MANAGEMENT PLAN FOR THE UPPER SPITI LANDSCAPE INCLUDING THE KIBBER WILDLIFE SANCTUARY





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Prepared by

Nature Conservation Foundation, Mysore, Snow Leopard Trust-India With support of the Wildlife Wing, Himachal Pradesh Forest Department & Youth Groups in Spiti

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MESSAGE

The Himalayas in the north form the watersheds of several of our major rivers, and are also home to rich biodiversity and cultures. These watersheds shelter wildlife populations, including several endangered species that inhabit the larger landscapes both within and outside protected areas, including village commons and revenue lands. The wildlife shares its habitat with traditional pastoral and agro-pastoral communities and their livestock.

Ministry of Environment and Forests realizes that typical wildlife in these areas; epitomized by the endangered snow leopard, needs a non-traditional conservation strategy that covers the entire landscape, and is truly participatory. Assisted by the Nature Conservation Foundation since 2004, the Forest Departments of the five Himalayan States- Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh, along with some other agencies, developed a science-based, and participatory, landscape-level conservation approach, called Project Snow Leopard, which was approved by the Ministry in January 2009.

I am delighted to note that Himachal Pradesh has taken the lead by facilitating the preparation of this Management Plan covering the 'Upper Spiti Landscape' as the first conservation landscape under the Project Snow Leopard. The Plan provides an excellent framework for initiating suitable conservation activities under this Project, and would also serve as a model for preparation of such plans for snow leopard landscapes in other states.

Surely, this pioneering and innovative effort provides us a great start and a basis for further improvement in the management regime of snow leopard. This is the first, but probably the most important step towards comprehensive participatory conservation of unique wildlife including snow leopards, wolves, ibex, blue sheep, pikas, and golden eagles in the Upper Spiti Landscape including the Kibber Wildlife Sanctuary.

I wish all success for a purposeful and participatory implementation of this Plan.

Jayanthalaagan (Jayanthi Natarajan)

PREM KUMAR DHUMAL प्रेम कुमार धूमल

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CHIEF MINISTER HIMACHAL PRADESH मुख्य मन्त्री हिमाचल प्रदेश

MESSAGE

Over half of the State of Himachal Pradesh lies above the tree line and under the domain of the snow leopard, our State animal. I am very happy to see that the state has taken the lead to initiate the Ministry of Environment and Forest's innovative programme-"Project Snow Leopard", Which has been developed to provide a suitable conservation framework for the unique needs of such non-forested tracts. In fact, recognizing the importance of wildlife in this larger landscape, the State Government has declared the entire Spiti Forest Division that includes the Pin Valley National Park and the Kibber Wildlife Sanctuary, as a "Wildlife Division" in order to strengthen the conservation efforts in the entire landscape and not just limited to the protected areas alone. In line with the guidelines of the Project Snow Leopard, the "Upper Spiti Landscape" has been identified as the first such area for the preparation of a detailed scientific Management Plan.

The Management Plan for the Upper Spiti Landscape and Kibber Wildlife Sanctuary covers about 4000 sq. km. of these high mountains tracts and provides a framework for consultations and inputs from not just local communities and NGOs, but all the Government agencies active there.

I congratulate the Wild life Wing of the Forest Department and the Nature Conservation Foundation, Mysore in collaboratively developing this Management plan, and look forward to the successful implementation of this innovative Plan.

Duuma (Prem Kumar Dhumal)

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Foreword

Snow leopards and its mesmerizing landscape has always fascinated all of us and me in particular me since early days in the forest service. In my earlier tenure as the Chief Wildlife Warden of the Himachal Pradesh, I was able to convince and mobilize my field staff in all high altitude areas of the state to begin recording any information on the endangered cat and other wild life species. I also encouraged exploration of these vast inhospitable tracts of the State to understand the occurrence of wildlife and the threats they face. Back in 2004, I had the pleasure of hosting a consultation of a cross section of my departmental staff, community members and some local organizations, that was the very first of four other consultations the Nature Conservation Foundation (NCF) organized in the Indian Himalayan States to develop the Project Snow Leopard. I am happy to note that after these years NCF and my department's staff are again the first team to come up with a scientific Management Plan for the Upper Spiti Landscape and Kibber Wild life sanctuary, an area covering over half of the Spiti Wildlife Division.

This Management Plan is based on years of knowledge gathered by the team that was complemented with focused research on biodiversity, human society and local institutions. The Management Plan has prioritized sites for conservation, assessed their threats, and developed innovative models for tackling each of them in a participatory manner. I am also happy to note that since this is a landscape based, participatory Management Plan we have not just limited to participation at the level of local communities alone but extend it to a variety of local and National organizations and importantly, most other line departments functioning in Spiti.

As far as my understanding goes this is the first concerted effort in the country to have a unified conservation oriented Management Plan, for a large landscape that includes variety of land uses, including a wildlife Protected Area. The process so far has been full of interesting lessons and I am sure the micro-planning and implementation of the Plan will also throw up numerous challenges and opportunities. I am, however, confident the Wild Life Wing, the partners and all other Stakeholders will face all the challenges well.

Arhurani Gula

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PREFACE

The Trans Himalaya are a fascinating region of the country with unique biodiversity and culture, and high value for ecosystem services. It is a region of both high opportunity and challenge for conservation. Our team has been actively working in the region, in particular, in Spiti, over the past two decades on a variety of research initiatives on the snow leopard, its prey and its habitat, developing community-based conservation models and generating awareness through conservation.

In 2004, we also initiated efforts to catalyze the Project Snow Leopard (PSL), with the MoEF, all the Himalayan states and other agencies. PSL was finally approved in 2009 and aims to strengthen science-based conservation initiatives in this remarkable region in a landscape based manner, fully involving the local communities who are seen as the most important stakeholder.

Following a request from the Chief Wildlife Warden, Himachal Pradesh, we agreed to help prepare a Management Plan in Spiti based on the principles of the PSL. While the PSL document provided an excellent working philosophy and framework for conservation in the Indian high altitudes, the opportunity to prepare the Management Plan allowed us to integrate these principles with scientific knowledge and our experience of setting up community-based conservation models to suggest future strategies for conservation of Spiti's wildlife.

This Management Plan is focused on a large landscape (c. 3,000 sq. km) as suggested by PSL, covering more than half of the Spiti Sub-Division of the Lahaul & Spiti District of Himachal Pradesh. The landscape includes the whole of the Kibber Wildlife Sanctuary (c. 1,500 sq. km), though, again in line with PSL, the management plan is not focused on the Sanctuary per se, but on the larger landscape.

In addition to using the knowledge and experience generated by several years of our work, we have conducted extensive field assessments for this Management Plan since late 2008 on the region's biodiversity, human society, local institutions and Government Departments to update the state of knowledge. We thus use a combination of rigorous science and local knowledge and perceptions to help guide conservation strategies suggested in this Plan. There are over 30 villages of varying sizes whose inhabitants depend on the landscape's natural resources for their sustenance. Further, over 30 Government Departments and a few NGOs strive hard to bring

development to this remote corner of the country. We have consulted most of these stakeholders at different stages of the assessments to develop this Plan.

The Management Plan has used existing and new information on biodiversity and human society (Chapter 1, 2 & 3) to identify values of the landscape for conservation and for local communities, to thereby assess how a mosaic of community conserved areas can be developed that have minimum negative impact on local livelihoods, and how conservation efforts can in fact help in enhancing livelihoods (Chapter 5). We assessed threats to wildlife and natural resources in these areas and have suggested mechanisms for mitigation based on scientific knowledge, experience and local knowledge (Chapter 6). Assessments with the local institutions and government line departments helped in identifying numerous areas of convergence as also some schemes that may compromise the status of wildlife. This yielded aspects where both Government departments and NGOs could contribute towards conservation through their existing programmes, thus optimizing the resource needs (Chapter 7). A tiered administrative structure for planning and implementation of the Management Plan has been suggested as per the PSL to ensure effective participation (Chapter 9). The plan is designed to help facilitate co-operation amongst various stakeholders and and to minimize the negative impacts of developmental initiatives. Knowledge from both robust scientific work and that from the local people are key to this Management Plan preparation but work still remains for effective implementation of the Plan and is outlined in Chapter 8. The work plan, including the budget is detailed in Chapter 10.

This Management Plan is the first such plan under the Project Snow Leopard. Considerable care has been taken to ensure robust content and practicality of the suggestions made in the document, but it is also recognized that there will always be scope for improvement. Apart from suggesting strategies and actionable points for comprehensive conservation in the land-scape, it is hoped that this document will be a useful resource material for all partners and others interested in conservation in Spiti. It is also hoped that this Plan will provide a suitable model for preparing Management Plans for all other PSL areas, as also any other landscape level conservation plan in the Himalaya.

We are thankful to the then Chief Wildlife Warden of Himachal Pradesh - Shri Vinay Tandon, to have requested us to undertake this management planning exercise. and the present CWLW, Shri A.K. Gulati, for providing positive inputs and all possible support for its completion. In between, Shri A.K. Gupta, CWLW, organized a workshop in Shimla for discussion and feedback. Shri Avay Shukla, Chief Secretary, Forests, Government of Himachal Pradesh reposed tremendous faith in us for this task. Shri Sanjeeva Pandey, CCF, provided support and encouragement, and shared his valuable knowledge. Shri R.K. Sood, CF, Shri K.S. Thakur, CF, Shri H.L. Rana, DFO, Shri Hari Singh, DFO, Shri Satpal Dhiman, and numerous other officers

and staff from the Himachal Pradesh Forest Department provided support and inputs into the Management Plan at different stages of its development and are gratefully thanked. The Additional District Commissioner of Kaza, Shri Priyatu Mandal, provided tremendous help during the course of the fieldwork and assessments. Other heads of the line departments and agencies working in Spiti also provided information and support during the course of our work. The Kibber Youth Council, our field staff in Spiti, and our PhD students, worked tirelessly during the course of the study and have contributed significantly to the document. Work of this magnitude requires the support of numerous people and agencies and all those that have been missed out here are duly acknowledged for their assistance.

June 2011

Yash Veer Bhatnagar

for the team from Nature Conservation Foundation (Mysore) and Snow Leopard Trust, India

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LIST OF ABBREVIATIONS

Abbreviation	Full Name
ACAP	Annapoorna Conservation Area Project
BADP	Border Area Development Programme
CBO	Community Based Organization
DDP	Desert Development Project
HP	Himachal Pradesh
HPFD	HP Forest Department
HPSCSTDC	HP Scheduled Caste and Scheduled Tribes Development Corporation
HPSEB	HP State Electricity Board
INGO	International Non Government Organization
ITDP	Integrated Tribal Development Plan
KCC	Kanchendzonga Conservation Committee
LeDEG	Ladakh Ecology Group
LLIC	Landscape Level Implementation Committee
LPG	Liquid Petroleum Gas
MGREGA	Mahatma Gandhi Rural Employment Guarantee Scheme
NCF	Nature Conservation Foundation
NGO	Non Government Organization
NREGA	National Rural Employment Guarantee Scheme (now see MGEREGA)
NSS	National Service Scheme
PRI	Panchayati Raj Institution
PSL	Project Snow Leopard
SECMOL	Students' Educational and Cultural Movement of Ladakh
SGRY	Sampoorna Grameen Rozgar Yojna
SGSY	Swarnajayanti Gram Swarozgar Yojnai,
SSA	Sarva Siksha Abhiyan
SSLCS	State Snow Leopard Conservation Society
VWCC	Village Wildlife Conservation Committee
WII	Wildlife Institute of India

EXECUTIVE SUMMARY

The Project Snow Leopard (PSL) of the Ministry of Environment and Forests, Government of India, is a flagship species programme to strengthen wildlife conservation in the Himalayan high altitudes. PSL recognizes the Indian higher Himalaya and Trans-Himalaya as unique zones requiring conservation efforts that differ from the usual approaches followed elsewhere in the country. Two important features of this region are (i) wildlife, including endangered species like snow leopards, are pervasive in the landscape (ii) a human population occurring a relatively low-density is also dependent on this landscape and it's natural resources. PSL recognizes that conservation efforts therefore must look beyond Protected Areas (PAs) and must focus on relatively large landscapes (exceeding 2,000 sq. km). The advocated means of achieving conservation in these landscapes is the identification of key landscape units that are important for wildlife and reducing human dependence on these 'core' landscape units that are interspersed among multiple use landscape units that allow for resource use by local communities. These smaller units are more manageable with local support and conservation actions can also be more focused in the related communities. Another important feature of the PSL is its recognition of the large people-wildlife interface in these landscapes and thus emphasis on scientific and participatory conservation and conflict management strategies. The PSL thus has recommended preparation of consultative and knowledge based management plans as a key first step for integrated conservation efforts to be initiated across the landscape. The PSL also suggests a decentralized decision-making and implementation structure. Four levels are identified including the village level, through the landscape and state, to the Central Government. Micro-plans for conservation are to be developed by involvement of local communities at the village level, their actions integrated and broader planning achieved at the landscape level represented by the local Forest Department, other line departments of the Government, and Civil Society groups. A Society formed at the State level with adequate representation of Government and Civil Society Groups including NGOs is responsible for co-ordination with and securing funds from the Central government. A Steering Committee at the MoEF, with representation from national NGOs, research institutions, and the MoEF, is deemed responsible for PSL management at the Centre. The Nature Conservation Foundation has been identified as the anchor institution assisting the MoEF in all technical aspects related to Project Snow Leopard.

In line with the landscape approach of the PSL, the Himachal Pradesh Forest Department (HPFD) had in 2008 declared the entire over 7,000 sq. km Spiti Forest Division as a Wildlife Division. Within this there are three PAs namely, the Kibber WLS (*c.* 1,200 sq.km), the Pin

Valley NP (675 sq.km), and the Chandratal WLS (38.6 sq. km). Based on the PSL criteria, the HPFD identified 3,944 sq.km of the upper catchment as the 'Upper Spiti Landscape' as the state's first PSL site. The Kibber WLS constitutes a third of this landscape while the remaining land is under different ownership that includes about 30 villages and multiple stakeholders. For this pioneering effort the State Government sought assistance from the Nature Conservation Foundation to develop a Management Plan for the Upper Spiti Landscape.

The Management Plan is divided into two parts. The first part deals with background information of the region and the prevalent land use. This part is provided as a status report that gives detailed information on the region's wildlife values, socioeconomic trends, threats to the region's wildlife and habitats, and their conservation implications. The second part deals with the management component. This begins with setting the goals and objectives based on the background information of Part I and each subsequent chapter deals with how each goal is proposed to be met. While extensive interviews and discussions have been held with local communities in the process of developing this management plan, specific micro-plans for the smaller landscape units are not suggested, as these are most appropriately developed by the Forest Department and locally active Civil Society groups in consultation with village councils and youth groups. These are expected to take considerably large trained work force and time to engage and develop. The Plan thus suggests ways of capacity enhancement in local participatory planning and implementation.

PART I

Chapter 1 highlights the salient features of the Project Snow Leopard and how this management plan is positioned to help in its effective implementation.

Chapter 2 provides a background of available information on the region's characteristics and values. These include geographic, climatic, biodiversity, socioeconomic and institutional information. Apart from literature, in order to ensure that the Plan was based on updated knowledge, extensive surveys were conducted by the team covering the entire landscape. For example, teams of researchers and trained local staff traveled throughout the landscape covering 33 valleys to document evidences of large mammals; covered most of the *c*. 30 villages in the landscape, including over 400 households, to assess local dependence; gathered institutional information from over 35 Government and non-government agencies operational in the area that covered aspects such as their mandates and key activities; and obtained information from official Web based resources and Government records on human demography and developmental indices.

Chapter 3 explores the socioeconomic transformations in the region and emergence of threats to wildlife conservation based on synthesis of the information from Chapter 2. Independent threats assessment for all core landscape units of the USL was also conducted and is presented

here. This chapter intends to outline the threats and opportunities in the USL that need to be pursued by the Management Plan.

PART II

Chapter 4 states the vision, goals and their respective objectives based on the values of the area and their threats. The Vision statement for the Plan is stated as - *"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."* In order to achieve this vision the Plan looks at zonation of the entire landscape based on local biodiversity values and human dependence on natural resources, assessment and mitigation of threats, and collaborative mechanisms of working, as its three key goals. Meeting these goals forms the subsequent three chapters, where the context is discussed in greater detail, specific objectives are stated, and for each of them recommended actions are discussed.

Chapter 5 deals with the zonation of the USL, which is the first important step in management of the area. Based on study of literature, extensive large mammal surveys and natural resource dependence of the community, 15 'core landscape units' were identified which are spread across the entire stretch of the USL. These cover *c*. 800 sq. km and are areas that have better wildlife values than adjacent valleys and also have limited human dependence. This chapter briefly dwells on their respective attributes, including threats and the broad conservation approach to be followed in each core landscape unit.

Chapter 6 explores all known threats to wildlife and their habitats in the USL, which include those related to local natural resource use, developmental pressures and climate change. Mitigating threats are critical for long-term conservation in the region. This chapter thus dwells upon what is known about the causes and mitigation of threats from literature and experience in order to outline the broad approach to be followed for each of them. Finally, specific actions are suggested for overcoming each threat.

Chapter 7: As stated earlier, the Management Plan is made for the entire region where over 30 villages, 35 Government departments and numerous other agencies have important stakes. The mandates and expertise of many agencies can support conservation efforts and in come cases these agencies may have divergent interests. This chapter deals with understanding areas of convergence and divergences and setting up collaborative mechanisms for carrying out all works under the Management Plan. Detailed institutional assessments carried out in Chapter 2 aid in this exercise.

Chapter 8: While information on wildlife distribution, conservation threats, human society and local institutions form the basis of the current Plan, it is recognized that additional information and constant monitoring would be important for effective conservation in the region. Further, it is recognized that threats and wildlife values may change with time and need to be monitored to effectively propose conservation initiatives adapted to address these changes. There is also a need for constant capacity enhancement of many stakeholders to keep upgrade necessary skills. The needs and the strategy for achieving them are outlined in this chapter.

Chapter 9 provides the details of organization and administration of the Plan, and draws heavily from the Project Snow Leopard document. This includes setting up of village level wildlife committees, a landscape level committee and finally, a state level society. It also dwells on the justification, potential structure and role of a new non-governmental organization to be set up in Spiti to carry out day-to-day coordination and activities under the plan. The Plan ultimately hopes to have conservation linked activities primarily carried out in village clusters based on the micro-plans developed collaboratively by all parties concerned. It is visualized that some landscape level activities such as research, monitoring, capacity and awareness programmes will be carried out by national organizations, protection and infrastructure by the HPFD, and identified convergence related works by other Government departments and local NGOs.

Chapter 10 provides the work plan for carrying out recommendations made in Chapters 5, 6, 7, 8 and 9 and indicates the timelines, lead agencies and required budget.

The Management Plan has used existing and new information on biodiversity and human society (Chapter 1, 2 & 3) to identify values of the landscape for conservation and for local communities, to thereby assess how a mosaic of community conserved areas can be developed that have minimum impact on local livelihoods, and how conservation efforts can in fact help in enhancing them (Chapter 5). The threats in these areas were assessed and mitigatory mechanisms suggested based on literature, experience and consultations with communities (Chapter 6). Local institutional and government line department assessments helped in identifying numerous areas of convergence as also some schemes that may compromise the status of wildlife. This yielded aspects where both Government departments and NGOs could contribute towards conservation through their existing programmes, thus optimizing the resource needs (Chapter 7). The tiered structure for planning and implementation has been suggested as per the PSL to ensure effective participation (Chapter 9). It is also designed to ensure that all works can be cooperative and the negative impacts of developmental initiatives on conservation can be minimized. Knowledge from both robust scientific work and that from the local people are key to this Management Plan preparation but much work still remains and is outlined in Chapter 8. The work plan, including the budget is detailed in Chapter 10.

This Management Plan is a pioneering effort for preparing landscape level plans in the country and is the first such plan under the Project Snow Leopard. Considerable care has been taken to ensure robust content and practicality of the document, but it is also recognized that there may be scope for improvements in different sections. Apart from suggesting strategies and actionable points for comprehensive conservation in the landscape, it is hoped that this document will be a useful resource material for all partners and others interested in conservation in Spiti.

PART I

THE SNOW LEOPARD CONSERVATION LANDSCAPE: EXISTING SITUATION

INTRODUCTION TO THE OVERALL FRAMEWORK FOR THE MANAGEMENT PLAN UNDER THE PROJECT SNOW LEOPARD



1.1. BACKGROUND

Himachal Pradesh is the second largest state in the Indian Himalaya with over 50% of its terrain under the high altitude regions of the Greater and Trans Himalayan tracts that occur above the forested zone. This region has severe climate, has unique biodiversity and people largely dependent on local resources for their sustenance. These regions could not receive sufficient conservation attention till recently due to the severity as well as poor information available for suitable options. With better information on the regions ecology and human society now available, it is important to take up conservation with renewed vigour. Another recent development is the Government of India's initiative called the Project Snow Leopard (PSL), developed specifically for strengthening conservation in these high altitude areas of the country.



MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE

The PSL clearly recognizes the importance of using innovative participatory, landscape level conservation approaches in the Indian high altitudes that are not restricted to the legal wildlife Protected Areas (PA) alone, but the larger landscape. The snow leopard (Panthera uncia) is used as a flagship and umbrella species to streamline overall conservation in the landscape.

The Spiti region (c. 10,000km²) of Himachal Pradesh has two PAs, the Pin Valley NP (675km²) and the Kibber WLS (c. 1,100km²), however observations by the department and other agencies suggested wildlife presence in vast areas outside these PAs. Based on this the Government of Himachal Pradesh designated the entire Spiti Division as a 'Wildlife Division' in 2007. The area has also been designated as a Biosphere Reserve under the Man & Biosphere Reserve program of the UNESCO in 2009.

The present management plan is thus a pioneering effort to apply the newly developed principles of the Project Snow Leopard (Anon 2008) to develop a Management Plan for a large tract of Spiti that has a mosaic of wildlife values, human use and an existing PA. Below, some salient aspects of the PSL are explained adapted from Anon (2008).

1.2. THE PROJECT SNOW LEOPARD IN THE INDIAN HIMALAYA

Himalaya, the highest mountain chain in the world, bound the northern part of the Indian subcontinent. These geologically young mountains originated less than 70 million years ago, and stretch over 2,500 km, originating in the east near the Namche Barwa peak where the Tsangpo or the Bhramaputra takes a 'U' turn, and extending towards the west up to the area where the Indus takes a southward turn near the Nanga Parvat. In the east, the range gives way to contiguous lower hills extending into Myanmar and southeast Asia. In the west, there is a complex knot of mountain chains comprising the Hindu Kush, the Pamirs, the Karakorum and the Altai. Another chain of mountains descends into Pakistan as the Salt Ranges. The Himalaya itself is a complex geo-ecological system, beginning with the low hills towards the south called the Siwaliks, that lead into the Middle Himalaya, and finally into the Greater Himalayan chain in the north. There is a general trend of decreasing precipitation from east to west, and from south to north in the Himalaya. There is a vast tract of mountains and plateaus immediately north of the Greater Himalayan chain, comprising the Trans-Himalaya. These areas of the Tibetan plateau and its marginal mountains lie in the rain-shadow of the Himalaya and are cold deserts. The Siwaliks and the Middle Himalaya have forested areas, while the Greater Himalaya has a few forested tracts, but mostly consists of sub-alpine scrub, alpine meadows and vast areas under permafrost, glaciers and rock faces. The Trans Himalayan cold deserts primarily consist of sparsely vegetated steppes, small patches of moist sedge meadows near water bodies and vast areas that are barren and under permafrost and glaciers. Most of these high altitudes (regions above 3,000m) are the headwaters of all major rivers of northern India. The Himalaya are home to unique biodiversity including at least 350 species of mam-



INTRODUCTIO

Figure 1.1. Map of northern India showing the important mountain ranges, including the Himalaya and the Tibetan Plateau, which form the project area for the Project Snow Leopard.

mals, 1200 species of birds, 635 species of amphibians and reptiles (Pei 1996), and numerous plants including those with medicinal properties. Over 335 species of wild relatives of cultivated crops are found in the region (Arora & Nayar 1984). There are numerous biologically important wetlands that form breeding grounds for waterfowl.

An important distinctiveness of the higher altitudes of the Himalaya comes from the fact that wildlife populations here occur over most of the landscape, their contiguity broken primarily by natural geographical features such as a high mountain chain or a river, and rarely by human induced barriers. Even endangered species of wildlife are not restricted to protected areas, but occur across the larger landscape. However, the human population density in the Himalayan high altitudes is on the rise and so is the magnitude of people's dependence on the natural resources. Since the harsh climate and topography of the area are relatively less conducive to agriculture and other developmental options such as industry, most of the region is largely dependent on pastoralism. Wild herbivore species are getting out-competed and their populations are declining due to increasing livestock populations in many areas (Mishra 2001).

This is leading to an increased dependence of wild predators such as the snow leopard *Pan-thera uncia* and the wolf *Canis lupus* on livestock (Bagchi & Mishra 2006), causing increasing human-wildlife conflicts (Mishra 1997).

Poaching is a major threat in some areas, along with opening up of areas due to road building, pressures from immigrant labour forces, etc (PSL 2006). In other areas scarce moist meadows that are important foraging grounds of wild herbivores, are either being converted to cultivation, or fenced to prevent wild ungulate grazing (Bhatnagar et al 2006). There are increasing reports of conflicts due to crop depredation by wildlife. Military and para-military personnel need extensive road networks and are usually settled near important but fragile wetland sites or key mountain passes that are also important for wildlife species such as the Tibetan argali *Ovis ammon* and waterfowl. The conservation scenario is fast changing and wild species are declining and becoming locally extinct (Chundawat & Qureshi 1999). Climate change is also expected to affect this landscape significantly that may influence both local livelihoods and biodiversity values of the region.

