable laws.
4.	Setting up of industries causing water or air or soil or noise pollution.	No new or expansion of polluting industries in the Eco-sensitive Zone shall be permitted.
5	Fishing by mechanical means.	Prohibited (except as otherwise provided) as per applicable laws.
6.	Establishment of major thermal and hydro-electric projects.	Prohibited (except as otherwise provided) as per applicable laws.
7.	Protection of hill slopes and river banks.	No construction activity unless otherwise permitted by State Level Committee shall be undertaken on the hill with slopes more than 1 to 10 and also upto 100 meters from the banks of any river, and natural nallah.
8.	Commercial use of firewood.	Prohibited (except as otherwise provided) as per applicable laws.
9.	Use of plastic bags.	Prohibited (except as otherwise provided) as per applicable laws.
10.	Undertaking activities related to tourism like over-flying the national park area by aircraft, hot-air balloons.	Prohibited (except as otherwise provided) as per applicable laws.
11.	Discharge of untreated effluents in natural water bodies or land area.	Prohibited (except as otherwise provided) as per applicable laws.
Regulated activities		

12.	Establishment of hotels and resorts.	No new commercial hotels and resorts shall be permitted within one kilometer of the boundary of the protected area except for accommodation for temporary occupation of tourists related to eco-friendly tourism activities. However, beyond one kilometre and upto the extent of the Eco-sensitive Zone all new tourism activities or expansion of existing activities would be in conformity with the Tourism Master Plan and National Tiger Conservation Authority guidelines.
13.	Construction activities.	(a) No new commercial construction of any kind shall be permitted within one kilometer from the boundary of the protected area: Provided that, local people shall be permitted to undertake construction in their land for residential use including the activities listed in sub-paragraph (1) of paragraph 3: (b) The construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum with the prior permission from the competent authority as per applicable rules and regulations, if any.
14.	Discharge of effluents and solid waste in natural water bodies or land area.	Regulated under applicable laws.
15.	Air and vehicular pollution.	Regulated under applicable laws.
16.	Noise pollution.	Regulated under applicable laws.
17.	Extraction of ground water.	Regulated under applicable laws.
18.	Felling of trees.	(a) There shall be no felling of trees in the forest or Government or revenue or private lands without prior permission of the competent authority in the State Government; (b) the felling of trees shall be regulated in accordance with the provisions of the concerned Central or State Acts and the rules made thereunder. (c) in case of Reserve Forests and Protected Forests the Working Plan prescriptions shall be followed.
19.	Water transportation.	Regulated under applicable laws and Zonal Master Plan.
20.	Existing establishments.	Regulated under applicable laws.
21.	Insulation of electric lines.	Promote underground cabling.
22.	Widening and strengthening of existing roads.	Shall be done with proper Environment Impact Assessment and mitigation measures, as applicable.
23.	Fencing of existing premises of hotels and lodges.	Regulated under applicable laws. In order to allow free movement of wildlife, hotels or other commercial establishments within the Eco-sensitive Zone

		shall not fence their properties with barbed wire and no fence shall be higher than 1 meter. Any existing fence not complying with this stipulation shall be modified as per the time lines mentioned in the Zonal Master Plan.
24.	Drastic change of agriculture systems.	Regulated under applicable laws.
25.	Introduction of exotic species.	Regulated under *applicable laws.*
26.	Movement of vehicular traffic at night.	Regulated under applicable laws.
27.	Sign boards and hoardings.	Regulated under applicable laws.
28.	Migratory grazing.	Regulated under applicable laws.
29.	TD rights.	Regulated under applicable laws.
30.	Small scale industries not causing pollution.	Non polluting, non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous goods from the Eco-sensitive Zone, and which do not cause any adverse impact on environment shall be permitted.
31.	Collection of small fodder.	Regulated under applicable laws.
Promoted activities		
32.	Organic farming.	Shall be actively promoted.
33.	Adoption of green technology for all activities.	Shall be actively promoted.
34.	Cottage industries including village artisans.	Shall be actively promoted.
35.	Snow and rain water harvesting.	Shall be actively promoted.
36.	Use of renewable energy sources.	Shall be actively promoted.

5. Monitoring Committee.- The Central Government hereby constitutes a Monitoring Committee, for effective monitoring of the Eco-sensitive Zone, which shall comprise of the following namely:-

(a) District Collector, Lahaul and Spiti - Chairman;

(b) One representative of Non-Governmental Organisations working in the field of environment (including heritage conservation) to be nominated by the Government of Himachal Pradesh. - Member;

(c) An expert in the area of ecology and environment to be nominated by the Government of Himachal Pradesh for a period of one year - - Member

(d) Regional Officer, Himachal Pradesh Pollution Control Board - Member;

(e) Senior Town Planner of the area - Member;

(f) Divisional Forest Officer Wild Life Spiti - Member-Secretary.