The endangered snow leopard occurs over most of the high altitudes of Central Asia and Himalaya (Jackson 1996). Little is known about the species' ecology, status and even distribution (McCarthy, T. M. and G. Chapron. 2003). The coarse global population estimate for the snow leopard is c. 7,400 individuals, and the species is classified as Endangered in the IUCN's Red List. The total potential habitat of the snow leopard globally is estimated to be c. 2 million km², with most animals occurring in China, followed by Mongolia and India. India is believed to have between 400 and 700 snow leopards in the five Himalayan states, though these estimates are not precise. With its wide distribution, precarious conservation status, and immense aesthetic appeal, the snow leopard is an effective flagship species for wildlife conservation in the Himalayan high altitudes.

Despite the ecological importance, the harsh conditions, and the increasing threats to conservation in the region, the wildlife of the Himalayan high altitudes has received little conservation attention. The Ministry of Environment and Forests (MoEF), Government of India, had initiated work on a flagship Snow Leopard Scheme in 1988 (Anonymous 1988), but it could not be launched. In 2004, the Nature Conservation Foundation (NCF) began a consultative process in all the five Himalayan states (Jammu & Kashmir, Himachal Pradesh, Uttaranchal, Sikkim and Arunachal Pradesh) to assess the need and scope for initiating Project Snow Leopard. A concept paper was prepared together with the Chief Wildlife Wardens that outlined the project justification and its objectives (PSL 2006). The goal of the project was articulated as "To safeguard and conserve India's unique natural heritage of high altitude wildlife populations and their habitats by promoting conservation through participatory policies and actions." These issues were further discussed in separate state level workshops with a cross-section of the Forest and Wildlife Departments in each state. The workshops focused on identifying project

areas within each state, the constraints faced by the departments in managing high altitude wildlife, and possible strategies and actions to overcome the constraints. This was followed up with a national workshop in Leh in July 2006 that was sponsored by the MoEF and organized by the Jammu & Kashmir Department of Wildlife Protection, in technical collaboration with NCF and the International Snow Leopard Trust. This workshop brought together officials and decision makers from the Government, scientists from the Wildlife Institute of India and other institutions, and conservation practitioners and NGOs to outline the structure of Project Snow Leopard. Following the recommendations of this national workshop, the MoEF constituted a committee to draft a strategy and action plan for Project Snow Leopard.

INTRODUCTION

The Project Snow Leopard is an Indian initiative for strengthening wildlife conservation in the Himalayan high altitudes. It aims to promote a knowledge-based and adaptive conservation framework that fully involves the local communities, who share the snow leopard's range, in conservation efforts.

The goal of Project Snow Leopard is to safeguard and conserve India's unique natural heritage of high altitude wildlife populations and their habitats by promoting conservation through participatory policies and actions.

The high altitude Himalayan landscape in India is spread over c. 130,000 km² including c. 35 existing protected areas (c. 31,000 km²). Given that this high altitude landscape is unique as the wildlife populations, though threatened, occur across the landscape and are not restricted to protected areas, an alternative, landscape-level conservation approach is needed. At the same time, this landscape continues to undergo traditional resource use in the form of livestock grazing and associated activities, and a participatory approach to conservation, that fully involves local communities, is urgently required. Keeping this broad philosophy in mind, the following are the objectives of the Project Snow Leopard:

1.2.1. FACILITATE A LANDSCAPE-LEVEL APPROACH TO WILDLIFE CONSERVATION

Since wildlife populations in the Himalayan high altitudes are not restricted to protected areas, a landscape-level conservation approach is needed. The Project Snow Leopard will accordingly facilitate the identification of biologically important landscapes (> 1000 km²), and assist in the development of landscape-level management plans based on management objective-setting (and zonation) for each landscape unit (10-100 km²) therein (Section 5).

1.2.2. RATIONALIZE THE EXISTING PROTECTED AREA NETWORK AND IMPROVE PROTECTED AREA MANAGEMENT

Within the larger landscape, Project Snow Leopard will facilitate biologically and socially meaningful demarcation as well as zonation of existing protected areas and the surrounding



landscape based on the landscape unit approach (Section 5), facilitate the establishment of new protected areas, the development of ecologically and socially responsible management plans, the development of frameworks for participatory conservation management, and provisioning of resources and capacity development of protected area staff.

1.2.3. DEVELOP A FRAMEWORK FOR WILDLIFE CONSERVATION OUTSIDE PROTECTED AREAS AND PROMOTE ECOLOGICALLY RESPONSIBLE DEVELOPMENT

Project Snow Leopard will facilitate initiatives required for preserving and promoting local peoples' tolerance towards wildlife, as well as support initiatives that promote the continued persistence and recovery of wildlife populations on common land. Project Snow Leopard will assist in conservation-linked income generation and incentive programmes for local communities.

1.2.4. SUPPORT FOCUSED CONSERVATION AND RECOVERY PRO-GRAMMES FOR ENDANGERED SPECIES SUCH AS THE SNOW LEOPARD AND ITS PREY SPECIES

Project Snow Leopard will encourage scientifically robust research (ecological and social), and

the use of this knowledge for formulating and implementing participatory, science-based conservation programs at local and regional levels.

1.2.5. PROMOTE STRONGER MEASURES FOR WILDLIFE PROTEC-TION AND LAW ENFORCEMENT

Project Snow Leopard will support initiatives that lead to enhanced capacity of wildlife department staff and local communities to effect stronger wildlife law enforcement through training, equipment, and innovative community-based protection measures.

1.2.6. PROMOTE BETTER UNDERSTANDING AND MANAGEMENT OF HUMAN-WILDLIFE CONFLICTS

Project Snow Leopard will support ecological and social research leading to better local understanding of human-wildlife conflicts, and encourage the development of knowledge-based frameworks that will allow for flexible and locally appropriate, community-based conflict resolution programmes that can be administered and managed by local bodies such as village councils.

1.2.7. RESTORE DEGRADED LANDSCAPES IN THE HIGH ALTITUDE HIMALAYAN AND TRANS-HIMALAYAN BIOGEOGRAPHIC REGIONS

Project Snow Leopard will support efforts to design and implement restoration programmes in degraded areas that have restoration potential. Restoration projects whose need is adequately justified, and which are designed based on rigorous scientific research, would be supported.

1.2.8. PROMOTE A KNOWLEDGE-BASED APPROACH TO CONSER-VATION AND AN ADAPTIVE FRAMEWORK FOR WILDLIFE MAN-AGEMENT

Project Snow Leopard will support and encourage high quality scientific research and monitoring of wildlife and human ecology, and enable management frameworks that are adaptive, periodically incorporating ecological and social feedback into management planning.

1.2.9. REDUCE EXISTING ANTHROPOGENIC PRESSURES ON NAT-URAL RESOURCES

Project Snow Leopard will support participatory programmes that aim at reducing human pressures on natural resources by provisioning of alternate income sources to local communities and value-addition to locally produced goods and services. Livestock grazing is prevalent in all protected areas of the region and forms an important source of livelihood for the people. Project Snow Leopard will support the formulation and implementation of appropriate grazing policies for both within and outside Protected Areas that will aim to harmonize the objec-



tives of pastoralism with those of wildlife conservation.

1.2.10. PROMOTE LOCAL CAPACITY, CONSERVATION EDUCATION AND AWARENESS

Project Snow Leopard will support education and awareness programmes for wildlife conservation targeted at local communities, children, as well as other human institutions including Gram Sabhas, EDCs, defence forces, road construction agencies, travel agents, etc. Project Snow Leopard will support programmes that aim to enhance the capacity of individuals and institutions from local communities in effecting wildlife conservation.

With the above background, the thrust areas of the PSL include:

- **Conservation in the larger landscape, not limited to PAs**. This also means that the ownership of land may be variable (de jure government owned, de jure community owned, de facto community owned). Management zonation is important: Needs to target 'Core zones' & 'Buffer areas'. The emphasis of maintaining these areas will mostly be with social consensus and incentives, rather than legal sanction. Knowledge based management will be done in these areas.
- Administrative and implementation structure:

Key to the project is its structure that will ensure participatory conservation efforts – both for planning and implementation

• Project formulation:

mechanism for inputs by community, NGOs, CBOs and line agencies

• Implementation:

mechanism for role of community, NGOs, CBOs and line agencies in implementation. Conflict management will be an important component

• Monitoring:

scientific monitoring to provide feedback on conservation action for 'adaptive management'

1.3 APPROACH FOLLOWED IN PREPARATION OF THIS MANAGE-MENT PLAN

Given the above context, in 2008, the Chief Wildlife Warden, Himachal Pradesh, assigned the task for the preparation of the Management Plan to the team from NCF-SLT that had catalyzed the PSL process. This was done to ensure that the team brings in its two decades of dedicated research, community based conservation work and the recent policy related experiences to prepare a landmark Management Plan, which truly represents the PSL. NCF-SLT has carried out many collaborative programmes with the HP Forest Department and has an MoU for strengthening cooperation. On receiving the assignment in late 2008, the team began focused research, consultations and finally completed the plan in late 2010. The fact that this was a pioneering effort where regular management planning guidelines didn't suffice, considerable information needed to be generated, and out-of-the-box thinking was required, resulted in almost two years for the preparation of the Plan.

Teams of researchers and trained local staff traveled throughout the landscape covering 33 valleys to document evidences of large mammals (details of methods in Section 2.2, 5.2); covered all of the c. 30 villages in the landscape, including over 400 households, to assess local dependence (Section 2.3); gathered institutional information from over 25 Government and non-government agencies operational in the area that covered aspects such as their mandates and key activities (Section 2.4); and obtained information from official Web based resources and Government records on human demography, developmental indices (Section 2.3, Chapter 3). Most of these were also included into spatial databases for analyses and are available to the implementing partners. The team also conducted threat assessments that are crucial in understanding their pattern as also a more robust mitigation strategy (Chapter 3, 6).

The Plan thus used past and present information on biodiversity and human society to identify values of the landscape for conservation and for local communities, to thus assess how a mosaic of community conserved areas can be identified that have minimum impact on local livelihoods (Chapter 5). The threats in these areas were assessed and mitigatory mechanisms were suggested based on literature, experience and consultations with communities (Chapter





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3 and 6). Local institutional assessments helped in identifying numerous areas of convergence as also some schemes that may threaten local wildlife. This yielded aspects where both Government departments and NGOs could contribute towards conservation through their existing programmes, thus optimizing the resource needs (Chapter 7). The tiered structure for planning and implementation has been suggested as per the PSL to ensure effective participation (Chapter 9) and also so that all works can be more cooperative and have a low negative impact on conservation. Knowledge from both robust scientific work and that from the local people are key to this Plan preparation but much work remains and is outlined in Chapter 8.

The Plan thus looks at zonation of the entire landscape based on local values to focus conservation efforts, assessment and mitigation of threats, and collaborative mechanisms of working, as its three objectives.

Chapter 2 gives details of the landscape boundaries, justification for its selection and significance for conservation.



BACKGROUND INFORMATION AND ATTRIBUTES OF SPITI



2.1 THE LANDSCAPE

2.1.1 AREA BOUNDARIES AND ADMINISTRATIVE INFORMATION

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 Kunzamla 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 patwar circles. The Lahul & Spiti district is spread over 13,885 km² (24.85% of the total State area) with a population of 33,224. Within this Spiti constitutes 7,591 km² (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



Figure 2.1: a) The upper Spiti landscape in the Lahul-Spiti districts of Himachal pradesh, India

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.

Two wildlife protected areas (PAs), the Pin Valley National Park (675km²) and the Kibber Wildlife Sanctuary (1,200km²) exist in Spiti. 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 (Letter No. 9/9/2005-CS/BR, MoEF, 28 August 2009).

2.1.2 GEOLOGY, ROCK AND SOIL

Spiti has contributed tremendously to the geological knowledge owing to the almost complete



Figure 2.1: b) The Biogeographic zones(As per Rodgers and Panwar 1988)

sequence of exposed sediments from the Pre-cambrian era to the Cretaceous period (Wadia 1967). The area is characterised by sharp changes in a combination of quartzite, shales, limestones and conglomerates. Most of the area is rich in fossils, mainly brachipods, trilobites, ammonites, bivalves and also certain corals and algae, indicating its Tethyan past. 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).

2.1.3 TERRAIN

All of Spiti occurs above an elevation of 3,000m. 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

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kilometre wide. The slopes on the right bank of Spiti are more rugged and have longer streams, while the left bank is less rugged (Figure 2.2). 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 500km². Of the c. 7,600 km² covered by Spiti, c. 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 Lahul.

2.1.4 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 effect. The temperatures can range over 70 degree Celsius, from – 40 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.

2.1.5 GEOGRAPHY & WATER RESOURCES

The Spiti River traverses c. 145km from its origins near the Kunzam la to Khab, where it meets the mighty Sutlej River. The region spread over c. 7,600 km², upstream of Hurling is administratively considered to be the Spiti subdivision of the Lahul & Spiti district of Himachal Pradesh (Figure 2.1). The name Spiti, or Piti, translates to 'middle country' and refered to the small kingdom between the Gyagar (Indian) and the Ladakhi or Tibetan country. Probably another reason for such a name could be because two high Himalayan ranges enclose it - the Pir Panjal, to the south, and a branch of the Zanskar, to the north. There are large clusters of high mountains and glaciers especially at three places - in the Bara-Shigri complex to the southwest, which divides Spiti from the Parbati Valley of Kullu district; the Gya massif to the northeast, at the tri-junction of Himachal Pradesh, Ladakh and Tibet, and the Manirang peak to the southeast, dividing the Spiti from the Kinnaur region. The two major tributaries of the Spiti River, the Pin arises from the Bara Shigri complex and the Lingti, from the Gya complex. The Pare Chu River forms a vast area to the north of the Gya-Parangla range. It originates in this region, moves northeast into Ladakh, and then again southeast into Tibet, before re-entering Spiti near Kaurik and joining the Spiti River at Sumdo. The other important tributaries of Spiti are the Ratang and Guindi nalas (tokpos) joining from the south, and the Shilla and the Parilungbi (or Kibber) nalas from the north. There are some 15-20 other smaller tributaries such as Takling, Giu and Quelling joining Spiti.

The Spiti River annually contributes a considerable flow to the Sutlej. However, little of this can be used for local cultivation due to the unstable nature of the riverbanks and problems of lifting the water to the fields. Cultivation is primarily dependent on the snowmelt from smaller streams where it can be brought to areas with stable, deep soil such as alluvial fans and some high banks. The river water is used for two mini power plants, one at Rangrik and another newer one at Lingti .

Vegetation type	Area (sq. km)	Per cent
Non-vegetated		
Glacial and moraine	614	16
Rocky & barren	2416	61
Vegetated		
Very sparse vegetation	662	17
Sparse to moderate vegetation	212	5
Moderate to dense vegetation	36	1
Total:	3940	

Table 2.1. Areas covered by the physiognomic vegetation types in the Upper Spiti Landscape. (see also Figure 4).



Figure 2.2: Prominent landforms of the Upper Spiti landscape as determined by using topographic position indices in ArcView

2.1.6 THE UPPER SPITI LANDSCAPE

Within Spiti this Management Plan is targeted for the Upper part of the Spiti catchment covering an estimated 3,944 sq km (c. 52% of Spiti; Figure 2.1) encompassing areas upstream of the point where the Lingti River meets the Spiti River, along Lingti's left bank ridgeline (separating Lingti with Tabo & Dankhar and further to a small stretch of international border with Tibet) till the Gya peaks (in the northeast). Here onwards the boundary follows the interstate boundary with Jammu & Kashmir till the SE corner of the Tsarap Chu catchment, from where it takes a westward turn along the ridgeline separating the Spiti from the Tsarap Chu first and then the Chandra catchment (also the subdivisional boundary) till the Bara Shigri complex. Here on the boundary follows the main Pir Panjal ridgeline separating Spiti from the Kullu district till upper Ratang Valley and then follows the ridge separating Ratang from Pin Valley, down to meet the main Spiti River at Queilling, whereon it goes slightly downstream to join the confluence of Lingti and Spiti Rivers.

The Upper Spiti Landscape (USL) covers over 2/3rd of Spiti's land area, leaving aside only

Tsarap Chu, the Pin Valley and the Tabo areas. This landscape includes the Kibber Wildlife Sanctuary as well as numerous other areas of significant wildlife values that are outside any existing PA. The values of the region are explained in the next section below. The area below 5,200m, the normal limit of vegetation in Spiti, is 2,163 sq km (54%) in the USL.

2.2 BIODIVERSITY VALUES OF THE LANDSCAPE

2.2.1. BIOGEOGRAPHIC CLASSIFICATION:

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

2.2.2. FLORAL VALUES OF THE LANDSCAPE:

The floral exploration in Spiti begun in the 19th Century, but the first flora was prepared by Aswal & Mehrotra in 1999. Localized studies were conduced in Kibber by Mishra (2001), and in Pin Valley by Manjrekar (1997). Apart from Kala (2000), who profiled the occurrence, use and conservation of medicinal plants in the whole of Spiti, no other study has looked into the entire landscape so far.

The vegetation in Spiti is classed as 'Alpine scrub' (Champion and Seth, 1968) or 'dry alpine steppe' vegetation (Schweinfurth 1957, Puri *et al.* 1989). Such areas are characterised by scattered and open bush-land mainly with herbaceous and shrub species such as *Artemisia spp.*, *Lonicera spp.* and *Caragana spp.* The graminoids such as *Festuca spp.*, *Poa spp.* and *Stipa spp.* are found in the area, but by and large their biomass seems to be depleted (Mishra 2001).

The Tibetan plateau attained its present average elevation (3,500-5,500 m) by the Miocene (8 million years ago), and through the Pleistocene, became progressively arid with open steppe vegetation (Harrison *et al.* 1992). Today, the two important vegetation formations in the region include open or desert steppe dominated by grasses and sedges (e.g. *Stipa spp., Leymus spp., Festuca spp., Carex spp.*) at altitudes up to 4,600 m, and dwarf shrub steppes between 4,000 and 5,000 m dominated by shrubs such as *Caragana spp., Artemisia spp., Lonicera spp.* and *Eurotia spp.*. Mesic sites such as river valleys and areas along springs and glaciers are often covered by sedge meadows (*Carex spp., Kobresia spp.*). Vegetation occurs up to 5,200 m, but becomes sparse above 4,800 m, and is limited to forbs such as *Saussurea spp.* and cushionoid plants such as *Thylacospermum spp.*. The important plant families include *Graminae, Cyperaceae, Brassicaceae, Fabaceae, Ranunculaceae*, and *Leguminoceae*.

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Figure 2.3: Vegetation in Upper Spiti showing broad cover types(using MODIS true color image(July - Aug, 2008) Normalised difference vegetation index(NDVI) mean of max summer values for the year 2001 to 2009(A total of 118 images))

Plant species richness and composition vary considerably over space and along gradients of altitude, soil moisture and soil texture (Klimes 2003; Rawat & Adhikari 2005). While figures from Spiti itself are not easily available some adjacent areas are illustrative. Kachroo *et al.* (1977) report 611 vascular plants from the Ladakh region (c. 90,000 km²), from 190 genera and 51 families. Rawat and Adhikari (2005) report 232 vascular plants from a 300 km² basin in eastern Ladakh belonging to 101 genera and 38 families. Eighty one species including 13 Graminae and 6 Cyperaceae are reported from a 35 km² area around a single village in Spiti region (Mishra 2001). In general, hemicryptophytes (perennial grasses and sedges) and chamae-phytes (dwarf forbs and matted shrubs) are the dominant life-forms in these rangelands (77% of all plants, Rawat & Adhikari 2005). The soils are generally alkaline (pH 7-9) and texture varies from sandy to sandy-clay, with 4 to 6% organic carbon content and 0.1 to 0.5% total nitrogen (Rawat & Adhikari 2005).

Plant growth is restricted to a short season (May-August) due to low temperatures during the rest of the year, and available soil moisture is an important limiting factor for plant growth during the growing season (Mishra 2001). Inter-annual variation in primary production is

high (Bai *et al.* 2004) and seems dependent on precipitation. For instance, aboveground net primary production (ANPP) in Spiti's rangelands was c. 210 kg/ha (\pm 48% CV) in 2005, whereas it was 340 kg/ha (\pm 43% CV) during 2006 when there was higher precipitation (S. Bagchi, unpublished observations). Vegetation cover is usually < 20-30% in most places, with some areas, usually mesic meadows and cultivation where higher cover occurs.

A preliminary map of the Upper Spiti Landscape has been produced (Figure 2.3). We used MODIS image constructed from the middle infrared, near infrared and red channels at 250m spatial resolution from the United States Geological Survey, Land Processes Distributed Active Archive Center, Moderate Resolution Imaging Spectroradiometer (USGS LandDAAC MODIS). Vegetation was classified as Sub shrubs dominated pastures, Sedge, grass and herb dominated pastures, Scree and scattered vegetation, Rock, Ice and Rock, and Permanent ice and snow. We classified the NDVI values into the above mentioned vegetation classes by comparing ground vegetation form known areas with the NDVI values obtained for those areas. Figure 2.3b gives the NDVI over a 10-year maximum, which primarily illustrates that the bulk of the vegetation is located at elevations below 5,000m, primarily along the main Spiti valley, some side streams, and importantly, in the Kibber-Langza plateau on the left bank of the Spiti River. The classification as per general cover types is shown in Figure 2.3c Most of the landscape was barren or with negligible forage (c. 77%, (Table 2.1)). The Very Sparse vegetation category consists primarily of very arid and unstable sites such as scree, the Sparse type consists of mesic areas, typically consisting of gramminoids and some forbs, and the Low to Moderate cover site are the moister depressions in valleys and plateaus that also have sub scrub including Caragana and Eurotia spp. Areas such as Mingiut and Tarbak in Kibber have high diversity of medicinal plants (Kala 2000).

2.2.3. FAUNAL VALUES OF THE LANDSCAPE

MAMMALS

The mammalian diversity of Spiti is not exceptionally large, but range-restricted species occur here. The primary large mammals reported from the landscape are the snow leopard, Asiatic ibex, bharal or blue sheep, Tibetan wolf and red fox (Table 2.2), all of which are nationally threatened, and many are also internationally threatened.

As a part of the Management Planning exercise NCF conducted extensive surveys in the entire landscape during October to December 2008. The USL was gridded along 30 catchments (Figure 2.4) and each was surveyed using both, direct and indirect tools, to document large mammal occurrences and identify areas that are of better quality for them (see details in Section 5.2).

Among the herbivores, ibex occupies much of the right bank and bharal, the left bank of Spiti

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River. Ibex also occurs on the left bank from the Lossar till near Kioto (Figure 2.4a for signs and Figure 2.4b for potential distribution (areas < 5,200m and field observations on occurrences)). In all, in the USL, bharal occupies an area of c. 1,144 sq. km, ibex 850 sq. km. The two species primarily overlap from the Takli nala to the Kibber nala (c. 143 sq. km). Bharal extend into the Pare Chu valley also. During the field survey over 500 blue sheep were sighted along the plateau area on the left bank, over 300 blue sheep in the Lingti valley and about 25 in the Pare-Chu catchments. Ibex is mainly distributed in the narrow valleys of the tributaries of the Spiti River along its right bank. During the field survey over 20 Ibex in the Ula nala (Quelling nala), 15 in Ratang nala, 19 around the Guindi catchments, 11 in the Suata nala and 7 in the Kabji nala were sighted. Although snow leopard occurs throughout the upper Spiti valley their signs were more frequent in the Lingti river catchments and the gorges formed by the Ula, Ratang and Guindi nala. Snow leopard signs are also common in the marking habitats along the plateau areas on the left of the Spiti river (Figure 2.5). A camera trapping study by NCF and the Forest Department in August-December 2009 has shown the occurrence of at least 5 snow leopards between Chichim and Shilla nala with a calculated density of 0.64 snow leopards per 100 sq. km.

Table 2.2. List of mammal species recorded in Trans-Himalayan rangelands and their IUCN Red List categories. Species occurring in Spiti are marked with an asterix or if doubtful, with '?'

Order/Family Genus		Species	Common name	Indian Wildlife (Protec- tion) Act 1972	IUCN Status (2008)
Artiodactyla		•			<u>`</u>
Bovidae					
Subfamily Cap- rinae	Capra	C. siberica	Asiatic ibex*	I	Low risk
	Ovis	O. ammon hodg- soni	Tibetan argali?	I	Vulnerable
		O. vignei vignei	Ladakh urial	I	Endan- gered
	Pseudois	P. nayaur	Bharal or Blue sheep*	Ι	Least con- cern
	Patholops	P. hodgsoni	Tibetan antelope	Ι	Endan- gered

Order/Family	Genus	Species	Common name	Indian Wildlife (Protec- tion) Act 1972	IUCN Status (2008)
Subfamily Anti- lopinae	Procapra	P. picticaudata	Tibetan gazelle	Ι	Least con- cern
Subfamily: Bovinae	Bos	B. grunniens	Wild yak	Ι	Vulnerable
Perissodactyla		•	<u>`</u>	•	
Equidae					
*	Equus	E. kiang	Tibetan wild ass?	Ι	Low risk
Rodentia	• -	• -			
Sciuridae	Marmota	M. caudata caudate	Long-tailed mar- mot*	II	Low risk
		M. bobak hima- layana	Himalayan mar- mot?	II	Low risk
Muridae	Alticola	A. roylei	Royle's Mountain vole?	IV	Low risk
		A. argentatus	Silvery mountain vole?	IV	Low risk
		A. stoliczkanus Stoliczka's moun- tain vole?		IV	Low risk
Lagomorpha	•	•	•		•
Leporidae	Lepus	L. oiostolus	Woolly hare*	IV	Low risk
L. capensis tibeta- nus		cape hare? IV		Low risk	
Ochotonidae	Ochotona	O. curzoniae	Plateau pika*	IV	Low risk
		O. ladacensis	Ladakh pika	IV	Low risk
		O. macrotis	Large-eared pika?	IV	Low risk
		O. nubrica	Nubra pika	IV	Low risk
		O. roylei	Royle's pika?	IV	Low risk
Carnivora					
Canidae	Canis	C. lupus	Tibetan wolf*	Ι	Least con-

Order/Family	Genus	Species	Common name	Indian Wildlife (Protec- tion) Act 1972	IUCN Status (2008)
	Cuon	C. alpinus laniger	Wild dog?	II	Endan- gered
	Vulpes	V. vulpes mon- tana	Red fox*	II	Least con- cern
	Vulpes	V. ferrilata	Tibetan fox	Ι	Least con- cern
Felidae	Panthera	Uncia	Snow leopard*	Ι	Endan- gered
	Lynx	L. lynx isabellinus	Eurasian lynx?	Ι	Near threatened
	Otocolo- bus	O. manul ni- gripectus	Pallas's cat?	Ι	Near threatened
Ursidae	Ursus	U. arctos isabel- linus	Brown bear?	II	Low risk
Mustelidae <i>Lutra L. lutra</i>		L. lutra monticola	Eurasian otter?	II	Near threatened
	Martes	M. foina inter- media	Stone marten*	II	Low risk
	Mustela	M. altaica temon	Mountain weasel*	II	Low risk
		M. erminea whiteheadi	Stoat?	II	Low risk
		M. siberica	Himalayan wea- sel*	II	Low risk

Distribution of the Tibetan wolf could not be ascertained based on field surveys as differentiating their sign from those of the feral dogs is very difficult. Therefore we relied on the information provided by key informants and direct sightings. The Tibetan wolf mainly occurs all along the Spiti River but not into the smaller valleys. Wolf is also distributed along the plateau areas on the left bank of the river (Figure 2.5).

BIRDS

A systematic survey of birds for the entire Spiti landscape is lacking, however Tak and Paliwal (2008) have given an account of birds of Pin Valley national park and based on existing



Figure 2.4: Survey grids used in the sampling of large mammals in the Upper Spiti Landscape. Of the 33 sub-valleys or 'grids', 30 were sampled. Sampling was mostly confined below the 5,200m contour, which is the inhabitable area by most wildlife.



Figure 2.5 a) Ungulate, snow leopard and wolf signs and sightings based on the 3 month survey in autumn 2008. A minimum of 15 km effort was made in 30 of the 33 'grids' to get wildlife evidences



Figure 2.5 b) Potential distribution of bharal and ibex in the Upper Spiti Landscape based on simple elevation based modelling (< 5,200m as inhabitable areas) corrected with ground surveys

literature, Mahabal (2005) has provided a tabular list of birds of Lahaul & Spiti district along with other districts of Himachal pradesh. Combining these two sources and excluding low elevation or forest dwelling species from Mahabal's list gives a total of 101 species. These belong to 13 orders, 31 families and 66 genera. High altitude specialists are prominently represented in the avifaunal composition. This list is attached as Appendix 2.1. Nearly 20% of the species are restricted to a single biome - Eurasian High Montane (Alpine and Tibetan), and hence are classified as "Biome restricted" by Birdlife International (Islam & Rahmani 2005), see Table 2.3. The biome restricted species may not be rare or uncommon where they occur but they occur only in a single biome, therefore their habitat needs to be safeguarded in the representative areas such as the Spiti landscape. Considering the good representation of high altitude habitats and their potential to hold good populations of representative avifauna, Kibber WLS and Pin valley N.P have been identified as an "Important Bird Area" under the global "IBA" programme (Islam & Rahmani 2004)

INSECTS

Himalayan high altitude insects as a whole show a remarkably high degree of endemism (over 70%, Mani 1968). Unfortunately not much is known about the populations, distribution and habitats of these endemics in the Spiti region in recent times. Prof M.S Mani and

his colleagues have made extensive collections in Lahul-Spiti, and Mani (1968 & 1974) has highlighted the uniqueness and hence conservation importance of Himalayan high altitude insects. In particular the North-Western Himalayan region has been regarded as an independent source of evolution of high altitude insects. Spiti falls within the NW Himalayan zone and hence is of high biological and conservation value for insect conservation. Since detailed information on endemic insects within Spiti is not readily available, the percentages of endemism in key insect orders and families from the high altitude of Himalayas as a whole are reproduced from Mani (1968) as a guide towards the endemism present in insects of Spiti. Among the more visible and charismatic groups, Lepidoptera comprise about 25% of all high altitude insects, and nearly 45% of the butterfly species are endemic to high altitudes (Table 2.4). An illustrative list of butterfly taxa endemic to Spiti or Lahaul & Spiti is presented below. High subspecies level differentiation reflects the recent evolutionary history of the Northwestern Himalayan insects. With the recent Pleistocene uplift of the North-Western Himalayas, many forms have been isolated on massifs, or otherwise elevated areas, diversifying in characters eventually developing into distinct species. Doubtless other insect orders also must have considerable proportion of endemic taxa but regrettably not much is know about their distribution and habitats in Spiti.

Table 2.3: "Eurasian High Montane Biome" 'Restricted' bird Species in Spiti (source Birdlife International (Islam & Rahmani 2005))

Snow Partridge	Lerwa lerwa
Hume's Short-toed Lark	Calandrella acutirostris
Rosy Pipit	Anthus roseatus
Robin Accentor	Prunella rubeculoides
Brown Accentor	Prunella fulvescens
White-winged Redstart	Phoenicurus erythrogaster
Tickell's Leaf Warbler	Phylloscopus affinis
Brandt's Mountain Finch	Leucosticte brandti
Red-mantled Rosefinch	Carpodacus rhodochlamys
Himalayan Griffon	Gyps himalayensis
Himalayan Snowcock	Tetraogallus himalayensis
Snow Pigeon	Columba leuconota
Grey-backed Shrike	Lanius tephronotus
Sulphur-bellied Warbler	Phylloscopus griseolus
Plain Mountain Finch	Leucosticte nemoricola
Great Rosefinch	Carpodacus rubicilla
Red-fronted Rosefinch	Carpodacus puniceus

Tibetan Snowfinch	Montifringilla adamsi
Yellow-billed Chough	Pyrrhocorax graculus

In recent times Zoological Survey of India (ZSI) has published an extensive compilation of faunal lists from Himachal Pradesh under the "Fauna of Western Himalaya" series (Editor-Director ZSI 2005). This compilation covers all animal groups and for several groups tabular list with species present in districts are provided. Entries for Lahaul & Spiti district may be indicative of the species present in Spiti. A compilation of all faunal groups occurring in Pin valley N.P has also been published by ZSI (Editor-Director ZSI 2008) and represents the diversity of Spiti.

Table 2.4: Butterfly taxa endemic to Spiti region (Mani 1968)

Family	Taxa	Remarks
	<i>Parnassius acco pundjabensis</i> (Bang-Haas)	Restricted to Spiti
Parnassidae (Snow Appolos)	P. Charltonius bryki (Haude)	Restricted to Spiti between 4500 – 5000 m, sometimes till 3050 m
	<i>P. epaphus hillensis</i> (Bang- Haas)	Restricted to Spiti
	P. stoliczkanus spitiensis (Bang-Haas)	Restricted to Spiti (4500m)
Satyridae (Browns)	Maniola davendra davendra	Lahaul & Spiti

AGRICULTURAL BIODIVERSITY:

Western Himalayas are one of the few global centres of agricultural biodiversity and forms part of the 'Southwest Asiatic Centre' (North-western Indian sub-centre) of Vavilov's eight global 'Centres of Origin' of crop plants' (Paroda and Arora 1991, Harlan 1971, Mountains – India's Thematic Report to NBSAP). According to Arora (1991) the West-Himalayan cold desert regions show high genetic diversity in cold wheat, barley (particularly hull-less types), buckwheat, prosomillet, amaranth, chenopods, field peas, lentil etc. These crops are adapted to cold and drought conditions. He further notes that high altitudes (above 3300 m) varieties of barley (of bluish/black grain types) show similarities to local Tibetan barleys and tall varieties of wheat (awned and awnless), from Lahaul and Spiti have show resistance/tolerance to rust. Crops in which rich diversity in landraces and primitive cultivars may occur in Spiti are wheat, barley, secale, and buckwheat.

Chumurthi – The Spiti horse.

Chumurthi or the Spiti horse is a recognised horse breed of the world and is one of the six horse breeds of India (Hendricks, 1995). The breed is entirely localized in Spiti, in par-



Figure 2.6: Potential snow leopard distribution in the Upper Spiti Landscape based on areas < 5,200m (as inhabitable areas) and wild prey occurrences

ticular in the Pin valley area. The breed is valued for its hardiness and a fifth gait, a lateral gait, which makes riding very comfortable. Based on the presence of primitive markings, it is speculated that it has descended from the Prezwalski's horse. The Chumurthi horse has been a valuable item of trade, and 200-300 animals are still traded annually in the state (Vinod.K. Bodh Veterinary Officer, Mobile Veterinary Dispensary, Keylong, ahdhp.nic.in/chamurthi. pdf). These horses fetch good prices (Rs 20,000-40,000) in annual markets like the Lavi mela (in Rampur Bhushair) and Ladarcha mela (in Kaza) and in adjoining areas like Changthang (Ladakh). Apart from cultural and commercial importance, the breed has its own conservation significance, as it is a rare and localized breed.

2.3. SOCIO-ECONOMIC PROFILE OF SPITI.

Spiti is one of the two tehsils or subdivisions of the Lahaul & Spiti district of Himachal Pradesh. Lahaul & Spiti district is the largest district in the state with an area of 13,885 km² (24.85% of the total State area). Spiti itself with an area of 7,591 km² (13.85% of the total State area) is larger than any district in Himachal Pradesh. Owing to it's high altitude arid environment, it is sparsely populated (population density <1 person/km², 2001 census), the low-



Figure 2.7: Secondary information on the better areas for ibex and bharal, which combines to predict the 'better' areas for snow leopard. This was determined from primary sampling of animal evidences and secondary information.

est in the state and one of the lowest in the country. The population is predominately tribal. Scheduled tribes comprise 77.8% of the population and scheduled castes constitute an additional 5.6%. This led to Spiti being designated a 'Scheduled Tribal Area', one of the five such areas in the state where tribal population exceeds 50%. The other such areas in the state are; Kinnaur district, Pangi & Bharmour tehsils in Chamba district, and Lahaul tehsil in Lahaul & Spiti district. The entire area is rural with no settlement classified as urban. Most of the area is under the control of the Forest department (73.2% of the total geographical area of the Lahaul & Spiti district).

Buddhism is the dominant religious faith in the area (83%, 1991 census). Habitation in Spiti is spread across 95 villages organized in 13 Gram Panchayats. The upper-Spiti landscape holds 30 villages in eight panchayats, with most population concentrated along the main Spiti Valley and the Kibber-Langza plateau (Figure 2.6). People are mainly agro-pastoralists, cultivating a single crop in summer and raising livestock in the surrounding pastures. Due to harshness of climate and high altitude, large tracts of the area are rocky or ice covered with no vegetation cover, about 56% of the area in Upper–Spiti is classified as without vegetation cover. The



Figure 2.8: Human population in 30 villages of the Upper Spiti Landscape villages. Data based on assessments made by survey team during 2008.

climate being arid, almost all the cultivation is irrigated. These set of conditions leave people to depend on a single crop a year and livestock grazing for livelihood. With this background the key elements of the socio-economic profile of Spiti and the government's efforts to bring changes in it, can be examined.

An excellent socioeconomic profile of Spiti is available in Mishra *et al.* (2001) and is reproduced in Appendix 2.3. for ready reference. Some other aspects are discussed below.

2.3.1. DEMOGRAPHY AND COMPOSITION:

According to Census 2001, Spiti has a total population of 10,679 persons and a population density of 1 person per sq km (Table 2.5). However there are signs of rapid population growth, the decadal population growth rate for 1991-2001 is 11.3%, much higher than 3.9% of neighbouring Lahaul tehsil, but lower than 17.5% of the entire state. Population below 6 years of age comprises 14.2% of the total population, higher than Lahaul (8.1%) and nearly equal to the state (13.1%).



The overall sex-ratio is 818 females per 1000 males, better than Lahaul (757 females per thousand males), but poorer than the state ratio (of 968 females per 1000 males). Sex-ratio in the population below 6 years of age is 967 females per thousand males for Spiti, 938 for Lahaul and 896 for the state. However subtle features are revealed if sex-ratio among different groups are examined. The scheduled tribe population in fact has a positively skewed sex-ratio of 1047 females per 1000 males and the scheduled castes a ratio of 893 females per thousand males. The overall lower ratio of 818 females per thousand perhaps results from the non-Spitian population of labourers and workers, which are largely male.

This population is distributed in 2,674 households, with an average size of 4 persons per household (based on 2001 census). The Scheduled castes account for 7.05%, Scheduled Tribes 74.72 and others account for 18.23% of the households (based on 1991 census).

Table 2.5a. Demographic Profile of Spiti Tehsil (Reproduced from census data online, census of India, 2001). SC refers to Scheduled Castes and ST, to Scheduled Tribes, CL, to casual labour, AL to agricultural labour, HHL to household labour and OW to other workers. See Appendix 2.6 for a complete list of villages and hamlets arranged as per panchayat and kothis.

Number of House- holds	Average Household Size (per Household)		4
Population-Total	10,679	Proportion of Urban Population (%)	0
Population-Rural	10,679	Sex Ratio	818
Population-Urban	0	Sex Ratio (0-6 Year)	970
Population(0-6Years)	1,515	Sex Ratio (SC)	893
SC Population	600	Sex Ratio (ST)	1047
ST Population	8,310	Proportion of SC (%)	6
Literates	6,794	Proportion of ST (%)	78
Illiterates	3,885	Literacy Rate (%)	74
Total Workers	5,901	Work Participation Rate (%)	55
Main Worker	5,206	% of Main Workers	49
Marginal Worker	695	% of Marginal Worker	7
Non Worker	4,778	% of non Workers	45
CL (Main+Marginal)	2,257	% of CL	38
AL (Main+Marginal)	149	% of AL	3
HHL (Main+Marginal)	84	% of HHL	1
OW (Main+Marginal)	3,411	% of OW	58

Table 2.5b. Distribution of Population in Panchayats across social groups (data from
B.D.O office, Kaza)

Pan-	Scheduled Tribe			Scheduled Caste		Total	Total	Total	Total	
chayat	Male	Fem.	Total	Male	Fem.	Total	Males	Fem.		House
										holds
Demul	308	305	613	14	18	32	322	323	645	139
Dhankar	411	414	825	47	60	107	458	474	932	211
Gyu	136	136	272	37	35	72	173	171	344	102
Hull	143	173	316	41	36	77	184	209	394	104
Kaza	467	497	964	27	33	60	494	530	1024	286
Khurik	330	404	734	91	103	194	427	507	928	261
Kibber	439	440	879	75	78	153	514	518	1032	242
Kungri	454	440	894	22	21	43	476	461	937	192
Lalung	216	254	515	1	1	2	262	255	517	132
Langza	231	219	450	12	10	22	243	229	472	127
Lossar	481	495	976	8	5	13	489	500	989	209
Sagnam	507	569	1076	8	7	15	515	576	1091	218
Tabo	414	457	871	38	39	77	452	496	948	201
Total	4537	4803	9385	421	446	867	5009	5249	10253	2424

2.3.2. GEOGRAPHIC DISTRIBUTION OF THE POPULATION.

Across the landscape, the population is distributed in 95 villages, clustered in 13 panchayats (Appendix 2.2a). The Upper Spiti Landscape includes 8 of these panchayats, and includes about half of the population (53%). These are often also clubbed under six 'kothis' (Appendix 2.2b). It is noted here that this list includes various hamlets attached with a village. Some of these have become all-year settlements and do no longer exist as hamlets but as villages. Due to these changes the temporal data are a bit difficult to compare for some village clusters. It is also noted that the village names are not very standard and different Government records may spell the villages differently, especially in English. An attempt has been made in this document to keep spellings of names consistent, but it may not always have been possible. It is thus suggested that while looking at names a phonetic sense is also maintained in recognizing the village. There are no permanent habitations above 4,400 m, and almost the entire human population occurs below this altitude.

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2.3.4. ECONOMIC ACTIVITIES:

Main occupation of people is agro-pastoralism. A single crop is raised during summer, almost entirely based on irrigation. Traditionally cereals such as barley were the main-stay of the people, however in recent times commercial crops such as Green-Peas are also a major component of agriculture. Horticulture, primarily dealing with apples, is in practice in the lower panchayats, where the climate is suitable for their cultivation. Tabo and Gyu are the two panchayats where apples are cultivated.

A major economic activity of people is raising livestock that includes sheep, goats, donkeys, yaks, yak-cow hybrids and horses. The larger livestock, yaks and horses are mostly free ranging in the surrounding pastures, where as the smaller livestock, sheep, goats and donkeys are herded daily. The agricultural residue forms a key component of livestock fodder, especially in winter. Dung produced by the livestock is an important source of fuel and to a lesser extent as manure for agriculture. With the exception of donkeys and horses, which are traded with the Changpas of Ladakh across the Parang-la, the livestock and livestock products are almost entirely consumed locally. The area is well known for it's prized breed of Chamurthi horses.

2.3.5. AGRICULTURE

Distribution of land.

A total of 1,810 ha is under cultivation in the entire tehsil. This area is held across 1339 holdings with an average of 1.35 ha per holding. An indication of the average number and size of land parcels per holding is given by the district average of 9 parcels per holding with an average area of 0.16 ha per parcel. This compares favourably with the state figures of 1.05 ha per holding, average number of 6 parcels per holding and an average area of 0.16 ha per parcel.

For Spiti, marginal and smallholdings (<2 ha) account for 77% of all land holdings constituting 46.7% of total cultivated area (Table 2.6 a,b,c). Scheduled castes (constituting c. 6% of the population), who were essentially landless ironsmiths and musicians till a few decades ago, hold 8.6% of the total holdings and 5.14% of cultivated area, however marginal and small holdings account for 93.9% of their holdings and 81.72% of the total area held by them. Scheduled Tribes (constituting c. 78% of the population) hold 90.6% of all holdings accounting for 91.9% of the total cultivated area in the tehsil. Marginal and smallholdings account for 75.8% of their total holdings and 46.1% of total area cultivated by scheduled tribes.

Women across all social groups hold 20.2% of all holdings, accounting for 14.1% of the total cultivated area across all social groups. Marginal and smallholdings account for 87.5% of holdings and 62.5% of the area held by women. Low as these figures are, women in Spiti fare better than women in other parts of the state. The state-wide share of women is 6.9% of all

holdings accounting for a mere 4.6% of all cultivated area in state.

Table 2.6a: Distribution of Land holdings- All Social groups. (Source: http://agcensu	s.
nic.in/cendata/tehsilsummarytype.aspx)	

Size of	Total Number	% Number	Total Area of	% Total	Total hold-
Holding	of Holdings	of Holdings	Holdings (ha)	area of	ings-Avg size
(in ha.)				Holdings	(ha)
Below 0.5	351	26.21	110	6.08	0.31
0.5 - 1.0	343	25.62	244	13.48	0.71
MARGINAL	694	51.83	354	19.56	
1.0 - 2.0	337	25.17	492	27.18	1.46
SMALL	337	25.17	492	27.18	
2.0 - 3.0	186	13.89	461	25.47	2.48
3.0 - 4.0	81	6.05	276	15.25	3.41
SEMIME-	267	19.94	737	40.72	
DIUM					
4.0 - 5.0	30	2.24	134	7.40	4.45
5.0 - 7.5	7	0.52	39	2.15	5.53
7.5 - 10.0	1	0.07	8	0.44	7.59
MEDIUM	38	2.84	181	10.00	
10.0 - 20.0	3	0.22	47	2.60	15.63
20.0 &	0	0.00	0	0.00	0
ABOVE					
LARGE	3	0.22	47	2.60	
ALL CLASS-	1339		1810		1.35
ES					

The Government has developed land and made it arable in villages under the Nautod scheme, under which landless or marginal farmers were provided additional land in the vicinity of their villages or areas farther away wherever such arable land could be developed. On the whole, between 1998 and 2008, c. 15% such additional land has been added in Spiti (Table 2.6d). Certain villages such as Kaza, Kee and Rangrik have added close to one thirds new land, Morang has added over 60% such land. The Government also tries to ensure reliable irrigation for these sites through khuls or water channels. In some cases these channels bring water from glacial melt over 15km away.

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Table 2.6b: Land holdings by Scheduled Castes and Scheduled Tribes-2001

Class	Total Num- ber of Hold- ings -SC	Total Num- ber of Hold- ings -ST	%Num- ber of hold- ings-SC	%Num- ber of hold- ings-ST	Total Area of Hold- ings -SC (ha)	Total Area of Hold- ings -ST (ha)	%Area held- SC (ha)	%Area held- ST (ha)
MARGIN- AL	86	605	74.78	49.88	46	307	49.46	18.46
SMALL	22	314	19.13	25.89	30	460	32.26	27.66
SEMIME- DIUM	7	257	6.09	21.19	17	712	18.28	42.81
MEDIUM	0	36	0.00	2.97	0	166	0.00	9.98
LARGE	0	1	0.00	0.08	0	19	0.00	1.14
ALL CLASSES	115	1213			93	1664		

Table 2.6c: Land holdings by women (across all social groups)-2001

Class	Total Number of Holdings	% Number of Holdings	Total Area of Holdings	% Total area of Holdings
MARGINAL	185	68.27	86	33.59
SMALL	52	19.19	74	28.91
SEMIMEDIUM	30	11.07	78	30.47
MEDIUM	4	1.48	19	7.42
LARGE	0	0.00	0	0.00
ALL CLASSES	271		257	

Table 2.6d: Land holding (bighas) in 1998 and 2008 at some villages in the Upper Spiti Valley. Naotod or new arable land carved out by the Revenue Department between 1998 and 2008 is also given (Source Revenue Dept., Kaza).

Village	Total minimum agriculture Land 1998	Under <i>Nautod</i>	Total minimum agricultural land 2008	% under <i>Nau- tod</i> (of 2008)
Chichim	887	50	937	5.3
Chichong	482	60	542	11.1
Demul	161	30	191	15.7

Village	Total minimum agriculture Land 1998	Under Nautod	Total minimum agricultural land 2008	% under <i>Nau- tod</i> (of 2008)
Hal	676	25	701	3.6
Hansa	947	20	967	2.1
Hikkim	738	-	738	0.0
Kaumik	291	-	291	0.0
Kaza	651	300	951	31.5
Kee	357	200	557	35.9
Khurik	454	100	554	18.1
Kiamo	502	20	522	3.8
Kiato	567	33	600	5.5
Kibber	1,085	200	1,285	15.6
Kibri	15	-	15	0.0
Lalung	629	40	669	6.0
Langza	820	30	850	3.5
Lara	273	50	323	15.5
Lidang	317	20	337	5.9
Lingti	-	10	10	100.0
Lossar	880	30	910	3.3
Morang	117	200	317	63.1
Pangmo	530	95	625	15.2
Quling	359	20	379	5.3
Rama	103	-	103	0.0
Rangrik	588	280	868	32.3
Saling	88	-	88	0.0
Sanglung	15	-	15	0.0
Shego	310	50	360	13.9
Sumling	334	20	354	5.6
Tashigang	97	-	97	0.0
Neketh kowang	-	450	450	100.0
	13,273	2,333	15,606	14.9

Agricultural crops and practices

The primary crops in Spiti were barley as the staple cereal, and some black peas and buck-

BACKGROUND INFORMATION

wheat, with some wheat also grown in lower areas. Over years this has changed to a crop dominated by the cash crop of green peas in over half of the total acreage under cultivation (51%), with barley contributing 42% and wheat (c. 6%) (Table 2.7). The cropping patterns however differ substantially across different panchayats of the landscape (Table 2.7). Green peas occupy over half of the acreage in most panchayats, and in some like Tabo and Gyu, it is as high as 70%.

Table 2.7. Area	(Ha.) under	different crops across	13 Panchayats	(2009): (data from the
Revenue dept.,	Kaza)			

Panchayat	Barley	Peas	Wheat	Total	% Peas
				cropped area	to Total
					cropped area
Demul	37	31		68	45.6
Dhankar	31	30	24	85	35.2
Giu	6	21	3	30	70.0
Hull	25	61		86	70.9
Kaza	35	32		67	47.8
Khurik	57	60		117	51.2
Kibber	79	88		167	52.7
Kungri	40	37		77	48.1
Lalung	23	25	11	59	42.4
Langza	26	23		49	46.9
Losar	71	71		142	50.0
Sagnam	45	44		89	49.4
Tabo	13	62	35	110	56.4
Total	488 (42.6%)	585 (51.0%)	73 (6.4%)	1146	51.0

As mentioned before most of the land holdings are marginal and small in size as per revenue standards for the state. Almost half of the number (37%) and area (43.5%) of land holdings are held partly in the village of residence and partly in other village(s). A smaller fraction of holdings are entirely outside the village of residence of the cultivators (7.24% by number and 3.15% by area). The dispersal of land in relation to the residence of cultivators is likely an important consideration in the event of any micro-planning exercise. Stakeholders in the village land will need to be recognized at the outset, including those who do not reside there.