6. Terms of Reference.- (1) The Monitoring Committee shall monitor the compliance of the provisions of this notification.

(2) The Monitoring Committee shall monitor the compliance of the provisions of this notification.

(3) The activities that are covered in the schedule to the notification of the Government of India in the erstwhile Ministry of Environment and Forests number S.O. 1533(E), dated the 14th September, 2006, and are falling in the Eco-sensitive Zone, except the prohibited activities as specified in column(3) of the Table under paragraph 4 thereof, shall be scrutinised by the Monitoring Committee based on the actual site-specific conditions and

referred to the Central Government in the Ministry of Environment, Forest and Climate Change for prior environmental clearances under the provisions of the said notification.

(4) The activities that are not covered in the schedule to the notification of the Government of India in the erstwhile Ministry of Environment and Forests number S.O. 1533(E), dated the 14th September, 2006 but are falling in the Eco-sensitive Zone, except the prohibited activities as specified in column (3) of the Table under paragraph 4 thereof, shall be scrutinised by the Monitoring Committee based on the actual site-specific conditions and referred to the concerned regulatory authorities.

(5) The Member-Secretary of the Monitoring Committee or the concerned Collector or the concerned Park in-charge shall be competent to file complaints under section 19 of the Environment (Protection) Act, 1986 against any person who contravenes the provisions of this notification.

(6) The Monitoring Committee may invite representatives or experts from concerned Departments, representatives from industry associations or concerned stakeholders to assist in its deliberations depending on the requirements on issue to issue basis.

(7) The Monitoring Committee shall submit the annual action taken report of its activities as on 31st March of every year by 30th June of that year to the Chief Wildlife Warden in the State as per proforma appended at **Annexure IV**.

7. The Central Government in the Ministry of Environment, Forest and Climate Change may give such directions, as it deems fit, to the MC for effective discharge of its functions.

8. The Central Government and State Government may specify additional measures, if any, for giving effect to provisions of this notification.

9. The provisions of this notification are subject to the orders, if any, passed, or to be passed, by the Hon'ble Supreme Court of India or the High Court or National Green Tribunal.

[F. No. 25/172/2015-ESZ-RE]

Dr. T. CHANDINI, Scientist 'G'

ANNEXURE-I

Co-Ordinates of Kihbar Wildlife Sanctuary

	Longitude	**Latitude**
North	78°22'41.71"E	32°45'39.903"N
East	78°31'29.452"E	32°24'40.306"N
South	78°17'37.195"E	32°12'4.149"N
West	78°2'48.683"E	32°26'1.122"N

ANNEXURE-II

Detail of Revenue Villages within the proposed ESZ of Kibber Wildlife Sanctuary

S. No.	Name of Village	GPS Co-ordinates
1.	Kiber	32°19'55N 78°00'30.55"E
2.	Langza	32°16'31.96"N 78°05'05.22"E
3.	Demul	32°10'10.71"N 78°10'43.79"E
4.	Lalung	32°08'49.62"N 78°14'03.61"E

Annexure-III

MAP OF ECO-SENSITIVE ZONE OF KIBBER WILDLIFE SANCTUARY WITH LATITUDES AND LONGITUDES

ANNEXURE-IV

Performa of Action Taken Report: - Eco-sensitive Zone Monitoring Committee.-

1. Number and date of Meetings
2. Minutes of the meetings: Mention main noteworthy points. Attach Minutes of the meeting as separate Annexure.
3. Status of preparation of Zonal master Plan including Tourism master Plan
4. Summary of cases dealt for rectification of error apparent on face of land record (Eco-sensitive Zone wise).
   Details may be attached as Annexure
5. Summary of cases scrutinised for activities covered under the Environment Impact Assessment Notification, 2006
   Details may be attached as separate Annexure.
6. Summary of cases scrutinised for activities not covered under the Environment Impact Assessment Notification, 2006.
   Details may be attached as separate Annexure.
7. Summary of complaints ledged under Section 19 of the Environment (Protection) Act, 1986.
8. Any other matter of importance.

Approved

Pr. Chief Conservator of Forests (WL)
and Chief Wildlife Warden (HP) Shimla

Uploaded by Dte. of Printing at Government of India Press, Ring Road, Mayapuri, New Delhi-110064
and Published by the Controller of Publications, Delhi-110054.

Himachal Pradesh

Forest Department

Wildlife Wing