2.3.6. LIVESTOCK HUSBANDRY

Rearing livestock is the second of the two major economic activities of people. Pastures sur-

rounding the villages provide grazing ground for the livestock. According to 2003 livestock census, Spiti holds a livestock population of 21,910 heads and the composition varies across the landscape (see Table 2.8). Sheep and goat are the dominant component constituting 65% of the livestock population. Cattle comprising yak-cow hybrids (dzo for male and dzomo for females) and cows are the next significant group. Yaks and horses although low in percent representation (3.68% and 2.77% respectively) are highly valuable. The indigenous horse breed called the chumurthi are highly valued and are an important part of the trade with Changpa's of Ladakh and other areas of the Himalaya (see also section on agro-biodiversity above). Horses also have a ritual significance and in many villages they may not be used for any work. Overall, sheep and goats form the key constituents of the herds and their share ranges from a low of 50.6% in Khurik Panchayat to a high of 83.2% in Gyu Panchayat (see Table 2.8). The distribution of livestock is not uniform across the landscape and there are areas, which clearly specialize in some species e.g. Kibber panchayat holds 31.4% of all the yaks and 22.6% of all the donkeys in Spiti. Sagnam panchayat rears 37.7% of all the horses (see Table 2.8). Sheep and goats are mainly reared along the Kibber-Langza plateau and downstream villages such as Shego and are usually very few along all the other villages (Figure 2.9 a,b). These usually relate to local conditions and traditional trade ties. The more lush areas of the Kibber plateau and Pin Valley allow rearing of yaks and horses, respectively. The need for donkeys in Kibber has grown with increased tourism opportunities for the Parangla trek.

Stocking Density:

The purpose of this component was to understand the spatial intensity of use of the Upper Spiti Landscape (c. 3,000 sq.km.) by the villagers for herding livestock and biomass extraction for (fuel, fodder, building materials and other 'forest produce').

What is presented here related to the data gathered regarding the livestock use intensity. Intensity here is measured by not just the number of animals using a unit area (density), but an index that is corrected for net consumption of forage by different livestock types and again corrected for duration of stay. Hence as per calculations explained below, 10 yak in a 1 sq.km pasture consume 5 times more biomass than 10 sheep grazing in the same pasture. That is, the yaks, horses, cows, etc are all converted into equivalence of sheep, or sheep units (SU) using a consumption estimate. By correcting for duration of use we say that 10 sheep grazing in a 1 sq.km. pasture for 2 months have double impact compared to if they were using it only for 1 month.

General Methods: The team conducted group interview surveys in all the 26 villages of the Upper Spiti Landscape. Village elders, village Lambarder (headman), village livestock herders and other villagers were requested to attend these meetings. In the group interview survey we requested all the people present to map their dependence on their surrounding area on a chart sheet (resource mapping). As a first step all the natural landmarks, such as streams, rivers, ridge-lines, cliffs, villages, hamlets were marked. Using this reference resource use such as live-

MANAGEMENT	PLAN F	FOR UF	PPER SP	ITI LAN	DSCAPE

9.7

 $\begin{array}{c} 11.4 \\ 9.2 \\ 2.5 \\ 3.9 \\ 3.9 \\ 3.9 \\ 4.9 \\ 5.4 \\ 5.4 \\ 8.9$

 $\begin{array}{c} 7.9 \\ 8.4 \\ 8.4 \\ 3.5 \\ 3.6 \\ 3.6 \\ 3.6 \\ 3.6 \\ 8.3 \\$

 $\begin{array}{r} 6.8 \\ 14.2 \\ 4.2 \\ 3.2 \\ 3.2 \\ 3.5 \\ 3.5 \\ 3.5 \\ 3.5 \\ 4.3 \\ 4.3 \\ 3.1 \\ 6.8 \\ 13.8 \end{array}$

 $\begin{array}{c} 6.1 \\ 1.3 \\ 1.3 \\ 0.7 \\ 0.7 \\ 0.7 \\ 0.7 \\ 0.9 \\ 0.9 \\ 3.3 \\ 3.3 \\ 3.7.2 \\ 3.7.2 \\ \end{array}$

 $\begin{array}{c} 8.5 \\ 7.6 \\ 2.3 \\ 8.2 \\ 8.2 \\ 3.3 \\ 3.3 \\ 3.3 \\ 3.3 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 5.9 \\ 5.9 \end{array}$

 $\begin{array}{c} 7.4 \\ 9.7 \\ 9.7 \\ 4.1 \\ 3.8 \\ 3.8 \\ 8.9 \\ 8.9 \\ 8.9 \\ 8.9 \\ 3.8 \\ 3.8 \\ 3.8 \\ 3.8 \\ 3.8 \\ 7.9 \\ 11.9 \end{array}$

14.4 2.2 6.4 5.5 7.3 9.7 9.7 9.7 3.4 5.7 5.7 5.7 5.7 5.7 5.7

 $\begin{array}{c} 14.16\\ 2.18\\ 7.07\\ 7.32\\ 7.32\\ 7.32\\ 9.20\\ 9.20\\ 9.20\\ 8.86\\ 8.86\\ 8.86\\ 8.86\\ 11.36\\ 12.73\\ 6.00\\ 6.00\end{array}$

Kibber Kungri

Lalung Langza

Khurik

Kaza

31.4 6.3 16.8 10.4 5.6

Gaat Gaat Gaat Coat C

 $\begin{array}{c} 0.1 \\ 2.4 \\ 0.0 \\ 0.5 \end{array}$

19.6

6.6

6.3

7.1

9.2

7.5

6.2

6.6

8.3

6.0

0.1

6.0

6.45

Tabo

Sagnam

Losar

Grand Total

14.3

5.6 10.9 2460

14252

5198

21910

1852

608

6905

7347

806

4392

9760 sq.km

14,857 sq.km

(Nos.)

11.2

65.1

23.7

8.5

2.8

31.5

33.5

3.7

20.1

of total

%

holding

3.1 2.9

7.3 3.5 2.6

8.4

9.0

9.4

1.2 **YeX**

Dhankar

Gyu Hull

Demul

Equines

sbirqs)

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lotal

Donkeys

Horses

dəəys

Sattle

(%) sbnslands (%) $\left| \begin{array}{c} \infty \\ 4 \end{array} \right|$

Panchayat

Pastures and

4

2

stock grazing, animal stocking pens, areas reserved for extraction of fodder grass for storage for winter use were also marked on the base resource map. Information on seasonality, number of livestock and duration of each resource use was also added to the sheet (eg. a particular pasture is used to collect Eurotia in August-September, or graze horses for the months from September to November and for grazing cows in February).
The group was also interviewed on the livestock holding of the village. Data were recorded for number of goats, sheep, cow, donkey, cow-yak hybrids, horses and yaks in the village. Use of each pasture was then noted by the number of livestock (type wise) sent there and for their duration of use. These data were then translated onto a topographic sheet and finally digitised on a digital elevation model of the region using ARC GIS. While digitizing, we marked all the

duration of use. These data were then translated onto a topographic sheet and finally digitised on a digital elevation model of the region using ARC GIS. While digitizing, we marked all the pastures of all the 25 villages in this landscape. Each pasture-polygon was given a value for the number of livestock that grazed in that particular pasture and a value for the duration of their stay.

ence is given in the table below:						
Livestock type	Body wt. (kg)	Metabolic equivalent (Body weight 0.75)	SU (ratio with sheep)			
sheep/goat	35	14.390	1			
yak	298	71.724	5			
cow	200	53.183	4			

62.494

29.220

248

90

horse

donkey

We used data on forage consumption by each livestock species from Foose (1988) to convert abundance of each livestock species to a sheep unit (henceforth SU). The conversion equivalence is given in the table below:

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Figure 2.9: a) Village-wise goat population in the Upper Spiti Landscape villages. Data based on assessments made by survey team during 2008.



Figure 2.9: b) Village-wise sheep population in the Upper Spiti Landscape villages. Data based on assessments made by survey team during 2008.



Figure 2.10: Stocking density of sheep, goats, cattle and donkeys in the Upper Spiti Landscape. (herded livestock) The figures are in Sheep Unit months per sq. km, thus incorporating the duration of grazing also in the value. Sheep units are based on forage biomass consumption calculations by Foose (1988). The pastures, livestock numbers and duration of stay were assessed & marked using resource mapping.



Figure 2.11: Stocking density of sheep and goats belonging to migratory gaddi herders using the Upper Spiti Landscape in June to Sept. The figures are in Sheep Unit months per sq. km, thus incorporating the duration of grazing also in the value. Sheep units are based on forage biomass consumption calculations by Foose (1988). The pastures, livestock numbers and duration of stay were assessed & marked using resource mapping.



Figure 2.12: Stocking density of yaks in the Upper Spiti Landscape. The figures are in Sheep Unit months per sq. km, thus incorporating the duration of grazing also in the value. Sheep units are based on forage biomass consumption calculations by Foose (1988). The pastures, livestock numbers and duration of stay were assessed & marked using resource mapping.



Figure 2.13: Stocking density of horses in the Upper Spiti Landscape. The figures are in Sheep Unit months per sq. km, thus incorporating the duration of grazing also in the value. Sheep units are based on forage biomass consumption calculations by Foose (1988). The pastures, livestock numbers and duration of stay were assessed & marked using resource mapping.

Figure 2.14: Stocking density of all livestock together in the Upper Spiti Landscape. The figures are in Sheep Unit months per sq. km, thus incorporating the duration of grazing also in the value. Sheep units are based on forage biomass consumption calculations by Foose (1988). The pastures, livestock numbers and duration of stay were assessed & marked using resource mapping (for livestock spp. wise values, pl. see Figure 2.10 to 2.13) a)



b) Village wise stocking density (SU months/ sq.km). This accounts for all pastures used by each village





they are left free for grazing for over six months a year and are stall fed through most of winter on farmland residue and fodder collected from pastures. The pastures used for yaks and horses were usually more open and further away from the villages.

Looking at all the species together (Figure 2.14), villages located away from the main highway going along the valley bottom (on the plateau - Kibber, Chichim, Langza, Hikkim, Komik, Demul and the Lingti valley – Lalung) have a much higher livestock density. The right bank of Spiti River is poorly stocked partly due to generally high ruggedness of this region (Figure 2.14). Also, the villages along the right bank are mostly along the main highway with higher development, green pea cultivation and employment, and consequently, lesser livestock. The areas near Langza, Kibber and Lossar clearly are the grazing 'hotspots'. Pasture stocking density in areas around Lossar village (Pilung-Kabji-Kunzam la) are also very high due to livestock grazing by nomadic gaddi grazers (Figure 2.11 & 2.14a). These 8-10 groups of herders with over 15,000 sheep & goats arrive in the area from lower parts of Himachal (Kullu, Kangra regions) and use the area from spring through summer based on lease agreements with the Lossar villagers and use pastures spread over c. 230 sq.km. The entire mid to upper Lingti valley (c. 350 km²) is used only by some 75 yaks from Lalung village and is one of the least stocked areas in the entire landscape (Figure 2.12, 2.14). Similarly, close to 1/3rd of the grazed part of the landscape clearly were under low intensity grazing (Figure 2.14).

Intensity of grazing of the herded livestock varied across the landscape much more compared with the other groups and varied from very low values to nearly 400 SUM/sq.km. Horses and yaks on the other hand, had patchy occurrence along the gentler left bank areas of Spiti, and were uniformly in the lower grazing intensity classes (< 50 SUM/sq.km.).

Sheep, goats, cattle and yaks are mostly consumed internally and are an important source of protein for people, particularly in the long high altitude winters. Dzo's and yaks are used for draught, donkeys and horses are used for threshing and transportation. Since agricultural mechanization is just beginning to catch up in places, animal power remains critical for agriculture. Dung from cattle, yak and equids are an important source of fuel for people. In fact dung is so important in the rural lifestyle that the community regulates collection of dung from pastures.

A defining feature of agriculture in Spiti is the high usage of Farm Yard Manure (FYM). The FYM is mainly composed of human waste and to a lesser extent of animal dung, but the proportion varies across the landscape considerably. An indication is provided by comparing the district and state level FYM usage statistics, 96% of the gross cultivated area was treated with FYM in Lahaul & Spiti as against 67% in the entire state. The FYM input is 7.24 metric tonnes per hectare as opposed to 4.4 metric tonnes per hectare of the gross cultivated area for the entire state. This translates to 590 kg of FYM per bigha (a Spiti bigha being 0.08 hectares

or 12.35 bighas in a hectare) and 796.5 kg per holding, average holding size being 1.35 hectares. Food-grains average 5.31 metric tonnes per hectare and vegetables a high 11.19 metric tonnes per hectare.

The agricultural residue is used as fodder for livestock in winter, thus providing critical resources in a season of resource crunch. This leads to a close association of animal husbandry and agriculture. This interdependence is likely to be a major consideration in any attempts to reduce livestock numbers (loss of fuel and manure maybe unacceptable) or to bring about a change in cropping pattern (crops yielding low amount of fodder maybe unacceptable).

2.3.7. UTILIZATION OF NATURAL RESOURCES:

The inhabitants of Spiti have led an agro-pastoral existence in which they depend heavily on local resources for fuel, fodder, construction material and other non-timber produce such as medicinal plants. The patterns of such dependence varies across the landscape (Table 3.4b). This was obtained by interviewing key informants from a sample of 29 villages to assess the species-wise household level and village level extraction. While these figures may not be coarse estimations, it is believed that the patterns they show are of use to understand relative extraction of villages and importance of species for fuel, fodder, etc.

Fodder:

Fodder is primarily extracted in autumn from designated pastures for winter stall feeding of all species of livestock. Horses and yaks, as also other smaller stock can be also left close to villages during winter if weather permits. Agricultural residue and plants growing on agricultural bunds are also harvested during autumn and usually constitutes greater bulk (77%) of total collection verses the collection from the rangelands (33 %, Table 3.4b). Typically households extracted an average of 778 kgs from the pastures compared with 1,768 kgs obtained from agricultural fields. The patterns of such extraction differed between villages and villages such as Rangrik (62%), Tabo (58%), Demul (56%) and Lossar (56%) depended proportionately more on pastures.

While extraction of species for fodder also differed between villages depending on the rangeland features and livestock composition, a relative overall picture of fodder extraction in 29 sample villages of Spiti is available in Table 3.4c. Twenty-three species were listed as important for fodder, excluding the cultivated ones, and among these *Trigonella sp., Cicer sp., Aconogonum sp.*, and *Festuca sp.* constituted the bulk collected from the pastures.

Table 2.9. Tourism related infrastructure in the Upper Spiti valley (Source: Key informant interviews in Oct-Nov 2008, pl. see text for details)

Panchayat Village		# Hotel Average		# Home	# Restaurant	# Taxi
	name		rent	stay		
Kibber	Chichim	1	100	0	0	1
Lossar	Chichiong	0	Na	0	0	0
Demul	Demul	0	Na	5	0	3
Kibber	Gaitey	0	Na	0	0	
Hal	Hal	1	200	0	0	4
Lossar	Hansa	0	Na	0	0	0
Langza	Hikkim	0	Na	0	0	0
Langza	Kaumik	0	Na	4	0	0
Kaza	Kaza	24	300	0	20-40	6
Kibber	Kee	0	Na	0	0	3
Khurik	Khurik	0	Na	0	0	6
Lossar	Kiamo	0	Na	0	0	0
Lossar	Kiato	0	Na	0	0	1
Kibber	Kibber	5	100	0	5	1
Lalung	Kibri	0	Na	0	0	0
Lalung	Lalung	1	100	1	0	2
Langza	Langza	0	Na	5	0	2
Lalung	Lara	0	Na	0	0	0
Demul	Lidang	0	Na	0	0	2
Lalung	Lingti	0	Na	0	0	1
Lossar	Lossar	0	Na	0	6	3
Hal	Morang	0	Na	0	0	0
Demul	Nakshung	0	Na	0	0	0
Hal	Pangmo	0	Na	0	0	2
Kaza	Quelling	0	Na	0	0	0
Lalung	Rama	0	Na	0	0	0
Khurik	rangrik	1	800	0	7	0
Kaza	Shego	0	Na	0	0	0
Khurik	Sumning	0	Na	0	0	1
Kibber	Taashigang	1	100	0	0	0

Na : Not applicable

Fuel wood:

In the past two decades the Government has covered all villages of Spiti under the supply of LPG cylinders. Further the Forest Department provides fuel wood at subsidized rates to all households up to a maximum of 1000kg per household. The traditional requirement of local fuel collection however remains, although it may have declined in patches. Apart from cooking, fuel is required for warmth's during the long winter months when temperatures mostly remain sub zero, at places touching a minimum of -40 degree Celsius. On an average each household in Spiti appears to use c. 625 kgs of fuel wood from 12 species. The per household collection in villages like Kiato (2000kg), Lalung (1950kg) and Rama (1830kg) are relatively high (Table 3.4b).

Caragana sp. (33%), *Lonicera sp.* (16%) and *Salix sp.* (12%) constitute over half of the collections from the pastures for fuel wood (Table 3.4c). Apart from wood, people also collect considerable quantities of cattle, yak and equid dung for fuel.

Other non-timber produce:

Many woody species of plants are used for construction of traditional mud brick houses. The larger boles for the roof are usually obtained from outside or local poplar and willow plantations. The multi-layered roof is lined with bushes and other plants, especially along the edges. Many of these serve as protection against erosion and seepage due to water flow and snow melt, but also serve as emergency fodder and fuel on occasions. The overall requirement of fuel wood per household from pastures appears to be 516kgs in Spiti, and villages like Kiato (1722kgs/household) and Rama (1650kgs/household) extract relatively high quantities of fuel wood (Table 3.4b).

The pattern of species use is similar to that for fuel wood with *Lonicera sp.* (37%), *Caragana sp.* (27%) and *Salix sp.* (18%) contributing the most for construction material (Table 3.4c). In some areas *Potentilla sp.* and *Hyppophae sp.* are also extracted in significant quantities for construction of houses.

Extraction of medicinal plants was largely limited in the past to a few amchi or local Tibetan medicine practitioner families in each village. This practice is declining in Spiti with the advent of modern medicine, however the extraction from some pockets (eg. Kaimo, Kibber & Lossar) continues these days, much of which appears to be commercial for serving outside markets. Arnebia or ratanjot is the most important collection (50%), followed by *Codonopsis sp.* (18%), *Gentiana sp.* (9%) and *Dactylorhiza sp.* or salaam panja (5%)

2.3.8. TOURISM

Tourism is the biggest industry in the upper Spiti landscape. Since 1992 when this area was opened for tourism, visitations have increased very rapidly in this region. Mishra *et al.* (2007) estimate about 8000 tourists visiting the upper Spiti landscape every year. Tourism businesses like hotel, restaurant and transport have grown and flourished rapidly and helped the local economy with many villages now catering to tourists (Table 2.9). Six taxi owners in the Spiti taxi union were interviewed to estimate the annual earnings from the business. The estimated net profit for taxi owners during the tourist season is about Rs. 60,000 per season (July to September) while Rs. 30,000 during off season, thus a total annual net profit of Rs. 90,000. Mishra *et al.* (2007) estimate the net profit for hotels outside Kaza to be from Rs. 40,000 to 75,000 annually. Tourism has also opened other job opportunities such as tour guide, trekking guide, cook, camp staff, etc. Earnings through these occupations are substantial contributions to the total family earnings in this region and are beginning to draw people away from the traditional occupation of livestock rearing and traditional farming.

Although there are many tourists visiting this region there is little focus on wildlife tourism. The survey conducted by Mishra *et al.* (2007) found that about 75% of the tourists were drawn to this region by the beauty of the landscape and the monastries, with wildlife tourism almost being nonexistent in this region. Ecosphere, an NGO working towards better livelihood for the people of this region, has started wildlife watching tour packages for tourists but at the moment their is limited response towards this new form of tourism.

Tourism has also benefited from the extensive network of roads in this region. All the villages in upper Spiti landscape are connected by road making cultural tourism an easier option for tourists. Certain roads connecting across villages with high tourism value are especially being constructed for better movement of tourists or example, the Demul-Lalung road.

2.4. INSTITUTIONS IN SPITI

An institutional analysis of the Government and non-Government organizations working in Spiti is provided here. As mentioned in Chapter 1, the Plan is meant for an entire landscape, where multiple stakeholders are operating and have genuine interests in development and conservation too. This section thus intends to profile these institutions so that their roles in development, livelihoods and conservation is recognized, and ways and means explored to leverage their existing programmes to help in conservation of the area, as well as to develop an understanding of their environmentally harmful practices so that a mechanism can be developed to minimize and mitigate them jointly.

2.4.1. ADMINISTRATION AND DEVELOPMENT PLANNING IN SPI-TI.

Tribal areas in Himachal Pradesh, although low in population density are focus of special development approach given their economic backwardness and strategic location along the international border. A major approach in the strategy since 1974-75 has been to target development through evolving Tribal Sub-plans or the Integrated Tribal Development Plan (ITDP). The strategy involved:

a) Identification of development blocks where tribals were in majority for adoption of integrated and project based development approach.

b) Ensuring budgetary allocation and flow of funds from State and Central plan, sectoral outlays, special central assistance (SCA), and financial institutions.

c) Creation of appropriate administrative structure and adoption of appropriate personnel policy.

Spiti falls within one of the five identified tribal development areas. The others are; the entire district of Kinnaur (3 blocks), Lahaul in Lahaul-Spiti district (1 block), Pangi and Bharmour (tehsil Bharmour and sub-tehsil Holi) in Chamba district (single block each). The Government of India has also designated these areas as 'Scheduled areas' under the 5th Schedule of the Indian Constitution that guarantees to indigenous people the right over the land they live in.

Himachal Pradesh allocates 9% of its state plan outlays to the Tribal development department, which allocates the outlays between the different areas. Each area determines it's own priorities, prepares its plan and allocates funds to those schemes that are relevant in the area (in consultation with the Project Advisory Committee headed by the respective MLA's). The division of the 9% state funds between different tribal areas are based on an objective criterion based on 40% population, 20% area and 40% relative backwardness. Spiti subdivision ITDP thus gets a share of 16% from the outlays. ITDP offices are located in each of the five areas headed by state civil service officers for monitoring and evaluation of the projects (ITDP office in Kaza is headed by the Sub-Divisional Magistrate (SDM) for Spiti).

A 'Single Line Administration' has been put into practice in all tribal areas since 1988. In Spiti thus all departments were brought under the control of a single authority in the area, the Additional District Commissioner (ADC). He is the head of department of all the departments functional in Spiti and has full powers of administrative approval and financial sanction for all departmental works. The Integrated Development Projects also benefit from Project Advisory Committees formed in each area. The committee "looks after formulation, implementation and review of the plan and dispensation of the nucleus budget". It is headed by the local Hon'ble Member of the Legislative Assembly and it's members include the Hon'ble Member

of Parliament of the area, Chairman and vice-chairman Zila Parishad, Chairman Panchayat Samiti's, one elected member of Zila Parishad, two Gram Panchayat Pradhans nominated by the chairman ITDP, members of the Tribal Advisory Council (TAC's), all heads of offices of projects. The ADC, in case of Spiti is the vice-chairman of the committee. The project officer ITDP is the member-secretary of the committee. At the state level Tribal Advisory Council advises and oversees the implementation of the Tribal Sub-Plans.

2.4.2. PRIMARY ORGANIZATIONS AND THEIR ROLES IN SPITI

There are c. 54 Government schemes/departments functional in Spiti, apart from at least four NGOs. As a part of the management planning process, the departments were invited to a workshop in November 2009 in Kaza to understand their mandates, thrust areas and flagship programmes, while also presenting the management planning approach and findings so far. The Addl. DC kindly organized the workshop and the brief proceedings are annexed here (Appendix 2.4). The Departments present at the workshop filled in information on these aspects and the information is presented in Table 2.10. Perusal of the table already shows the significant mandate that the departments carry in order to achieve the goals of effective development in Spiti. Apart from the Government departments, a few local and national NGOs also are helping in conservation and development.

Roads have reached the remote corners of the Sub-Division, thus helping all other means of development that include agricultural marketing and tourism, to reach these remote settlements. There has been a substantial impetus into the Government funding for programmes as discussed in the next section.

The Forest Department is the key custodian of natural resources of Spiti with about three fourths area of the landscape under their jurisdiction. The Department has placed a Divisional Forest Officer in Kaza with a Range Forest Officer in charge of Pin Valley NP, Kibber WLS, Tabo (Pin Valley), Tabo, and Kaza (See details in Appendix 2.6). The DFO is the Director of the Pin Valley National Park (675 sq.km) and the Kibber Wildlife Sanctuary (c. 1,200 sq.km). In 2007 the Himachal State Government converted the entire division into a 'wildlife division' due to the entire regions importance for wildlife and relatively lower significance of traditional forestry practices. This move has made the whole departmental infrastructure available for wildlife conservation purposes and includes over 35 staff.

2.4.3. FUNDING UNDER THE ITDP

A brief analysis of the ITDP funding for Spiti is presented here to understand focal areas and funding priorities, which is based on the Annual Tribal Sub-Plan (2007-08). The Departmental/Scheme-wise detailed activities are summarized in Appendix 2.5 as derived from the above Plan and these go beyond the details presented in Table 2.10. The ITDP has contributed a sum of Rs. 205 crores in the past decade (1996-97 to 2006-07), with an annual average of Rs. 20.5 crores. This, at the current population figure of 10,679 translates into a per capita expenditure by the Government of c. Rs. 19,300 per year. The 54 schemes or departments can be clubbed into 15 sectors as presented in Table 2.11 and include sectors such as Agriculture, Education, Environment, Transport and Welfare.

Sector-wise compilation of allocations under the ITDP clearly show that infrastructure has been the top priority of the Government in terms of funding taking up close to 1/3rd of the total decadal expenditure (Table 2.12). Annual allocations have differed, but the top five or six sectors have remained almost common through out. Agriculture and allied fields have taken close to 12%, followed by Education (9.5%) and Welfare (8.9%) schemes. Environmental works are given substantial priority using about 7% of the funds, and in some years such as 1998-99 and 1999-2000, this sector has been only second to infrastructure in terms of allocations. The BADP and other central funds are used for a variety of crosscutting developmental goals and is second to infrastructure in most years, as also for the decadal allocation. But as mentioned, such programmes contribute to agriculture, soil conservation, infrastructure, and others and are thus somewhat separate in scope compared with the other departments.



Table 2.10: Information on Line Departmental mandates collected through a discussion workshop in November 2009 and personal interviews with concerned officials.

Sr.	Depart-	Mandate	Thrust areas	Flagship Schemes			
No.	ment						
1.	Desert De- velopment Program	• All schemes at watershed level development (mainly water and soil conservation related)	 Water Resource Development, Soil conservation, Horticulture and pasture development. All Spiti at watershed level (works with watershed committees. 	 Water Resource Development - Tank canal construction. Soil conservation – Land development, check dam construction. Horticulture development – apple and poplar plantation in lower valleys. Pasture development. – (unclear, but from discussions it emerged that it mainly entails in diverting water to pastures) Artificial glaciers (Snow harvesting) in Tashigang and Getey. 			
2.	Block De- velopment Office	 Implementation of various devel- opment schemes for alleviation of poverty and em- powering people to have sustainable livelihood. Encouraging and implementing decentralized plan- ning 	 Development of infra- structure in rural areas Generation of employ- ment and poverty al- leviation Providing basic ameni- ties like drinking water and sanitation Land development and water/snow harvesting 	 National Rural Employment guarantee scheme (NREGA) Swarnjayanti Gram Swarozgar Yojna Indira Awas Yojna Total Sanitation Campaign Tribal Sub-plan Drought Area Development Program Integrated Watershed development program 			

BACKGROUND INFORMATION

Sr. No.	Depart- ment	Mandate	Thrust areas	Flagship Schemes			
3.	Sarva- Shiksha Abhiyan	 Universalization of elementary educa- tion 100% enrolment of school going age children 100% retention, zero dropouts To provide quality education, improve infrastructure and innovative schemes 	• All Primary, Middle, Higher and senior sec- ondary schools	 Provide Teacher training. Community mobilization Yoga education to all physical education teachers Exposure tours, health hygiene, First aid Training to all school children. 			
4.	Revenue Depart- ment	 Five yearly surveys for updating Land records. Yearly surveys for recording area un- der different crops Providing "Nau- tod" land to people 					
5.	Health and Fam- ily Welfare (BMO office)	 Proper disposal of Biomedical waste 100% coverage of children in Village panchayats Family welfare services through camps 	 Prophylactic & Preventive aspects of disease control Immunization program for control of communicable diseases Family welfare program Referral services Janani Suraksha Yojna Sanitation program 	 National Rural health Mission National (Universal) pro- gram of immunization Family welfare program Janani Suraksha yojna Rogi Kalyan Samiti in various institutions in Spiti 			



Sr.	Depart-	Mandate	Thrust areas	Flagship Schemes			
No. 6.	ment Animal Husband- ry	 Genetic improvement of livestock Improve Health Status of Livestock To keep animals disease free 	 Genetic improvement of livestock for milk production Availability of feed and fodder Prevention of major outbreak of diseases 	 Shepherd Insurance program Provision of feed in 100% freight subsidy. Provision of fodder seed in 50% subsidy 			
7.	Agricul- ture De- partment	 Increase agricul- ture production. Provision of new agricultural technologies and agricultural imple- ments. Promotion of organic fertil- izer material such as Gobar khaad (dung compost) and Kechua Khaad (vermicompost). 	 Promotion of improved seeds. Promotion of new irrigation techniques, such as sprinkler and drip irrigation 	 Distribution of improved seeds and new technologies in agricultural implements. Promotion of organic agriculture. Laghu Sinchai Yojna (micro irrigation project) - providing sprinklers, tank, drips etc. Promotion of green fodder and green manure. Promotion of organic fertilizers (Dung and vermicompost) in the place of chemical fertilizers. Awareness campaigns among farmers. Promotion of mixedagriculture. 			
8.	Horticul- ture	 Expansion of area under horticulture Subsidized distri- bution of fertilizers Distribution of Apple 	• Spread apple is all po- tential sites of Spiti	 Horticulture Technology mission Development of Horti- culture Distribution of subsidized horticulture material, ap- ple, apricot (saplings) and irrigation material such as water storage tanks and hose pipes. 			

BACKGROUND INFORMATION

Sr.	Depart-	Mandate	Thrust areas	Flagship Schemes
No.	ment			
9.	Depart- ment of wildlife	 Improvement of wildlife habitat Afforestation of degraded areas Reafforestation of medicinal herbs/ shrubs Providing fuel- wood on subsi- dized rates 	 Raising of fodder and medicinal plant nursery Afforestation, Enrich- ment, Reafforestation to substitute fuel and fodder. Improvement of wildlife habitat by constructing water pond, water har- vesting structure, repair of path bunkers, saltlicks etc. 	 Improvement of tree cover. Raising of medicinal/fodder spp. Soil conservation works. Intensive management of Wildlife Sanctuary and national park. Development of Sanctuary and National parks. Forest protection. Development of pastures.
10.	Him Urja	• Providing alternate sources of energy, especially for rural areas	 Micro-hydel projects to provide much needed power in remote areas Popularize use of solar products 	 The Lingti power plant (2 X 200 KW) for Lallung and Pin panchayats Street lighting (c. 100 installed in Kaza, Tabo & Kibber) Free distribution of solar cookers (500 being dis- tributed free in Pin) and 200 to schools across Spiti Six Micro-hydel projects planned, 1.5MW each (Takling, Guru Padma Sambhava, Lobzang Tand- up in Mane, & Saral)
11.	HP State Electricity Board	• Providing power to all parts of Spiti	• Hydro electricity power generation	• Ratang nala power proj- ect (2MW) caters to 63 villages covering 3,240 users)



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Sr.	Depart-	Mandate	Thrust areas	Flagship Schemes	Sr. No	Depart- ment	Mandate	Thrust areas	Flagship Schemes
12.	State Bank of India (SBI)			 Kisan credit card – loans of upto Rs1 lakh at 7% interest (Rs10-15 thou- sand per bigha) Krishak Uthan Yojna – loans upto Rs 50 thou- sand at 7% interest 	16. 1.	Employ- ment exchange NGOs Ecosphere	 Channelize job opportunities "Ecosphere is a 	• Responsible tourism	 Till late 2009, 1,140 people were registered of which 29 (2.4%) had be placed Organizing eco tours and
				 Sahyog Niwas Yojna – loans upto Rs 50 thou- sand at 8% interest Life insurance scheme- entire premium amount is returned after 10 years. 		(www.spit- iecosphere. com)	social enterprise, which is a collab- orative effort of the local community of Spiti and profes- sionals from di- verse backgrounds,	 Organic and natural products from the Hi- malaya that conserves its ecosystem and sustains local livelihoods Conservation: Enabling a more sustainable 	 helping communities set up homestays Help people produce and market organic agricultur- al produce that includes those from seabuckthorn Developing marketable han diaraft and dues from
13.	Public Works De- partment (PWD)	• Develop infra- structure in Spiti	 Construct & maintain roads and buildings in Spiti Implement the Pradhan Mantri Grameen Sadak Yojna (PMGSY) 	 Since the decade beginning in 1999 c. 117 km of new roads have been added (11.7km/year) with about 102 km being metalled (10.2km/year) In the same period 47 residential and 36 non residential buildings have been added at an average rate of c. 9 per year 			 with a wide spectrum of skills and experience, effectively spanning the bridge from the general to the niche. Our focus is to create sustainable livelihoods that are linked to nature 	 future by linking local economies, conservation and development Handicrafts develop- ment: From 'thangka' paintings on silken canvas, 'zama' with local clay to woolen handi- crafts with natural dyes. 	 handicraft produce from Spiti to augment house- hold incomes Leverage income genera- tion to help in conserva- tion works
14.	Khadi Bhandar	• Popularize khadi products and help sale of local pro- duction		 Local production has had limited success, but a Sheep Wool Centre is present in Kaza Sale of products has been on an average Rs. 3.36lakhs annually since 2005 			and culture conser- vation. As a social enterprise it is our mandate to address the triple bottom- line of conserva- tion, development and economies"		
15.	Postal de- partment			• 3 sub-post offices each in Kaza, Sagnam and Tabo serve the entire landscape	L		1	1	·]

Sr.	Depart-	Mandate	Thrust areas	Flagship Schemes
No.	ment			
2.	Pragya		• Conserving the Herbal	
	(www.pra-		Wealth of the Himalayas	
	gya.org)		• Promotion of the Cul-	
			tural Heritage of Hima-	
			Dan Iribes	
			• Kenewable Energy & Water Technologies for	
			the Himalawas	
			• Heritage Based Liveli-	
			hoods in the Eastern	
			Himalayas	
			• Enhancing Capacities of	
			and Opportunities for	
			Mountain Women	
			• Education & Informa-	
			tion Services in High	
			Altitude Himalayas	
			 Endogenous Mecha- 	
			nisms for Health &	
			Sanitation in Remote	
			Areas	
			Pragya Policy Research	
			• Empowering Indigenous	
			Community in the Ne-	
			pai Himalaya	
3	World	• Conservation and	• Responsible tourism in	• WWF is collaborating
5.	Wide	awareness genera-	Spiti	with Ecosphere to under-
	Fund for	tion in India	I	stand tourism in Spiti,
	Nature			and its possible future
	(WWF			course to make it environ-
	– India)			ment and culture friendly.
	(www.			NCF is also providing
	wwfindia.			some technical support to
	org)			this programme

BACKGROUND INFORMATION

Sr. No.	Depart- ment	Mandate	Thrust areas	Flagship Schemes
4.	Nature Conserva- tion Foun- dation, Mysore (www. conserva- tion.in)	• Promote knowl- edge based conser- vation in India	 Focused quality research on ecology & human society Develop effective conservation models, especially using local support Spread awareness about wildlife and environ- mental conservation Help improve local capacity, planning and implementation of con- servation works 	 Developing snow leopard & prey species monitoring protocols Understanding and managing people-wildlife conflicts Developing models for maintaining socially fenced areas for conserva- tion Awareness programmes directed at school chil- dren, teachers and youth Helping in conservation planning and implemen- tation (this management plan)

Table 2.11: The Government Schemes/ Departments clubbed into 15 sectors as per the nature of their works.

Sr.No.	Sector	Scheme/department				
1	Agriculture & allied	Agriculture				
		Horticulture				
		Irrigation				
		Minor Irrigation				
2	Animal Husbandry &	Animal Husbandry				
	allied	Fisheries				
3	Central	Border Area Development Programme				
		Desert Development Program				
		Special Area Development Authority				
4	Disaster	Flood Control				
5	Cooperatives and Indus-	Co-operation				
	try					
		Industries				



Sr.No.	Sector	Scheme/department					
6	Education	Education-Primary					
		Education-Secondary					
		Elementary Education					
		Information & Publicity Public Library					
		Technical Education					
7	Employment	Employment Assurance Scheme					
		Jawahar Rozgar Yojna					
8	Energy	Energy					
		Himurja, Integrated Rural Energy Pro-					
		gramme					
		Power					
		Rural Electrification					
9	Environmental	Forest & Wildlife					
		New & Renewable Sources of Energy					
		Science & Technology					
		Soil Conservation					
		Soil Conservation-Agriculture					
		Soil Conservation-Forest					
10	Governance	Land Revenue					
		Nucleus Budget					
		Panchayats					
11	Health	Allopathy					
		Ayurveda					
12	Infrastructure	Housing-PWD					
		PWD					
		PWD-Non Residential & Residential					
		Road & Bridges					
		Water Supply & Sewerage					
13	Tourism	Mountaineering					
		Tourism					
14	Transport	Civil Aviation					
		Road & Transport					

BACKGROUND INFORMATION

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Sr.No.	Sector	Scheme/department
15	Welfare	Art & Culture
		Civil Supplies
		Community Development
		Public Relation
		Rural Development
		Social Welfare
		Tribal Development Machinery
		Vikas Mein Jan Sahayog
		Welfare For SC/ST
		Youth Services & Sports



Overall	%	34.2) 12.3	3 12.0	5 9.5	8 8.9	9 7.4	4.7	2.7	2.0	1.7	1.4	1.2	1.0	0.9	0.1	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Decadal	total	7,017.49	2,528.39	2,457.68	1,944.5	1,824.83	1,527.09	957.58	548.68	408.50	340.16	285.76	250.80	201.26	185.26	25.00	20,503.0
20 2000	/0-0007	637.46	531.74	377.41	320.27	473.72	107.36	119.14	56.24	7.00	48.30	56.34	43.60	2.00			2,780.58
	00-0007	929.83	266.46	332.09	165.14	175.48	101.20	131.97	58.24	8.00	11.57	62.98	31.60	17.80	32.00		2,324.36
20 200	CU0-1-007	728.06	433.34	262.74	79.75	178.13	60.17	113.14	52.53	7.00	30.74	24.27	29.00	13.35	33.11		2,045.33
2002 0.6	+0-C007	721.06	167.29	293.10	76.11	126.37	74.23	101.59	48.50	1.00	19.39	11.65	41.00	25.90			1,707.19
2002 03	CN-7007	929.31	475.15	398.37	282.07	112.91	169.67	82.95	73.96	5.00	30.63	18.18	31.00	20.88			2,630.08
	10-0007	814.40	322.21	214.51	354.42	181.75	208.20	94.94	66.75	13.00	40.42	24.56	25.00	20.00	14.80		2,394.96
1000 2000	0007-6661	840.14	168.60	172.98	213.26	203.08	300.32	108.57	51.81	23.50	57.87	21.86	15.00	25.00	20.00		2,221.99
1000 00	1770-77	644.35	151.00	181.48	163.94	98.89	262.14	90.14	55.17	22.50	34.48	21.43	15.00	15.50	28.00		1,784.02
1007 00	06-/661	475.30	7.00	142.84	157.73	137.10	139.35	72.61	44.57	10.00	38.70	23.76	10.00	34.33	44.00	25.00	1,362.29
1006 07	16-0661	297.58	5.60	82.16	131.86	137.45	104.45	42.53	40.91	311.50	28.06	20.73	9.60	26.50	13.35		1,252.28
L Control	Jector	Infrastructure	Central	Agric. & Allied	Education	Welfare	Environmental	Health	AH & allied	Transport	Governance	Economy	Disaster	Tourism	Energy	Employment	Grand Total

MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE



3.1. A BRIEF SOCIOECONOMIC SYNTHESIS OF THE UPPER SPITI LANDSCAPE

The human population density of Spiti has been low, remaining below one person per sq. km since independence. In terms of absolute numbers however, there has been a substantial increase in the population from merely *c*. 2,272 in 1868 (Harcourt 1871), to c. 10,600 in 2001, with a decadal growth rate of 11.3% that is over half the national average for the same period (19.4; India Census, 2001). The population is said to have doubled in the period from 1951 to 1981 as per Sanan & Swadi (2002). Higher population growth in recent decades is probably due to better survival, lower death rates, and higher number of households as a result of breakdown of the polyandrous system (Mishra 2000). The population density, however, continues to be relatively low due to the harsh environment that limits agri-

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cultural land, pastures and other common-use resources (Bhatnagar 1996, Mishra 2000). It is important to note here that for Spiti, where over half the landscape is permafrost prone above 5,200m or consisting of large rocky mountains, the actual usable areas are limited. Assessments show that in the 3,944 sq. km Upper Spiti Landscape, only *c*. 900 sq. km (23%) can be classed as pastures, while a fraction (35 sq. km, 0.9%) consists of moister areas. Merely 1,800 ha or 18 sq.km. (0.24% of geographical area) is recorded as arable land in the whole of Spiti in the Government Revenue records. If we take this actually available land (900sq.km) into consideration, then the human density is considerably higher (11/sq. km). Spiti has a healthy sex ratio close to one and large proportion of the population (*c*. quarter) consists of minors (< 15 yrs), indicating a growing population. Further the literacy rate has been consistently improving, and is close to cent percent for the school going age group of 5 to 18 years.

3.1.1. A BRIEF NOTE ON AGENTS OF SOCIAL CHANGE IN SPITI:

Since the 1960's the government has been bringing in considerable programmes and funds to improve the livelihoods and standard of living of the local population under direct central funded programmes such as the Desert Development Programme (DDP), the Border Area Development Programme (BADP), and the Integrated Tribal Development Programme (ITDP) (see Section 2.4). These have led to almost all villages getting connected by roads, electricity and recently, by mobile or WLL phone connectivity. These Government programmes have been a major vehicle of change in the landscape that have provided better amenities such as food (through PDS), communication, employment, education, health and fuel, mostly at subsidized rates. Apart from these, two other major agents of change have affected the local population - one is the opening up of the green peas cash crop market in the mid-1990's that has now grown to a c. Rs. 1.8 crore economy (Table 3.1; see also Table 3.2 for the changes in acreage of peas and apple versus other crops over the past decades), and the second is the opening up of the area to tourism in 1992. Both these agents have further provided cash income that has helped in improving livelihoods in the region. It can be noted here that the marginal and small holdings growing green peas has grown at a remarkable rate of 133% and 77%, respectively, over a decade from 1996 (Table 3.2b), indicating that the small and marginal farmers are taking advantage of the new option. In recent years the lower parts of Spiti are in addition able to take advantage from apple cultivation, which is becoming quite remunerative. An optimistic estimate from the region that has c. 8 ha (of fruiting trees) under apple cultivation, the total yield is close to 2,400 kgs with an economy of c. Rs. 1.8 lakhs (Table 3.1). A direct assessment of households in Tabo and Pho, that have a substantial proportion of apple growers from Spiti, indicates a much higher economy at Rs. 34 lakhs. Green peas and apples have thus provided completely new and substantial income sources to the local population in the past two decades amounting to over Rs 1.8 crores translating for green peas alone into a per capita income of c. Rs. 1,700 or a per household income of Rs. 6,800 given an average size of four. Although the incomes through these means are spread unevenly across different villages and households, this provides a substantial proportion of household income. In the state's context it provides *c*. 5% of the per capita income of Himachal Pradesh (Estimated at Rs. 36,783 (http://www.himachalpr.gov.in/hpglance.asp)). Thus, along with better employment and tourism, local incomes in Spiti have enhanced in the recent years due to the cash crops.

Table 3.1: Estimated contribution to local economy by the two primary cash crops of Spiti, green peas and apple (area figures are from Revenue records for 2009 and average production and value are based on a) Krishi Vigyan Kendra, Lahul & Spiti).

Cash Crop	Area (ha)	Yield (kgs/ ha)	Total pro- duction (kgs)	Price/ kg	Total cost of production (Rs)
Peas (2009)	585	1098	642,330	28	1,79,85,240
Apple (2009)	8	300	2,400	52	1,24,800
					1,81,10,040

b) Production and earnings from apple from a sample of 50 households in Tabo and 43 in Pho in lower Spiti (Sham) area.

Village	No. boxes (20 kg/box)	Production (Kgs)	Total earnings (Rs)	Earnings per Household (Rs)
Tabo	2,431	48,620	25,28,240	50,565
Pho	905	18,100	9,41,200	21,888
Total	3,336	66,720	34,69,440	

The livestock wealth in the landscape has also constantly increased from close to 18,000 in 1977 to over 21,000 in 2003 (Table 3.3a,b). Villagers in Spiti usually rear a combination of livestock types to meet different purposes and to safeguard against environmental risks (Mishra 2002). They use the larger bodied yaks and dzsos for draught, wool and meat, local and hybrid cows for milk and meat, while horses and donkeys are used for carrying loads, and agricultural purposes too. Horses are often considered symbols of wealth and were used for ceremonial purposes apart from the thriving trade in their sale in adjacent markets. Sheep and goats are used for both meat and wool. Apart from the Chumurti horses, and to some extent yak, the other livestock are not important for trade, although the relative importance of species for a village could change with changing local needs. For example, with trekking catching up in an area, the demand for donkeys often increases, with the advent of small tractors, the importance of yak declined in some villages. Villagers thus have constantly altered their holding composition depending on their needs and/or local or long distance markets.

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database, nup://agc	census.nic.in/)								
Type	Crop	Area (2001)	% Area	Area (1996)	% Area	Number of Holdings	% of Holdings	Number of Hold-	% of Hald-
		in Ha.	(1007)	in Ha.		(2001)	(2001)	ings (1996)	ings (1996)
Cereal	Barley	520	42.59	512	45.11	1124	38.92	946	40.85
	Paddy					2	0.07		
	Ragi	1	0.08			2	0.07		
	Wheat	84	6.88	149	13.13	249	8.62	239	10.32
Fruit	Almond	1	0.08						
	Apple	55	4.50	32	2.82	83	2.87	92	3.97
	Other fruits	2	0.16	6	0.53				
Oilseed	Rapeseed & Mustard	6	0.74	60	5.29	39	1.35	171	7.38
	Sesame (Til)	4	0.33			11	0.38		
Pulses	Gram	1	0.08			7	0.24		
	Masur	6	0.49	3	0.26	36	1.25	39	1.68
	other pulses	10	0.82	9	0.79			47	2.03
	Urad					2	0.07		
Peas	Peas (Green)	452	37.02	287	25.29	1109	38.40	594	25.65
Potato	Potato	57	4.67	60	5.29	198	6.86	171	7.38
Other vegetables	Brinjal	2	0.16			4	0.14		
	Cabbage	2	0.16	1	0.09	6	0.21	12	0.52

Type	Crop	Area (2001) in Ha.	% Area (2001)	Area (1996) in Ha.	% Area (1996)	Number of Holdings (2001)	% of Holdings (2001)	Number of Hold- ings (1996)	% of Hold- ings (1996)
	Cauliflower	1	0.08			14	0.48		
	Onion					2	0.07		
Others	other veg- etables	14	1.15	14	1.23				
	other cereals			1	0.09				
	other food- crops							5	0.22
	other oilseeds			1	0.09				
Grand Total		1221		1135		2888		2316	

Table 3.2b. Change in Green Peas cultivation from 1996 to 2001 (from Agriculture Census of India database, http://agcensus.nic.in/)

Class	Total number of holdings- 2001	Total number of holdings- 1996	% change (holdings) in 2001 over 1996	Area-2001 (in Ha)	Area- 1996 (in Ha)	% change (Area) in 2001 over 1996
Marginal	519	222	133.78	79	68	16.18
Small	303	171	77.19	129	69	86.96
Semimedium	248	177	40.11	163	130	25.38
Medium	37	24	54.17	41	20	105.00
Large	2	0		7	0	
All land	1339	1366	-1.98	1810	1809	0.06
Net sown all crops				1224	1085	12.81
Fallow				22	80	-72.50
Fallow % of all land				1.22	4.42	

Table 3.2c. Changes in area under different crops across Spiti in the past 25 years. Note the increased % in green pea cultivation post 1995. Also, most peas recorded before mid-1990's included little of green peas, and more of the local black peas.

(data from the Revenue dept. Kaza)

Year	Barley	Barley	Peas	Peas	Wheat	Wheat	Ma-	Ra-	Mus-	Po-	Total
	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	sur	jma	tard	tato	Area
							(Ha)	(Ha)	(Ha)		(ha)
1985	573.00	62.62	232.00	25.36	74.00	8.09			10.00	25.00	915.00
1986	649.00	60.88	255.00	23.92	118.00	11.07			11.00	33.00	1066.00
1987	503.00	48.83	341.00	33.11	113.00	10.97		19.00	16.00	31.00	1030.00
1988	624.00	57.09	319.00	29.19	95.00	8.69			7.00	42.00	1093.00
1989	648.71	58.56	334.57	30.20	56.41	5.09		1.09	10.29	46.99	1107.81
1990	570.49	54.66	343.01	32.87	87.68	8.40	1.00	0.13	5.40	33.63	1043.64
1991	584.17	54.38	362.00	33.70	86.91	8.09	1.38	1.33	8.76	28.12	1074.30
1992	581.37	55.32	344.42	32.77	86.03	8.19	4.00	1.00	9.28	24.87	1050.97
1993	571.66	53.83	363.61	34.24	83.26	7.84	2.00	1.00	11.25	27.98	1062.02
1994	536.00	51.94	362.00	35.08	84.00	8.14	3.00	1.00	16.00	30.00	1032.00
1995	465.00	42.74	487.00	44.76	91.00	8.36	6.00	1.00	16.00	22.00	1088.00
1996	535.13	50.02	390.17	36.47	92.00	8.60	2.00	5.00	17.76	27.79	1069.85

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Year	Barley (Ha)	Barley (%)	Peas (Ha)	Peas (%)	Wheat (Ha)	Wheat (%)	Ma- sur (Ha)	Ra- jma (Ha)	Mus- tard (Ha)	Po- tato	Total Area (ha)
1997	460.00	42.75	468.00	43.49	91.00	8.46		9.00	20.00	28.00	1076.00
1998	552.00	53.49	365.00	35.37	89.00	8.62		8.00	18.00	35.00	1032.00
1999	517.00	48.91	427.00	40.40	81.00	7.66		9.00	23.00	31.00	1057.00
2000	505.00	47.82	463.00	43.84	66.00	6.25	1.00	5.00	16.00	30.00	1056.00
2001	528.00	49.39	474.00	44.34	55.00	5.14	4.00	5.00	3.00	30.00	1069.00
2002	528.00	49.21	474.00	44.18	58.00	5.41	8.00	4.00	1.00	20.00	1073.00
2003	560.00	52.09	447.00	41.58	57.00	5.30	4.00	5.00	2.00	26.00	1075.00
2004	459.00	38.90	665.00	56.36	56.00	4.75					1180.00
2005	544.00	50.56	484.00	44.98	48.00	4.46					1076.00
2006	471.00	46.18	549.00	53.82						13.00	1020.00
2007	496.00	49.01	516.00	50.99						14.00	1012.00
2008	466.00	46.18	543.00	53.82						13.00	1009.00
2009	488.00	42.58	585.00	51.05	73.00	6.37				8.00	1146.00

The Chumurti horses from Pin Valley are considered to be the best, but those from other places also fetch considerable prices (ranging from Rs. 25,000 to 30,000 depending on age and colour). There were *c*. 600 horses in Spiti in 2009 and on an average *c*. 30 are annually traded in the Lavi fair (Rampur Bushair), Ladarcha fair (Kaza) and in Changthang (Ladakh) fetching *c*. Rs. 8.4 lakh (considering an average price of Rs 28,000 for each adult animal sold).

While clear figures for employment are not available, it was reported by respondents that in the past two decades there are more avenues available to youth and others to get employed or self-employed. These opportunities include those in the Government sector such as teachers (including Junior Bachelor Teachers (JBT), opportunities in over 50 Government Departments functional in Spiti, Government contractors, labour in NREGA, and private/self employed sectors such as taxi drivers, tour guides, hotel owners, and hotel staff. The cash incomes and security provided by these jobs often changes the manner in which people depend and use their natural resources. In addition to enhancing incomes tourism in such remote areas is also seen to influence local perceptions of their own lifestyles and the outside world as was noted in neighbouring Ladakh (Anon. 2007).

Figure 3.1: Occurrence patterns of snow leopard conflicts in the Upper Spiti Landscape. This is based on key informant interviews consisting of at least 8-10 members per village.



Figure 3.2: Occurrence patterns of wolf conflicts in the Upper Spiti Landscape. This is based on key informant interviews consisting of at least 8-10 members per village.



Figure 3.3a: The total livestock holdings of 30 villages for which data were available from NCF census in decade 1998 and 2008. The line represents the equality line, i.e. villages above the line have registered an increase and vice versa for those below the line. Most villages below the line are primarily along the main road in the Spiti Valley.



Figure 3.3b: Difference in livestock population in the decade 1998 & 2008. Most villages showed a sharp decline, with some villages showing modest increases. Poh village has shown a drastic change due to increase in small stock.



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3.2. HUMAN IMPACTS - SIGNIFICANT SOCIAL & CONSERVATION IMPLICATIONS OF CHANGES

Studies in Spiti and elsewhere have demonstrated the adverse impacts of excessive livestock grazing on rangelands and consequently on wild herbivores (see Section 8.1.1). The competition often pushes these herbivores to raid crops and a decline in their numbers often can lead the predators to kill more livestock. These trends are now visible in Spiti with increased instances of conflicts getting reported from pockets. Snow leopard conflicts are high in the Kibber-Langza plateau (Figure 3.1), an area that has high stocking density (Figure 2.10 to 2.14). A similar pattern is seen for conflicts with Tibetan wolf (Figure 3.2). As mentioned above, livestock, when grazing at high densities can outcompete wild herbivores (Mishra *et al.* 2004, Namgail *et al.* 2007, Bagchi *et al.* 2004, Raghavan 2004, Bhatnagar et al 2001). In Spiti areas such as the Kibber plateau, have livestock numbers more than double the estimated figures for bharal (Mishra *et al.* 2001). With a general increase in livestock numbers in Spiti as seen since the 1970s till the 1990s, competitive exclusion of wildlife can be expected. The livestock numbers in villages, especially those near the main highway with other employment opportunities, are actually seeing a decline in numbers in recent years (Figure 3.3a,b).

Extraction of resources in Spiti for fuel, fodder, construction material and miscellaneous uses exceeds an estimated 2,077 metric tons. Nearly a third of fuel and fodder is collected from the rangelands. Subsidized fuel from the forest dept. helps meet the remaining requirement and the local agricultural residue meets the balance need for fodder (Section 2.3.7, Table 3.4 a to d).

Development has been a major agenda in the remote Spiti region as noted in Section 2.4 and as a result of this thrust considerable improvement in the standard of living of the people is visible. However, the few clear drawbacks of this appear to emerge from the large numbers of migratory labourers coming into the landscape (close to 10% of the local population; Table 3.5). These poor people have brought in a variety of conservation threats from camping in eco-sensitive sites to poaching and NTFP collection (Table 6.1). Also, a result of the opening up of the area has been the influx of tourists and an increase in their infrastructure. While this again is a positive development there are issues regarding environmentally unfriendly activities related to tourism that are increasing. One important issue is the increase in feral dog population, ostensibly due to the open disposal of large quantities of garbage from restaurants and hotels. These animals that hunt in ferocious packs, have become a major threat to livestock in the vicinity of Kaza (Figure 3.6) and are fast becoming a problem for even wild herbivores (Sharma 2009).

Table 3.3: Kothi and village wise livestock holdings for 1977, 1987 and 2003 as obtained from the Animal Husbandry Dept in May 2010 (for 1977 and 1987). Figures for 1977 are available only at kothi level (3.3a). Data from 1998 and 2008 are based on data gathered by NCF from some sample villages of Spiti (3.3c).

a)			
Kothi	1977	2003	Change
Barji	5196	6786	1590
Choji	2168	2564	396
Gyu	1083	1583	500
Pin	2562	2949	387
Sham	3832	4007	175
Totpa	3140	4021	881
Grand Total	17981	21910	3929 (22% increase)

b)

Kothi	Village	1987	2003	Change
Barji	Chobrang	88	3	-85
	Demul-Khas	335	847	512
	Hikam	434	894	460
	Kaumik	291	435	144
	Kaza-Khas	637	410	-227
	Kuiling	242	601	359
	Kwang	95	180	85
	Lalung	529	631	102
	Langza	520	888	368
	Lara	226	451	225
	Lidang	280	441	161
	Rama	136	308	172
	Sanglung	37	50	13
Choji	Hansa	376	775	399
	Hull	300	299	-1
	Kyamo	259	310	51
	Lossar	583	477	-106
	Pangmo	151	254	103
Pin	Guling	275	155	-120



Kothi	Village	1987	2003	Change
	Khar	102	247	145
	Kungri	203	280	77
	Mudh	273	292	19
	Sagnam	486	746	260
	Siling	73	34	-39
	Tangti-Yongma	364	197	-167
	Tiling	152	375	223
	Tudnam	38	86	48
Totpa	Chicham	814	818	4
	Kee	98	725	627
	Khurik	244	454	210
	Kibber	823	822	-1
	Morang	58	58	0
	Sumling	93	178	85
		9,615	13,721	4,106 (42% increase)

c) Trend between the decade (2008 and 1998) based on data collected by NCF in 32 villages of Spiti (see also Figure 3.3 a & b)

Kothi	Village	1998	2008	Difference
Barji	Rangrik	388	135	-253
	Kuiling	346	112	-234
	Hikam	578	434	-144
	Lara	162	128	-34
	Rama	148	128	-20
	Lidang	171	263	92
	Langza	349	537	188
Choji	Hansa	622	196	-426
	Losar	483	188	-295
	Hull	238	122	-116
	Pangmo	244	153	-91
	Kyato	250	167	-83
	Kyamo	275	216	-59
	Kaumik	199	148	-51

Kothi	Village	1998	2008	Difference
	Kibri	5	9	4
	Shego	83	168	85
Pin	Sagnam	676	549	-127
	Bar	288	181	-107
	Guling	199	96	-103
	Tiling	320	226	-94
	Khar	212	119	-93
	Tangti-Kongma	214	132	-82
	Upper Guling	126	104	-22
	Kungri	240	237	-3
	Mudh	353	384	31
Sham	Tabo	109	92	-17
	Poh	120	1027	907
Totpa	Khurik	172	161	-11
-	Sumling	138	136	-2
	Morang	43	58	15
	Kee	180	225	45
	Chicham	401	487	86
		8332	7318	-1014 (12% decline)

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3.3. THREATS AND OPPORTUNITIES

As also noted in Chapter 2, the landscape is unique in having wildlife spread almost everywhere, which is a boon, but also a fact that creates a huge human-wildlife interface. This Plan recognizes that it needs to be proactive in maintaining wildlife across the landscape, but simultaneously address local needs and especially address conflicts that may arise between people and wildlife. Based on the above background, it is clear that there are considerable threats to wildlife, especially in parts of the landscape. The threats thus can be summarized as given below. These are given in greater detail in Table 6.1 where their background information, along with suitable strategies for mitigation are discussed.

1. Livestock Grazing

Excessive grazing by migratory herders and local herders that may result in herbivore population declines due to competition, degradation of pastures and spread of diseases 2. People-Wildlife Conflicts

Livestock depredation by wild carnivores that results in monetary losses to people, and



importantly, may lead to negative perceptions and retaliatory killing of the carnivores. Similarly, crop damage also causes monetary losses to people, negative perceptions and retaliatory persecution in some areas.

3. Developmental Activities

Development, while undoubtedly desirable in the landscape, can cause direct degradation due to road, channel and other construction in sensitive sites. As noted above, development often brings in outside labour that at times may be involved with poaching and NTFP collection. In recent years livestock depredation and wildlife disturbance/depredation by feral dogs is also on the rise and this new threat has clear links with both the emergence of the tourism industry and with migratory livestock grazing.

4. Other Human Disturbances

Plant biomass extraction and uncontrolled tourism have potential to degrade sites and cause direct disturbance to wildlife. Biomass extraction of important food plants can also affect ungulate survival especially if forage is extracted from important wintering sites.

5. Habitat Degradation

Habitat degradation and loss of habitat can result due to a combination of any of the threats mentioned above.

6. Climate change

There are perceived changes in precipitation patterns that indicate increased late summer rainfall but a reduction in snow fall that can have serious implications on rangeland quality. In combination with the threats from livestock the damage can become even more significant. This threat is of recent origin and is not understood well.

7. Lack of awareness

Lack of awareness among a variety of stakeholders in the region that include local villagers, school children, youth, teachers, officials, and tourists is again a crosscutting threat, that leads to differing perceptions and at times inappropriate reactions to conservation issues.

While the threats are prevalent, it is recognized that development itself can be channelized to create opportunities for conservation. The emergence of cash crop economy, tourism, better employment, better education and health care are all opportunities that can be tapped to reduce local pressures on the environment, while being conscious and addressing any negatives emerging from these.

3.4. A BRIEF SYNTHESIS OF ISSUES

The socio-economic changes in Spiti have had a mixed impact on wildlife conservation. On one hand, the increased market driven agriculture, government and non-governmental jobs and self employment has empowered the local people and reduced their dependence on local resource extraction but at the same time the economic development has opened the doors for labor influx and rapid development which can be harmful for wildlife conservation. Market driven agriculture is shifting the economic dependence of the local people away from livestock husbandry. A direct outcome of this shift in economic dependence has led to reduction in the livestock holdings and reduced pressure on some rangelands. But increased dependence on market driven agriculture has also led to increased conflict between farmers and wild herbivore over the issue of crop raiding. This is exacerbated because wild herbivores appear to clearly prefer green peas to any other crop. There is also pressure to increase land under cash crop agriculture. Agricultural land demands irrigation and road connectivity and both these can add to disturbance of wildlife.

It appears that the overall use of resources in Spiti may have increased, however the per capita dependence of Spiti villagers on local resources for fuel, fodder, pasture, agricultural land and NTFP may have actually declined due to the increase in the number of households and population.

As a simple guiding theme in this management plan it is suggested that in the larger landscape, valleys are identified and prioritized for conservation (Chapter 5), activities that reduce people's dependence on livestock grazing and biomass extraction need to be explored (Chapter 6). Reduced livestock will mean fewer areas where this form of economy is important and for these, better systems can be in place for their utilization and mitigating conflicts. While development should reach all parts of the inhabited area, collaboration among agencies can ensure to minimize impacts (Chapter 7). These ideas are further discussed in the Chapter 4 that states the management vision, goals and objectives of the Management Plan.

Туре	No. of Villages uti-	Average/household	Median/house-
	lizing the resource	(Kg)	hold (Kg)
Fodder collected	28	805.94	737.44
Fodder agricultural residue	28	1830.70	1637.50
fodder all	28	2636.64	2225.00
%Fodder collected from pastures	28	33.28	31.87
Construction	28	534.82	550.00
Fuel wood collected	28	647.63	500.00
Fuel wood-depot	28	1000.00	1000.00

Table 3.4a: Total use and extraction estimated for fuel, fodder and construction material
n Spiti. (Source Key informants in 29 villages of the USL; Pl. see Section 5.2 for more
letails)



Туре	No. of Villages uti- lizing the resource	Average/household (Kg)	Median/house- hold (Kg)
fuelwood all	29	1590.82	1500.00
%Fuelwood collected	29	36.17	33.33
Total woody ex- traction, including construction		1182.45	1050.00
Medicinal	10	1.96	0.61
Snowbroom	2	37.50	37.50

Table 3.4b: Extraction of biomass from the rangelands based on a sample of 29 villages of Spiti as sampled during 2008. Estimated household wise fuel, fodder, construction material and other NTFP are given in kilograms per household (HH). Also given is the approximate local production of fodder as agricultural residue and fuel purchased from the Forest Depot. It is assumed that the fuel purchased from the Depot is equal at about 1000 kg/household, which is the maximum permissible amount and people normally take most of it.

Village	Fodder collected/ HH	Fodder-agriculture residue/ HH	Fodder all/ HH	Fodder collected from pastures/ HH (%)	Fuel wood collected/ HH	Fuel wood-depot/ HH	Fuel wood all/ HH	Fuel collected/ HH (%)	Construction/ HH	Medicinal/ HH	Snow broom/ HH	Number of HH
Bhar	300	1750	2050	15	725	1000	1725	42	750	1		30
Demul	2200	1750	3950	56	300	1000	1300	23	550	0		57
Dhankhar	525	950	1475	36	677	1000	1677	40	611			44
Gulling	125	1500	1625	8	125	1000	1125	11	125			30
Hansa	1189	3400	4589	26	375	1000	1375	27	600	0	25	45
Hikkim	800	1000	1800	44	375	1000	1375	27	700			30
Hull	713	1650	2363	30	600	1000	1600	38	550	1		40
Kee	1650	1750	3400	49	500	1000	1500	33	550			45
Khurik	738	2800	3538	21	350	1000	1350	26	450			40
Kiamo	210	713	923	23	300	1000	1300	23	525	11	50	23
Kiato	1137	4150	5287	22	2000	1000	3000	67	1722			27
Kibber	550	747	1297	42	404	1000	1404	29	139	4		72

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Village	Fodder collected/ HH	Fodder-agriculture residue/ HH	Fodder all/ HH	Fodder collected from pastures/ HH (%)	Fuel wood collected/ HH	Fuel wood-depot/ HH	Fuel wood all/ HH	Fuel collected/ HH (%)	Construction/ HH	Medicinal/ HH	Snow broom/ HH	Number of HH
Komic	425	1625	2050	21	475	1000	1475	32	825			13
Lalung	525	4325	4850	11	1950	1000	2950	66	825			53
Langcha	1000	1750	2750	36	850	1000	1850	46	450	0		30
Lara	775	4000	4775	16	1025	1000	2025	51	600			12
Lidang	900	2625	3525	26	375	1000	1375	27	450			22
Lingti					350		350	100				11
Lossar	413	325	738	56	800	1000	1800	44	75	2		70
Mikkim	1000	1250	2250	44	125	1000	1125	11	375			7
Morang	673	2125	2798	24	625	1000	1625	38	550	1		6
Mud	825	1375	2200	38	188	1000	1188	16	578			32
Pangmo	625	3000	3625	17	500	1000	1500	33	250			25
Pho	500	1375	1875	27	592	1000	1592	37	75			45
Rama	800	800	1600	50	1830	1000	2830	65	1650			14
Rangrik	737	450	1187	62	1025	1000	2025	51	300	0		107
Sagnam	1250	1750	3000	42	68	1000	1068	6	100			62
Sumling	733	1450	2183	34	625	1000	1625	38	550			18
Tabo	1250	875	2125	59		1000	1000	0	50			70
Average/	778	1,768	2,546	33	625	966	1591	36	516	1	3	37
For all HHs	8,40,405	19,08,977	27,49,382		6,75,324	10,42,759	17,18,083		5,57,691	730	2,793	



Figure 3.4: Occurrence patterns of crop damage conflicts in the Upper Spiti Landscape based on data gathered during 2008. This is based on key informant interviews consisting of at least 8-10 members per village.

Figure 3.5: Green pea acreage (in Ha) in the eight Panchayats of the Upper Spiti Landscape (based on data of 2009 from the Revenue Dept., Kaza). See also Table 2.7.



Figure 3.6: Conflicts from feral dogs in the Upper Spiti Landscape. Note the concentration of higher conflicts near Kaza. This is based on key informant interviews consisting of at least 8-10 members per village.



Table 3.4c: Species wise extraction in a sample of 29 villages in Spiti (see list in Table 3.4b for village names). Figures represent percent values for total estimated extraction of fodder (total 26,61,235 kgs), fuel (total 6,66,950 kgs), construction material (total 4,64,950 kgs) and medicinal plants (total 761 kgs). All, except the agricultural crops (barley, green and black peas, and wheat) are extracted from the wild.

Sr.	Plant	Fodder	Fuel	Construc-	Medicine	Total (kgs)
No.				tion		
1	Barley	28.3	0.0	0.0	0.0	753,525
2	Green Peas	27.7	0.0	0.0	0.0	736,350
3	Trigonella emodi	8.8	0.0	0.0	0.0	234,900
4	Cicer arietinum	6.1	0.0	0.0	0.0	161,800
5	Peas (var. black pea)	4.9	0.0	0.0	0.0	130,850
6	Wheat	4.9	0.0	0.0	0.0	129,950
7	Aconogonum	4.0	0.0	0.0	0.1	106,376

Sr.	Plant	Fodder	Fuel	Construc-	Medicine	Total (kgs)
No.				tion		
8	Festuca rubra	3.0	0.0	0.0	0.0	78,800
9	Geranium	2.8	0.0	0.0	0.0	73,525
10	Cousinia thomsonii	1.6	0.0	0.0	0.0	43,450
11	Lindelofia stylosa	1.3	0.0	0.0	0.0	34,850
12	Leymus secalinus	1.2	0.0	0.0	0.0	32,475
13	Rumex	1.0	0.0	0.0	0.0	25,875
14	Allium carolinianum	0.7	0.0	0.0	0.0	19,060
15	Astragalus candolleanus	0.6	2.6	3.1	0.0	48,175
16	Polygonum tortuosum	0.5	0.0	0.0	0.0	13,075
17	Aeldang *	0.4	0.0	0.0	0.0	11,400
18	Khilchey *	0.4	0.0	0.0	0.0	11,250
19	Krascheninnikovia ceratoides	0.4	12.1	0.0	0.0	90,950
20	Carex infuscata	0.3	0.0	0.0	0.0	8,550
21	Stipa orientalis	0.3	0.0	0.0	0.0	6,800
22	Kobresia royleana	0.2	0.0	0.0	0.0	5,300
23	Heracleum thomsonii	0.2	0.0	0.0	0.0	4,500
24	Shor sa *	0.1	0.0	0.0	0.0	3,750
25	Ephedra gerardiana	0.1	0.7	0.0	2.6	7,270
26	Shilim *	0.1	0.0	0.0	0.0	2,300
27	Oxytropis	0.1	0.0	0.0	0.1	1,501
28	Polygonum spp	0.0	0.0	0.0	0.0	875
29	Kandagiri *	0.0	0.0	0.0	0.0	575
30	Caragana brevifolia	0.0	33.7	27.2	0.0	350,925
31	Lonicera spinosa	0.0	16.3	37.3	0.0	281,975
32	Salix	0.0	12.6	18.4	0.0	169,275
33	Hippophae tibetana	0.0	8.9	2.0	0.1	68,526
34	Myricaria	0.0	6.2	0.5	0.0	43,275
35	Rosa webbiana	0.0	4.5	0.5	0.1	32,526
36	Ribes orientale	0.0	2.0	0.0	0.1	13,176
37	Cotoneaster duthiensis/ falconeri	0.0	0.4	0.0	0.0	2,650
38	Juniperus	0.0	0.2	0.0	0.0	1,325

Sr.	Plant	Fodder	Fuel	Construc-	Medicine	Total (kgs)
No.				tion		
39	Potentilla	0.0	0.0	11.1	0.0	51,450
40	Aconitum	0.0	0.0	0.0	2.6	20
41	Arnebia euchroma	0.0	0.0	0.0	50.1	381
42	Avasa *	0.0	0.0	0.0	1.6	12
43	Codonopsis clematidea	0.0	0.0	0.0	13.7	104
44	Dactylorhiza hatagirea	0.0	0.0	0.0	4.9	37
45	Gentiana	0.0	0.0	0.0	8.5	65
46	Gentianella moorcrof-	0.0	0.0	0.0	2.2	17
	tiana					
47	Leontopodium	0.0	0.0	0.0	4.6	35
48	Pedicularis	0.0	0.0	0.0	6.6	50
49	Pterocephalus hookeri	0.0	0.0	0.0	1.3	10
50	Waldhemia stoliczkai	0.0	0.0	0.0	0.7	5

* Only vernacular names available for these plants

Table 3.4d: Estimated production of biomass in the crop fields in Spiti and in the rangelands (Mishra 2002). The lower section of the table illustrates the possible alternative crop area requirement if all fodder collection in the 29 villages (840,405 kgs) is to be replaced with farm residue. Area of 1 to 2 sq. km is already available in the Forest Department plantations. (discussed in greater detail in Section 6.2.1, 6.2.5, Table 6.1).

Description	Quantity	Units
Cultivated area		
Biomass of green pea plants	10,427	Kg/ha
Biomass of black pea plants	5,653	Kg/ha
Biomass of barley plants	3,863	Kg/ha
Biomass of weeds growing in green peas and barley fields	785	Kg/ha
Rangelands		
Forage (gramminoid) biomass in heavily grazed area	251	Kg/ha
Forage (gramminoid) biomass in moderately grazed area	565	Kg/ha
Estimated fodder collected in 29 villages	840,405	Kg
Estimated total produced in farms (farm residue)	1,908,977	Kg



Description	Quantity	Units
Area required for growing all forage needed from pastures	Ha	Sq.Km
If barley is sown	217.5	2.18
If black peas is sown	148.7	1.49
If green peas is sown	80.6	0.81

Table 3.5: Seasonal labourers coming into Spiti for summer works registered by the Police dept. annually since 2008. The figures for 2010 are indicative and represent only the beginning of the working season.

Year	Nepali	Indian plains	Total
2008	462	399	861
2009	531	322	853
2010 (till 15 May)	304	130	434



PART II

MANAGEMENT IN THE UPPER SPITI LANDSCAPE



MANAGEMENT VISION AND OBJECTIVES FOR THE CONSERVATION OF THE UPPER SPITI LANDSCAPE



A Vision Statement describes the desired and ideal long-term state of conservation in the landscape. The Upper Spiti Landscape is the selection of the Himachal Pradesh state as its first landscape under the Project Snow Leopard. The snow leopard is a conservation flagship for this landscape. PSL believes in landscape based, truly participatory conservation management based on good scientific information and monitoring. All these aspects are reflected in the vision statement for the Upper Spiti Landscape:

"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



MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE

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."

In order to meet the above vision, the following goals and objectives have been set out. A goal broadly describes the desired result and what needs to be done to achieve the vision, while objectives are specific statements describing how each goal can be attained. The various goals are interrelated but are stated separately for the purpose of greater clarity in coming up with subsequent activities and prescriptions.

4.1. GOALS AND OBJECTIVES

Goal 1: Set up a network of small Core Landscape Units that are biologically important and socially acceptable, and free from human disturbance

Context: The Management Plan is for wildlife conservation in the entire Upper Spiti Landscape that includes a variety of land use categories from revenue land, to 'forest' land to community owned. It is recognized that the entire landscape has wildlife values and human dependence is also pervasive. The PSL thus suggests that areas of relatively higher wildlife values be identified so that conservation activities can be prioritized and made more effective. This goal targets identification of such areas that have relatively higher values for wildlife and then work with relevant stakeholders to negotiate its implementation through local people's support. Such Core Landscape Units for prioritized conservation have been identified in the Management Plan based on values to the snow leopard and its prey species. More areas could be added if necessary to address other taxa or microhabitats that are missed out in the first phase of core landscape units identified.

Objectives:

- 1. To identify Core Landscape Units in the entire Upper Spiti Landscape including within and outside the Kibber WLS based on their wildlife values and socioeconomic feasibility Primary PSL Objectives addressed: Nos. 1, 2
- 2. To generate baselines for wildlife populations in the Upper Spiti Landscape, especially in the Core Landscape Units using robust scientific methods Primary PSL Objectives addressed: Nos. 1, 8
- To negotiate with local people and migratory herders for designation of socially fenced Core Landscape Units Primary PSL Objectives addressed: Nos. 1, 9

Goal 2: Address the threats to snow leopard and other wildlife in the Upper Spiti Landscape through the support of local community, other stakeholders, NGOs and scientific organizations.

Context: Wildlife populations in the Upper Spiti Landscape, although quite widespread, are subjected to some threats (as outlined in Section 3.3). The threats arise due to local resource use, due to migratory herders in some parts, and due to developmental pressures. These need to be tackled in a multi-pronged manner that includes a clear understanding of the threat (magnitude, causes, spatiotemporal spread, etc) based on which a strategy is developed. It is also recognized that threats need not be static and can change with time in importance and intensity.

Objectives:

- 1. To generate sound information for understanding the threats to wildlife and their habitat based on both, scientific information and local knowledge in the Upper Spiti Landscape Primary PSL Objectives addressed: No. 9
- 2. To undertake measures to mitigate threats posed by resource use by local communities in the area, using participatory approaches Primary PSL Objectives addressed: Nos. 9, 8, 5, 6
- To undertake measures for mitigating threats posed by developmental projects, including the need for protection Primary PSL Objectives addressed: Nos. 9
- To set up targeted conservation awareness programmes for local people, visitors and tourists, Government and non-governmental agencies Primary PSL Objectives addressed: Nos. 10
- 5. To set up measures to halt and reverse habitat degradation, especially of the rangelands Primary PSL Objectives addressed: Nos. 7
- To understand climate change in the context of Spiti and its impacts on local resources for both, people and wildlife Primary PSL Objectives addressed: Nos. 8, 4

Goal 3: Set up mechanisms for collaborative conservation efforts in the landscape involving local communities and all other appropriate stakeholders

Context: The primary agency mandated by the Government for conservation is the Forest Department. However, in recent times local communities, NGOs and even other departments are



taking interest in conservation activities. The Management Plan recognizes that especially in the landscape context, where land use differs and ownership of land varies, facilitating convergence in a manner that all groups are able to participate in and contribute to conservation is important.

Objectives:

1. To develop structural mechanisms for role of community in conservation planning & implementation.

For example, at the village level, Village Wildlife Conservation Committees (VWCC) under the Project Snow Leopard (PSL) need to be set up in appropriate landscape units. Primary PSL Objectives addressed: Nos. 1, 2, 3

- 2. To develop mechanisms for convergence (& minimizing conflicts between conservation and development) in activities with other Government departments and NGOs working for development. For example, the Landscape Level Implementation Committee (LLIC) under the PSL will serve this purpose and aid in providing a forum for facilitating convergence and avoiding conflict with conservation interests. Primary PSL Objectives addressed: Nos. 1, 2, 3
- 3. To build capacity of local staff and officers of the Forest Department and other concerned departments in collaborative and participatory functioning Primary PSL Objectives addressed: Nos. 1, 2, 3
- Conduct targeted capacity enhancement of VWCCs in collaborative planning and implementation of conservation projects Primary PSL Objectives addressed: Nos. 1, 2, 3
- 5. To undertake Forest Department staff welfare activities to improve the capacity and morale of the frontline wildlife staff with incentives and better equipment Primary PSL Objectives addressed: Nos. 1, 2, 3

4.2. ACTIVITIES TO MEET THE OBJECTIVES:

The Management Plan aims to bring all interest groups together to achieve the goals of wildlife conservation in the Upper Spiti Landscape. Some activities will be localized depending upon the micro needs of a village, while others will be cross cutting across the landscape. It will be the Forest Department's responsibility to facilitate participation of all appropriate stakeholders in these efforts. The activities at various levels can be grouped as follows:

1. Community based/Landscape unit focused: These will be localized action and primarily based on micro planning, which will be led by local community groups such as the Village Wildlife Conservation Committee (VWCC) and will have participation of NGOs, Forest Department, and other departments. Activities to be undertaken at this level include joint designation of socially fenced areas (Core Landscape Units), their management, management of village resources, habitat improvement initiatives and conflict resolution including better herding practices, livestock and crop insurance programmes, and other grassroots conservation and livelihoods improvement incentives.

MANAGEMENT VISION

- 2. Landscape level: These activities will usually include work over larger parts of the landscape, including capacity building, awareness programmes, protection, etc. They also include larger scale monitoring of populations of the snow leopard and other wildlife.
- 3. Facilitated by convergence: This is based on an understanding that agencies other than the Forest Department do have mandates and programmes that are environment friendly and can be used effectively for promoting wildlife conservation. This will give recognition to other agencies (both Government and Non-Government) role in conserving the environment and help better utilization of resources, and will include works relating to alternate sources of energy, education, agriculture and alternate employment.
- 4. Led by *Gompas* (monastries): Most of the USL comes under the jurisdiction of the Kee and Kaza gompas. The Rimpoche or the head Lamas of these *gompas*, as also other lamas have a strong influence on the people and are essentially in favour of conservation and need to be encouraged and assisted in efforts to promote conservation and awareness.
- 5. Science: The Management Plan, especially in its adaptive framework, heavily depends on robust information on wildlife populations, human society and institutions to design and adapt activities on a continued basis. Such research needs to be led by specialized national and state level research agencies.
- 6. Policy: There are some issues such as the role of tourism, grazing, and organic agriculture that may have both positive and negative environmental consequences. There may thus be a continuing need to take up activities by civil society organizations as also Government Organizations to work out policy or discussion documents for wider consensus and directions.

The type of activities specifically grouped according to the nature of work include:

MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE

- 1. Research: Information, whether through scientific studies, action research, local knowledge, and meta-analysis, is the cornerstone of the Management Plan and its implementation. Monitoring of areas and programmes through any of the above mechanisms is also an important aspect of the Plan
- 2. Capacity enhancement: Better capacity to carry out works will be an important aspect for the VWCC and the Forest Department staff. This will include continued training in aspects such as participatory planning and action, dealing with offenses against wildlife, and wildlife monitoring.
- 3. Awareness: Awareness amongst all concerned stakeholders is important for a better understanding and appreciation of the environment. Awareness programmes are likely to be important for almost all activities at some stage or the other, whether it is conflict resolution, enforcement or dealing with offenders. The role of the *gompas* and NGOs working closely with local schools is emphasized.
- 4. Enforcement: The Forest Department needs to detect and deal with offenses against wildlife to curb all illegal activities in the landscape. This will often include partnership with local youth and other bodies in patrolling, intelligence and spreading awareness.
- 5. Helping improve livelihoods of local people and reducing dependence on natural resources: These activities form an important part of the Plan as they will target improved livelihoods through conservation-friendly approaches and incentive programmes, and will help in reduction of pressures on local resources. Most of this work will be carried out through the micro-plans, but some of it may be done directly by independent agencies.
- 6. Infrastructure development and staff welfare: Apart from capacity development and good plans the Forest Department also needs good infrastructure and motivated staff. Infrastructure here includes good accommodation and equipment for the staff and facilities to support research and training.

The Chapters 5, 6 & 7 below deal with the three goals, their objectives and activities in greater detail.

ZONATION: ESTABLISH A NETWORK OF BIOLOGICALLY IMPORTANT, SOCIALLY ACCEPTABLE CORE LANDSCAPE UNITS IN THE UPPER SPITI LANDSCAPE



5.1. CONTEXT AND OBJECTIVES

This Management Plan is meant for conservation in the entire Upper Spiti Landscape that includes a variety of land use categories from revenue land to community owned, to 'forestland'. It is recognized that the entire landscape has wildlife values while human dependence on natural resources is also pervasive. The Project Snow Leopard (PSL) thus suggests that areas of relatively higher wildlife values be clearly identified in the landscape so that conservation activities can be prioritized and made more effective. This goal targets identification of such areas in the Upper Spiti Landscape and valleys that have relatively higher values for wildlife and then work with relevant stakeholders to negotiate its implementation through local support or legal categories. Fifteen such Core Landscape Units have been identified in the Management Plan based on habitat importance for the snow leopard. More such areas may be added based on their value to other taxa in the future.

Livestock consumes plant biomass and at high levels of grazing can cause adverse impacts on the rangelands and wild herbivores (see Section 3.2). In the Himalaya, stoppage of livestock grazing has led to vegetation changes that can range from some adverse impacts such as were noted in the Valley of Flowers NP, Uttarakhand, where wild prey populations have been historically low (Kala 2004), to vegetation recovery, and very high levels of wild ungulate biomass, as was seen in the Nanda Devi NP (Sathyakumar 1993). Experiments in Spiti by NCF have demonstrated that stopping livestock grazing can lead to a rapid increase in wild ungulates such as the bharal (Mishra *et al.* 2003), growing to up to three times the abundance in just 5 years. Snow leopard use of such areas also increases, with relatively frequent sightings in the vicinity by villagers and researchers. It is thus felt that such Core Landscape Units, especially in areas where the habitat quality is good and there is already a sizeable population of wild ungulates, can result in rapid increase of of wild ungulates, presumably followed by increase in carnivore populations.

The spill over effects of wildlife can help recovery of their populations not just in the Core Landscape Units, but the Buffer Landscape Units around these cores. This means that there is a possibility of intensification of human wildlife conflicts (greater livestock predation by carnivores, and greater crop damage by wild ungulates). Management will therefore need to be prepared with effective, multi-pronged conflict resolution programmes in all adjacent villages. The partial loss of grazing and resource use in the reserves on the other hand can provide a reliable source of income to local communities based on better opportunities of the fast developing field of wildlife tourism in the country, but not so much in Spiti at the moment.

With this context, the following objectives are stated to achieve the goal of establishing a network of effective socially managed reserves in the Upper Spiti Landscape.

- 5.1.1 To identify Core Landscape Units in the entire Upper Spiti Landscape based on their wildlife values and socioeconomic feasibility (Primary PSL Objectives addressed: Nos. 1, 2)
- 5.1.2 To generate baselines for wildlife populations in the Upper Spiti Landscape, especially in the Core Landscape Units, using robust scientific methods (Primary PSL Objectives addressed: Nos. 1, 8)
- 5.1.3 To work with local people and migratory herders for social fencing of Core Landscape Units (Primary PSL Objectives addressed: Nos. 1, 9)

5.2. METHODS FOR IDENTIFYING 'CORE' LANDSCAPE UNITS IN THE UPPER SPITI LANDSCAPE

A two-pronged approach was followed to identify relatively important areas or Core Landscape Units for large mammals, particularly the snow leopard, and its two primary prey species, bharal and ibex, in a landscape where wildlife is pervasive. Firstly the entire Upper Spiti Landscape was divided into 30 'grids' represented by smaller catchments (on an average 70 sq. km in size; Figure 2.4). Surveys of at least 15 km in each grid (three transects of 5 km each) were conducted to get direct and indirect signs of the target species as also other species such as the Himalayan wolf and marmots. A total of over 450 km was thus walked during autumn-winter 2008-09 in the entire Upper Spiti Landscape. Each transect was walked by two people together. On the transects, one person scanned primarily for ibex and bharal while the other person walked along microhabitats preferred by snow leopard (eg. landform edges) and wolf. Data on presence of any of the species was recorded for every kilometer of the transect along with other habitat co-variates. Secondly, key informants such as herders, panchayat pradhan and village elders were interviewed to find out about important wildlife areas in the vicinity of their village. These data were used to understand the distribution patterns of snow leopard, ibex, blue sheep and Tibetan wolf in the study landscape and especially areas or valleys that were better for these species. The Pare Chu River was attempted from the Ladakh side, however due to advancing winter, much of the Pare Chu area could not be surveyed.

For understanding the dependence of people on the area around villages and their level of use of the pastures, a variety of participatory rural appraisal (PRA) tools were used. We queried groups of key informants (129 people) in village meetings in all 29 major village clusters of the Upper Spiti Landscape to learn about their spatiotemporal resource use. We developed 'resource maps' and also conducted semi-structured interviews in these areas. Information generated thus included – pastures, livestock herd size and composition, duration of stay in each of the pastures, and species-wise plant biomass extracted. We also collected information on the causes of livestock mortality and crop losses. Most of this information was geo-referenced for detailed GIS analysis.

A combination of direct field surveys and local knowledge of wildlife were used to identify the potential Core Landscape Units. The steps followed in the identification of areas for development of Core Landscape Units were:

Step 1: Identified important areas based on the field surveys. These areas were marked on a standard 1:50,000 & 1: 250,000 Survey of India toposheets.

Step 2: Created a stocking density surface for the whole study area using the human resource use maps that were prepared in the field through interview data. Care had to be taken that

the major pastures are mapped in the field based on clear topographic features.

Step 3: 'Good' areas for wildlife (as perceived by the local people), were mapped based on the key informant surveys using resource maps and village interview surveys.

Step 4: Based on actual field data and computer modeling, we developed habitat suitability and species distribution surfaces using Maximum entropy (Maxent) modeling technique (Phillips *et al.* 2005).

Step 5: Core Landscape Units representing important wildlife areas were plotted based on the combined understanding of the field survey team on the layers generated in Steps 1, 2 & 3 as explained below.

Using standard GIS software, areas above an elevation of 5,100 meters (above which, plant growth is minimal) were eliminated. The map of important wildlife areas prepared through the information given by the key informants was then overlaid with the human resource use map and each area was then assessed in terms of the local dependence and landscape context (such as connectivity) for their importance so that the Core Landscape Units excluded areas of high human dependence.

Finally this map was overlaid with the predictions of Maxent Modeling predictions for wild ungulates (ibex and blue sheep) and suitable corrections were made and connectivity was explored.

5.3. CORE LANDSCAPE UNITS IN THE UPPER SPITI LANDSCAPE

Field surveys covering over 450 km in 30 'grids' obtained several evidences of snow leopards, ibex, bharal and Himalayan wolf (Table 5.1). This yielded some information on the important areas for these species in the autumn-early winter season (Figure 2.5). The annual picture was obtained by interview with key informants that clearly identified over 15 pockets that were exceptionally good for these four species (Figure 3).

The stocking density maps showed the intensively used areas for livestock grazing and to some extent, natural resource extraction by people. These areas are spread mainly around the villages along the main valley but do extend into some of the side valleys (Figure 2.10-2.14) with values ranging from 5 sheep units (SU) months/sq. km to 650 SUM/sq. km. Perusal of the map suggests that the pressures are usually lower in the side valleys. Livestock type-wise maps are given in Figure 2.10 to 2.14.

The 15 Core Landscape Units identified primarily for snow leopard, bharal and ibex range

from 7 sq. km to 308 sq. km, covering an area of *c*. 800 sq km in total and are spread across the Upper Spiti Landscape (Figure 5.1) covering all its 10 side valleys. The Pare Chu River has some areas with bharal, ibex, snow leopard and wolf, however none of the secondary sources identified the region as an important wildlife area. Most of this area is extremely high elevation and some people visit it annually (limited to some trekking guides and traders). The valley however needs more specific surveys to establish its importance for wildlife.

Table 5.1: Details about wildlife evidences obtained during the surveys in the Upper Spiti					
Landscape during Autumn-Early Winter, 2008-09.					
Species	No. sightings & (total seen)	No. of indirect evidences			

Species	No. sightings & (total seen)	No. of indirect evidences
Snow leopard	2 (4)	262
Tibetan (Himalayan) wolf	2 (4)	19
Bharal	50 (750)	256
Ibex	10 (130)	147



Figure 5.1: The 15 'core' reserves identified in the Upper Spiti Landscape. See Section 5.2 for methods followed to identify these areas, and Table 5.2, 5.3 and Appendix 5.2 for their vegetation, topographic and threat attributes. The Pillung reserve can be increased to cover both the valleys above Losar

nter-	mor	4.		8.	.2	6.	4.9	0.9	4.2	4.8	78.1
lass i	letoT	0		<u> </u>	1 4	.3 8	.5 1	.2 2	.9 2	.6 2	.4 8
Jm c	Takli nala	0		2.4	7.1	10	13	17	19	29	35
he 20(Shauta (Losar)	0		0	1.7	8	13.8	20.5	23.9	32.3	13.2
les of t	Ratang	0.9		2.5	5.6	9.8	14.1	19.2	23.3	24.6	92.2
% valu	Quelling	1		4.3	7.7	13.1	17.3	20.4	19	17.3	65.4
ure in '	Pilung (Gaddi reserve)	0		0	0	1.6	8.3	21.7	32.9	35.5	27.3
gures a	Pangmo	0		0	0.3	11.9	20.3	19	20.4	28.2	23
uits. Fiș	ogən Shunde Makshung	0		0	0	4.3	34.2	50.6	9.2	1.7	6
cape Un	Lingti Valley	0.3		1.4	3.3	7.8	14.2	21.3	25.6	26.1	411.5
Lands	rangza	0		0	0.3	2.4	9.1	28.6	38.9	20.7	19.2
l Core	Kibber	0		0.3	4.8	9.9	10	20.8	35.8	18.3	17.5
entified Map.	Kee Rangrik	15		29.5	19.4	15.6	11.1	8.5	0.8	0	7
the ide ation]	alan senaH	0		0	1.8	6.2	12.9	18.5	27.2	33.3	20.8
utes of tal Elev	ibnuyð	0		2	5.5	10.1	16.5	21.1	22.4	22.1	124.1
t attrib e Digi	Demul	0		1.2	7.4	16.1	19.3	16.7	12.7	26.4	8.2
vation rom th	midəidƏ	0		0	12.3	31.6	38.4	13.3	4.3	0	4.3
Table 5.2: Ele vals derived fi	(m) noitsvəlA	v	3800	3801-4000	4001-4200	4201-4400	4401-4600	4601-4800	4801-5000	> 5000	Total area (sq km)

Table 5.3: Terrain and vegetation attributes of the identified Core Landscape Units. Figures are in sq. km area. See Table 2.1 for values for the entire USL (see also Figure 2.3).

(mA.ps) lstoT	6.7	564.5	265.0	50.9	6.9	894.0
alan ilahT	0.0	78.1	21.2	0.7	0.0	35.5
Shauta (Losar)	0.0	76.8	23.2	0.0	0.0	13.1
Ratang	0.0	48.8	43.1	8.1	0.0	92.1
Quelling	0.0	41.4	47.9	9.5	1.2	65.4
Pilung (Gaddi reserve)	0.0	86.7	13.3	0.0	0.0	27.5
omgna¶	0.0	73.7	26.1	0.2	0.0	23.2
ozəyc-zunysyeN	0.0	0.0	14.5	44.2	41.3	8.9
Valley Valley	1.6	65.5	26.9	5.7	0.3	411.8
ezgneJ	0.0	57.6	27.3	15.1	0.0	19.1
Kibber	0.0	52.8	43.3	3.9	0.0	17.4
Kee-Rangrik	0.0	46.7	51.1	2.2	0.0	7.0
alan sanaH	0.0	100.0	0.0	0.0	0.0	20.7
ibnuyð	0.0	66.8	30.6	2.6	0.0	124.4
Demul	0.0	61.3	37.5	1.3	0.0	8.3
midoidD	0.0	0.0	17.9	50.0	32.1	4.3
lerrain Types	l-Glacial and noraine	2-Rocky & 2arren	3-Very sparse vegetation	4-Sparse to moderate veg- station	5-Moderate to lense vegeta- ion	Total (sq.km)
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5.4. ATTRIBUTES OF THE CORE LANDSCAPE UNITS

- 1. Topography & Vegetation: The Core Landscape Units are spread across all the topographic types of the landscape, but over half are in the upper slopes (Table 5.2), that are relatively disturbance free. Most of the area is rugged, and as a result, rocky areas dominate most cores. Some like Shego, however, are well vegetated (Table 5.3).
- 2. Threats: The threats to wildlife and their habitat in the Upper Spiti Landscape arise from excessive local use of natural resources, developmental pressures, human-wildlife conflicts, which vary in importance among the various Landscape Units. There are other cross-cutting issues such as habitat degradation, poor awareness about wildlife, and effects of climate change (as detailed in Chapter 3.0). The important threats however vary across the landscape and this section looks into these patterns for the 15 Core Landscape Units.

The threats in each of the Core Landscape Unit were ranked using an absolute scale from 0 to 3, representing absence of the threat, low, medium and high threat intensity by informed researchers familiar with the entire landscape. Using this scale, each threat was weighed according to its geographical spread within the Landscape Unit, the urgency of tackling it, and the intensity of the problem (examples given in Appendix 5.1). The total score for each threat in each core landscape could thus vary from '0' meaning no threat to '9', (Table 5.4). The sum of all threat scores provides the threat ranking for each of the Core Landscape Units. The cores across the nine threat categories can have a maximum value of 99 (11 threats X max value of 9 per threat) and the threats across 15 reserves can have a maximum value of 135 (15 X 9). Thus column and row totals weighed against their respective maximum possible value gives an idea of the magnitude of threat to a core or the threat in the entire landscape.

Of the total threat value possible for each threat across all 15 sites, it is evident that most threats have moderate to low values across the Upper Spiti Landscape. For example, only the threats related to local livestock grazing and immigrant labour get values close to 50% (Table 5.4). Site wise however, some threats may be severe in terms of spread, urgency or intensity of the problem. Thus, local livestock grazing, immigrant labour and human-carnivore conflicts are the top threats in the landscape. The spatial spread of threats in the landscape is variable with some such as grazing by *Gaddis* being confined to a few sites to the west of the landscape (8 of 15 sites), crop damage to sites on the Kibber-Langza plateau (6 of 15 sites) and livestock depredation by feral dogs in the villages adjacent to Kaza (5 of 15 sites). Crop damage appears to be an emerging threat, especially with high value cash crops such as green peas and apple being sown, often in crop fields far off from the villages. Other threats are pervasive in the landscape. Primary among these is grazing by local livestock and hunting by immigrant labour (mostly moderate to high). Developmental pressures in general are also spread across the landscape. Plant biomass extraction is also pervasive, but mostly at low to moderate levels. Habitat

degradation relates to numerous other threats that include the ones outlined above and is also pervasive in the landscape.

Data show that amongst all the Core Landscape Units, the Gaddi reserve near Lossar (56%), Kibber (54%), Chichim (48%) and Kee-Rangrik (41%) are the most threatened sites. However, here too the level of threats is not exceedingly high (being mostly near 50% of the total threat value possible). For most other sites the levels are usually low to moderate. However, each site has at least one critical issue that can severely threaten wildlife. Of the 11 threat categories considered in this analysis, most core units had 8-9 threats, although many were at low levels. It is notable that Pangmo, Nakshung-Shego, Demul, Takli and Hansa have considerably low threats.

While the management plan outlines the threats in Core Landscape Units, which again may change over time, it will also be important for such threat assessments to be done for all Buffer Landscape Units, prior to initiating conservation interventions. The nature of the threat should lead to designing of appropriate conservation intervention, and therefore, the importance of threats assessment, and their continued monitoring, cannot be overemphasized.

5.5. BROAD CONSERVATION APPROACH FOR THE CORE LAND-SCAPE UNITS

As mentioned above, the Core Landscape Units will primarily serve to reduce or exclude human pressures from the designated areas through social fencing. The primary conservation significance expected is that these reserves will serve as 'source' (i.e. areas where species will be able to breed and multiply due to lack of disturbance as well as better survival) populations and will also attract more wildlife. The rationale for this approach is discussed in detail in the Project Snow Leopard document. The larger landscape comprising Buffer Landscape Units will absorb the spillover populations from the Core Landscape Units as a result of protection. As mentioned earlier, this is likely to lead to intensification of livestock and crop damage by wildlife, at least in some regions, and the management will need to proactively support multipronged, community-based conflict management efforts.

The designation of Core Landscape Units will need to be done with the co-operation of local communities based on positive financial and other incentives and time-bound but renewable (through mutual consent) agreements. The examples of incentives may differ from site to site but can primarily relate to helping develop conflict resolution programmes, self help groups, setting up conflict management funds, leverage important works from other departments, etc. While this will be the common broad approach to set up reserves in USL, Appendix 5.2, discusses the possibilities in each proposed Core Landscape Unit based on its values, threats and opportunities.

5.6. RECOMMENDED ACTIONS

5.6.1 Carry out targeted surveys to identify areas of high plant endemism or with significant concentration/diversity of medicinal plants for possible inclusion in the network of cores in the landscape

An assessment of Spiti's plant resources doesn't exist although a flora covering the entire Lahul-Spiti district (Aswal & Mehrotra 1999) and assessment of occurrence and status of medicinal plants (Kala 2000, 2005) are available. These sources however do not provide a spatial reference of the resources. It is suggested that the Wildlife Department commissions a study or a few studies through credible research organizations to document plant resources of the landscape, the threats and possible conservation actions. This can be done from the second to the fifth year of the Plan.

5.6.2 Institute wildlife, vegetation and human society monitoring protocols for each reserve beginning with the baseline estimates.

Clear outlines for monitoring snow leopards, wild prey and vegetation are given in Appendix 5.3 that will need to be carried out by the Forest Dept. and VWCC along with appropriate partners in all cores to establish baselines for at least the large mammals, viz. snow leopard, ibex and bharal. These need to be completed within the first two years of the planning period. The data and information available in this plan can help design the work better.

5.6.3 Carry out targeted wildlife and dependence surveys in any gap areas of the landscape to identify further 'cores'

While the current plan has taken care to cover almost the entire landscape systematically, given the vastness of the area, other important areas may be present, especially in the seasonal context (eg. wintering areas) which need to be identified. It is suggested that the Forest Department collaborate with organizations of repute to conduct these studies over the first five years of the plan. Further, with changing landuse and effective conservation measures, it is possible that newer valuable landscape units may be discovered in a few years.

5.6.4 Carry out meetings with relevant stakeholders to develop and implement agreements for the designation of the Core Landscape Units identified in this plan.

This is a critical step of landscape zonation and the goal of establishing a network of reserves with low or no pressures in the landscape. The designation of the area, its final boundaries, and its consequent freeing up will be dependent on discussion with the villagers. It is hoped that

details of ranking method and A _f 5.4.2). The column totals help in of threats in the entire landscapes scape Units (% of 135) and acros threats). The overall threat (colun	ppen com s. Pei s the nn 1	dix 5 uparii rcent rcent : 11 t 8) is	.1 fo ng th rank hreat rank	r obta reats ing d categ ed in	uining across enote gories desce	the t Lans the (% o nding	hreat scape mag f 99) f ordd	t valu Unit nitud . Valu er of	e foi s, wl e of ies ra threa	: each hile th the ov unge fi unge fi	Core e rov erall om '1'.	Land v tota total 0° (th	lscap ls he value reat	oe Ur lp in e acr abse	nit (Se t over: oss C oss C nt) to	ction Ill ran ore La '9' (hi	king nd- igh
Threats		Demul	ronna.	Kee-Rangrik	Kibber	ezgneJ	itgniJ	Nakshung-Shego	omgns¶	Pillung (Gaddi area reserve)	Quelling (Ula)	Ratang	Shauta (Losar)	Takli	Total	Ranking - Threats	Percent ranking
1.0. Livestock Grazing																	
1.1. Excessive grazing by local 6 herders (Competition, degra- dation and disease transmis- sion)		с, с,	ω	3	~	6	3	5	4	6	\mathcal{C}	2	6	3	73	1	54
1.2. Excessive grazing by migratory herders (Competi- tion, degradation and disease transmission)	0	5	9	0			4	0	0	6	0	0	6	9	48	Ś	36
2.0. People-Wildlife Conflicts																	
2.1. Livestock Depredation 6 by wild carnivores (monetary losses to people, negative perceptions and retaliatory killing)		-	ω	9	9	6	2	1	1	6		1	$\tilde{\omega}$	\mathcal{O}	61	ϵ	45

See text for

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Conservation threats

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Threats	midoidO	Demul	ibnuyƏ	Hansa	Kee-Rangrik	Kibber	ezgnej	itgand itgand	Januaria Summaria	Pillung (Gaddi	area reserve)	Quelling (Ula)	Katang	T-1-1: Shauta (Losar)	Тотаї	Ranking -	Threats	Percent ranking
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory persecution)	3	1	0	0	\mathcal{C}	6	-	0	ω	0		0	0	0) 13	7 11	1	13
3.0. Developmental Activities																		
3.1. Development – Roads & channels	9	0	1	~	4	3		7 3		9		5	2		4	ŝ	<i>(</i> ()	36
3.2. Development – Outside labour	8	0	3	6	2	2	3	7 3	0	9		8	5	2 C) (6	5 2	7	<u></u>
3.3. Development - Poaching	9	1	3	3	5	5	1	1	0	5		1	2	0) 37	7 7		27
3.4. Livestock depredation and wildlife disturbance/dep- redation by feral dogs	3	0	0	0	6	3	0	0 0	0	3		0	5 (0) 2	6 1	1	16
4.0. Other Human Distur- bances																		
4.1. Plant Biomass extraction	9	0	1	3	3	9	1	1 0	0	3			3 () () 28	8 8	(1	21
4.2. Uncontrolled tourism		0	0	0	4	9	9	0	0	2		0	0	0	1) 10	-	14
5.0. Habitat Degradation						_	_											

1 птеаts Регсепt гапking	41			
- gnising -	4			
Total	56			
Takli	\sim	23	11	23
Shauta (Losar)	$\tilde{\omega}$	28	8	28
Ratang	$\tilde{\omega}$	28	8	28
(slU) guillouQ	Ś	24	10	24
Pillung (Gaddi area reserve)	6	55	1	56
omgna¶	1	10	15	10
osəuS-gaundsafeN	1	14	14	14
itgniJ	4	29	7	29
ezgneJ	Ś	37	9	37
Kibber	Ś	53	2	54
Kee-Rangrik	\tilde{c}	42	4	42
Hansa	~	41	5	41
ibauyd	7	23	11	23
Demul	-	19	13	19
midoidO	\mathcal{C}	48	3	48
nreats	1. Habitat degradation & ss of habitat (linked with ost threats mentioned ove)	otal	unking for threats to reserves	rcent ranking



MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE

the Village Wildlife Conservation Committee (VWCC), who will be trained in participatory approaches, will take a lead in this along with the Forest Department and civil society organizations. The discussions will heavily depend on the provisioning of incentives to communities to tackle the threats, provide livelihood, manage human-wildlife conflicts, etc. The plan of activities will emerge from the micro-planning exercise as also the convergence facilitated by the Landscape Level Implementation Committee (LLIC) to enable these negotiations. These activities will need to be carried out for each of the 15 Core Landscape Units covering about 20 villages. The micro-planning exercise will need to be spread across in a phased manner over about two years to cover all Core Landscape Units and each site may need multiple engagements.





MANAGEMENT INTERVENTIONS TO ADDRESS THREATS TO WILDLIFE



6.1. CONTEXT AND OBJEC-TIVES

This chapter deals with the second goal "Tackle Threats to Snow Leopard and Other Wildlife in the Upper Spiti Landscape with the Support of Local Community, Other Stakeholders and Credible Scientific Organizations". Wildlife in the Upper Spiti Landscape, although quite widespread, is subjected to several threats as outlined in Chapter 3.0. The threats arise due to local resource use, migratory herders in some parts, and developmental pressures. These need to be addressed in a multipronged manner that includes developing a good understanding of the threat itself (in terms of urgency, area impacted, and intensity) based on which a strategy is developed. Table 6.1 covers these aspects in greater detail and lists the strategy elements and potential activities to tackle specific threats. These activities are specific for the threats, and

more general activities are given in Section 6.2 below.

In general, it is important to develop a good understanding of threats to the snow leopard, prey species, other wildlife, and their habitat in each landscape unit, and then take steps to address them with support from local people and involved agencies. It is also important to constantly monitor threats as new ones often keep emerging. Periodically (at least once in two years), threat reduction assessments in each landscape unit must be conducted to measure management performance, and to enable course corrections.

The measures employed to address the threats must be flexible, tailor-made for each landscape unit, and be sensitive to the ecological, cultural, administrative, and socio-political context in each unit, or in the villages that have ownership over the specific landscape unit.

In this section very broad approaches to address the main current threats in Spiti are listed, along with a summary of background knowledge (which must be constantly improved and built upon). It is stressed that in most cases a combination of interventions will work better than any single one. The objectives for the goal of tackling threats are stated as:

- 6.1.1 To generate sound information for understanding the threats to wildlife and their habitat based on both, scientific information and local knowledge in the Upper Spiti Landscape (Primary PSL Objectives addressed: No. 9)
- 6.1.2. To undertake measures to mitigate threats posed by resource use by local communities in the area, using participatory approaches (Primary PSL Objectives addressed: Nos. 9, 8, 5, 6)
- 6.1.3. To undertake measures for mitigating threats posed by developmental projects, including the need for protection (Primary PSL Objectives addressed: Nos. 9)
- 6.1.4. To set up targeted conservation awareness programmes for local people, visitors and tourists, Government and non-governmental agencies (Primary PSL Objectives addressed: Nos. 10)
- 6.1.5. To set up measures to halt and reverse habitat degradation, especially of the rangelands (Primary PSL Objectives addressed: Nos. 7)
- 6.1.6. To understand climate change in the context of Spiti and its impacts on local resources for both, people and wildlife (Primary PSL Objectives addressed: Nos. 8, 4)

An analysis of important threats in the landscape is given in Chapter 3, with 'core' landscape unit wise synthesis of the issues discussed in Chapter 5 (Section 5.4.4). It is evident from this synthesis that threats in the USL arise from excessive local use of resources, recent thrust on development and problems caused by changing climate. It also shows that the threats vary between villages and landscape units, necessitating a flexible approach to tackle them.

6.2. RECOMMENDED ACTIONS

6.2.1. Facilitate scientific and general information generation (see also Chapter 8.0).

Most threats are only partially understood, and there is a need to understand them in the general and specific area's context to be able to tackle them fully. Also, there is a need to monitor the indices of the threats as these can change spatio-temporally. Credible research organizations are the best to lead these efforts as per their specialization with significant contributions from the Forest Department and local organizations. These studies should be encouraged right from the onset of the plan implementation and will continue till its completion. On an average 2-3 short studies should be encouraged every year. For example perusal of Table 3.4d shows the possibilities of using just 2 sq.km of additionally developed areas along the Spiti River or in existing Forest Department nurseries that can meet all fodder collection requirements of a large portion of Spiti's population.

6.2.2. Build local capacity and structures for carrying out conservation efforts by local communities.

Village Wildlife Conservation Committees (VWCC), as recommended by the PSL (Appendix 9.1) will be set up in appropriate villages or village clusters that will have representation of local *gram sabha*, youth, women, *Gompa* (monasteries), NGOs, CBOs, Forest Department, etc as stipulated in PSL. This group will be trained in participatory planning and action, accounting and monitoring wildlife through training workshops and programs. Particular emphasis will be given on involving and getting inputs from the local Buddhist religious institutions that already promote protection of all sentient beings.

Organizations such as the NCF and Wildlife Institute of India should be involved in developing modules along with capable individuals or organizations, and providing resource persons to conduct capacity enhancement workshops each year in the landscape, especially over the first two years. This will help establish a strong group of youth, villagers and departmental people capable of implementing conservation and monitoring initiatives.

6.2.3. Carry out conservation awareness programmes for important stakeholders, especially local school children, teachers, youth and general public. In addition, awareness programmes for the local administration, *panchayats*, politicians and armed forces will also be developed and implemented. These programs will primarily target an appreciation and understanding of local wildlife, threats, and their mitigation.

A strong and comprehensive awareness programme is ongoing in Spiti that has been set up by NCF. This programme has organized functional Himalayan Nature Clubs in schools and

MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE

has organized the youth in Youth Awareness Clubs that already reach out to almost the entire landscape. Regular activities that include nature camps, painting competition, and film shows are organized and awareness material is produced. These programmes can be adapted and the spatial spread can be increased.

6.2.4. Staff capacity of the Wildlife and Police Departments in wildlife protection, intelligence gathering, offense detection, case handling and legal issues will be provided through specialized workshops.

There is a potential of increased poaching in the landscape, primarily due to considerable number of migratory labourers who are known from other adjacent areas to poach wildlife, from fish and birds to larger mammals and collect NTFP. Also, there has been an increased spurt of illegal international wildlife trade involving tiger, sandalwood, snow leopard and *shahtoosh*, among other wildlife products, in neighboring region of Ladakh. It is quite probable that similar issues may develop in Spiti and the concerned officials need to proactively be prepared for detecting and processing the cases.

Organizations such as the Wildlife Trust of India, New Delhi, TRAFFIC (WWF) and WII, have considerable expertise in these issues and need to be co-opted for these modules for the Wildlife and Police Department staff. At least one such training should be conducted annually in the first three years.

6.2.5. Provide economic opportunities wherever possible to reduce people's dependence on local resources.

This is a particularly important facet of the conservation programme in the USL. Local people are primarily agro-pastoral and with increased agricultural incomes, tourism, and employment in the past couple of decades, there is a likelihood that their dependence on livestock and local resources will decline. It is clearly important that these opportunities are constantly explored through assessments and appropriate action be taken. The means to do this will be primarily through the micro-planning exercise. Additionally, conservation agencies involved can help develop programmes that may relate to community based tourism development, better infrastructure and interpretation. In specific cases convergence with other departmental work can be aligned with conservation programmes as detailed in Chapter 7. A crucial aspect here is to link livelihoods with conservation activities, so that the link is clearly established. If the experiment of growing all additional fodder requirements works (Section 6.2.1), this can be a useful income generation activity too if local people are involved in suitable ways for the purpose.

This will remain an ongoing activity through out the planning period and multiple Govern-

ment and Non-Government agencies will be involved.

6.2.6. Set up incentive programmes and self-help groups to reduce the threats by local people and other users of natural resources in the USL.

Threats such as excessive livestock grazing pressures, extraction and conflict resolution can be addressed through incentive based programmes where the local communities are able to get direct access to conservation funds or to programmes that help them economically, or that save their personal resources. Wherever appropriate, Self Help Groups (SHGs) can be set up to take advantage of more organized work and equitable sharing of resources and responsibilities.

Such programmes can also be planned and implemented under the micro planning-convergence framework by the VWCC, credible organizations and the Wildlife Department, and will need to be taken up through out the planning period.

The specific strategy for each threat is discussed in Table 6.1. This, in conjunction with the prevalent site specific threats discussed in Chapter 5.0., should help in the micro planning process for each village cluster.
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All 15 suggested Core Units (CLU) are free of grazing based on clear with the local commun buffer areas be maintai or reduced. A good understanding presence and transfers livestock and wildlife is livestock and wildlife is conducted to assess the transfer potential betwe livestock and wildlife.
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	Threats	Background information	Broad approach	Broad conservation targets (in next 5 years)
1.	2. Excessive	In general migratory grazing in	Understand current grazing patterns & history of grazing	All suggested CLUs in areas
90. 	azing by	Spiti, wherever prevalent, is known	in affected landscape units.	grazed by migratory livestock are
Ë,	ugratory	to be intense - a large number	The second south to be designed to that mostioned	free of grazing, based on clear
ре У	erders	of livestock (primarily sheep \propto	I ne approach needs to be summar to that inclutioned for local literatory though the overall coal should be	agreements with them or the
ک ج	Jompetition,	goats) are concentrated in a small	to reduce the area affected by migratory livestock.	Iocal community depending on
an	disease	area during ure chure short plant prowth season (Mav/June to	Strict monitoring and enforcement to curtail poaching	
tra	ansmission)	September) (Bagchi, Bhatnagar, &	by migratory herders should be put in place, with an	A livestock disease-monitoring
		Mishra, 2004)	awareness programme targeted against poaching and	programme is set up for all
		~	unregulated NTFP collection.	villages adjacent to the CLUs,
		Research in sample areas has		with prophylactic measures also
		shown that this leads to depletion	In some cases local people lease out their pastures to the	put in place. Rapid treatment in
		of wild ungulates through direct distriction of	migratory nertoers. I vegotations with the local owners can also help reduce or completely exclude livestock use of	the case of disease outbreaks is
		available forage.	the area based on some incentives	
		0		Use of dogs needs to be
		The threat of disease transfer to		discouraged unless well trained
		wildlife is believed to be greater		dogs are available.
		from migratory livestock as they		
		are potential carriers of diseases		Poaching by migratory graziers is
		prevalent at lower altitudes.		completely controlled through a
		However, disease is an aspect that		combination of better patrolling,
		needs to be better researched.		enforcement and awareness
				campaigns
		Migratory graziers are reported to		
		be involved in occasional poaching		Suitable research programmes
		of mammals and birds, and		are encouraged for helping
		extraction of medicinal plants.		management, including
				monitoring the impact of the
		Accompanying dogs pose direct		conservation programme
		threats to the snow leopard and		
		prey species. Often these dogs stay		
		back in the area during winter and		
		add on to the feral dog population		
		within Spiti		
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Broad conservation targets (in next 5 years)	Multi-pronged programmes are in place for managing livestock depredation in all villages surrounding the core zones. Local communities are empowered to manage conflicts, and have improved attitudes towards wild carnivores. Relevant monitoring systems are in place to understand the pattern of losses and a better scientific understanding of conflicts is developed	Broad conservation targets (in next 5 years) After identifying all vulnerable fields and seasons, suitable steps are taken to minimize crop losses (guarding and/or fencing) A community-based crop insurance programme is set up to help offset any major crop loss instances A centralized contingency fund is in place so that any major losses can be compensated.
Broad approach	Within each affected CLUs, understand the main areas where livestock get killed, vulnerable seasons and age-sex classes, and identify the gaps in herding practices (such as lax herding, children being sent for herding, poorly constructed corrals, etc.). Aim to reduce livestock depredation levels, and not to completely eliminate depredation instances (which is not necessarily a feasible target) Facilitate increase in wild prey availability by reducing grazing pressures and freeing up key areas ungulate areas from livestock gerazing. Reduce livestock depredation instances by working with the community to ensure better herding and construction of predator proof corrals (in those villages where carnivores are reported to enter corrals). Better herding can include hiring capable herders and even using trained guard dogs. It can also include be through a system of incentives for herders losing the least number of livestock. Institute cost sharing mechanisms such as community based livestock insurance programmes, insurance through companies, etc. Awareness for the affected communities about causes of conflicts, and about the possible ways to manage them, including enhanced security of livestock and cost and tisk sharing mechanisms such as insurance. The role of local religious institutions, the <i>gompa</i> , in this aspect is emphasized.	Broad approach Broad approach Encourage research aimed at better conflict management, including experimental trials of various other mitigation measures. Develop comprehensive conflict management programmes that are multi-pronged (involving all above elements) and aim at (i) increasing wild ungulate abundance, (ii) encouraging better livestock protection to reduce the extent of livestock damage by wild carrivores, (iii) sharing the cost of livestock damage by wild carrivores, (iii) sharing the cost of livestock damage by wild carrivores, (iii) sharing the cost of livestock damage by wild carrivores, improving peoples' tolerance through education and incentive programmes such as insurance, and (iv) improving peoples' tolerance through education and incentive programmes. Facilitate research to understand the spatiotemporal occurrence of crop damage – identify the vulnerable seasons and fields in the affected landscape units. Encourage better vigilance and guarding of vulnerable fields in vulnerable seasons using community guards and informants. Provide part support for removable electric fences during the critical season). However, discourage large fences and take utmost care that the fences protect crops but do not hamper wildlife movement. The Guwahati based NGO Ecosystems India has considerable expertise in this aspect, especially temporary electric fencing. Community-based crop insurance programmes to offset any major crop loss instances.
Background information	There are several depredation hotspots in the landscape. Wherever conflict occurs, livestock depredation by the snow leopard and wolf is high in patches, partly due to inadequate livestock grazing practices, and partly due to relatively low availability of wild ungulates compared to livestock. This has resulted in relatively high dependence of snow leopards and other carnivores on livestock. Even under conditions of high wild ungulate availability, some livestock will continue to get killed by wild carnivores. Carnivores are occasionally persecuted in retaliation/ prevention (Mishra 1997). Compensation programs, by themselves, have been inadequate in helping resolve this conflict (Mishra <i>et al.</i> , 2003) There is a tendency among some people to collect livestock killed by predators (as also 'steal' kills of wild ungulates), which denies the predator of its kill. This can acoravate the conflict nothlem	Background information Background information Although the problem is not widespread, it is poorly understood. As agriculture is becoming important economically, the tolerance for crop damage by wild ungulates is decreasing. Preliminary studies indicate that confined to some vulnerable fields (such as remote ones) and short season (especially in spring) In areas where wild ungulate populations are increasing, there are higher instances of crop damage.
Threats	2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative perceptions towards and retaliatory killing of carnivores)	Threats Threats 2.2. Crop Damage (monetary losses to people, negative perceptions towards and retaliatory persecution of wild ungulates)

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In case of heavy losses, contingency funds need to be kept for compensation. This can ideally be a programme that links with other conservation funds where the communities also contribute.

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Broad conservation targets (in next 5 years)	An expert committee is put in place, and guidelines developed for evaluating projects for their environmental impacts. In most cases, the thrust of this committee may be on altering proposals if needed, for minimizing impacts rather than on stopping them. All Forest/Wildlife Staff are trained for monitoring and patrolling, especially in the development project areas Local youth are engaged into formal bodies for helping in conservation works through bodies such as youth clubs (that already exist in all villages and has been formalized with are trained for monitoring and patrolling in development project areas A complete curtailment of off- road driving.	Broad conservation targets (in next 5 years) (in next 5 years) Clear baseline about labour employers, movements, population, etc is established and updated Guidelines are prepared for contractors and circulated. All contractors are made aware about punitive action for the violations. At least one awareness programme is held for labourers and contractors every year that helps them modify their behaviour by understanding the issue. Community based and Wildlife Department led patrolling is in place in all areas where labourers are camping in the pastures, or general areas of high labour
Broad approach Awareness for the affected communities about causes of conflicts, and about the possible ways to manage them, including enhanced security of fields and compensatory mechanisms. The role of local religious institutions, the <i>gampas</i> , in this aspect is emphasized.	A system needs to be instituted, through inter- departmental co-operation, such that all potential large and small developmental projects be evaluated for possible effects on wildlife and if a major threat is perceived, the programme be revised or realigned to avoid the ill effects. This may involve realignment of roads, channels and shifting proposed construction to less environmentally destructive sites. The system of CLUs discussed in Chapter 4.0 already provide pointers to areas that are important and further assessments suggested in sections (5.6.2 to 5.6.4) should provide more clarity about important or vulnerable sites Guidelines need to be developed and implemented to ensure the use of conservation friendly practices during construction Forest staff and local youth groups are trained in monitoring techniques for the above task and are provided guidelines, along with contractors and engineers. Contractors are also held responsible for instances of poaching or other damage caused by labuorers hired by them. Awareness programme amongst local vehicle owners (tractors, taxis etc.) to sensitize about the damaging effects of off-road driving to pasture quality, and thereby livestock and windlife. VWCC can be empowered and encouraged to fine off-road drivers.	Broad approach Understand the numbers and spatiotemporal distribution of these labour groups, the works they come for and where they are spread out. Strict directives to the contractors to not allow any illegal activity by labourers, with a provision for punitive action. Also, clear directives regarding camp site selection, no littering, etc Close monitoring of labourers through informers and forest staff Directed awareness programmes for labourers and contractors, and their employers (government agencies or local people).
Background information	Activities Most developmental projects in Spiti involve construction of roads, bridges, channels, new crop fields, and potentially, micro-hydel projects. Often, detrimental effects are related with the construction phase (blasting, heavy machinery and labourers) and to some extent, the effects of traffic and easier access subsequently, leading to habitat degradation. Where the workers involved are migratory labourers, there are also instances of trapping and hunting of wildlife (see below). Off-road driving by both locals and outsiders is leading to significant pasture degradation in some areas. Currently, when new construction is being undertaken, hardly any effort is made to understand its ecological impacts	Background information They are involved in developmental projects, and also increasingly with local villagers as agricultural and local construction labour Immigrant labourers have been known to be involved in poaching, and are also a source of disturbance to wildlife, especially while camping in or near important wildlife areas.
Threats	3.0. Development 3.1. Development - Roads & channels	Threats 3.2. Development – Immigrant labour

1	MANAGEMENT PLAN FOR U	PPER SPITI	LANDSCAPE		
Broad conservation targets (in next 5 vears)	Information generated proactively and systematically on poaching through informants and community representatives. Community based and Forest Department led patrolling is in place in all areas with high concentration of labourers, <i>gaddis</i> or other identified offending groups	Capacity enhancement of enforcement staff and other local representatives in enforcement and legal issues	At least one awareness programme is held for the offending group about the biodiversity loss as well as the legal implications of poaching	Broad conservation targets (in next 5 years)	Drastic reduction of feral dog
Broad approach	Greater understanding on who's responsible and problem areas needs to be identified Organizing/mobilizing local groups for proactive efforts to prevent poaching. This is already prevalent in most parts of Spiti and needs to be given recognition and encouraged, especially from the good offices of the <i>gompa</i> Strict enforcement			Broad approach	The feral dog population must be constantly managed to
Background information	Poaching, though limited, is mainly linked with migrant labourers, graziers, and outside staff.			Background information	The extent of livestock
Threats	3.3. Development - Poaching			Threats	3.4. Livestock

Broad conservation targets (in next 5 years)	Drastic reduction of feral dog population across the landscape.
Broad approach	The feral dog population must be constantly managed to keep it at a minimum. Various options are feasible, and include (i) culling programmes including assisting village communities with required resources, equipment and training, (ii) large scale capture and sterilization of feral dogs (especially females) (iii) encouraging better garbage management systems in townships and villages.
Background information	The extent of livestock depredation by dogs decreases as one moves away from townships such as Kaza Dog populations are being sustained by edible waste generated in the townships and villages, especially where tourism infrastructure (hotels and restaurants) are mushrooming Dogs concentrate in Kaza during the tourist season (summer months, when the tourist facilities are active), breed and then disperse to other adjacent villages as winter approaches as winter approaches pirds, hares, and even snow leopards. Periodically, when the instances of livestock depredation increase, villagers organize themselves and collectively try (and sometimes succeed) in culling feral dogs. This is a laborious, often cruel process which the people themselves don't like but have no options.
Threats	3.4. Livestock depredation disturbance/ depredation by feral dogs

3	MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE		MANAGEMENT
Broad conservation targets (in next 5 years)	Studies are undertaken to understand the spatiotemporal extraction patterns and use of resources by people Programmes are implemented for the use of alternative sources of energy that would reduce consumption of fuel wood and dung. This is recognized as a general good practice for all areas – even where extraction is not a problem. Local fodder resources are developed in forest nurseries for providing winter fodder (as per Table 3.4d) to villagers. This however needs to ensure that collection of fodder from rangelands is stopped and that villagers do not increase livestock numbers with more winter fodder available. Local fuel wood resources (plantations in commons, bunds, etc) are developed as appropriate to the specific site in which local communities are involved and participate as partners	Broad conservation targets (in next 5 years) Education programs are conducted to increase peoples' awareness about detrimental effects of excessive extraction on local environment, including on long-term availability of the resources, local hydrology, etc Changes are facilitated in the construction of local houses to make them water resistant, while reducing local biomass use and retaining original aesthetic designs. A study is commissioned to understand the current	tourism patterns in Spiti vis-à- vis environmental, social and economic impacts Capacity enhancement of local people as guides skilled not only in camping issues, but especially in nature interpretation
Broad approach	The extraction may need to be stopped or reduced as the case maybe after the provision of a suitable alternative. One possibility is discussed in Table 3.4d, whereby developing less than 2 sq.km of land for cultivating fodder in USL can take care of all needs of collection from the rangelands. Use of alternative sources of energy such as efficient solar cookers, power generation units, etc, through co-operation with other departments such as Himurja. Local fuel wood resources from willow, seabuckthorn and other native species need to be developed in village commons so that dependence on wild resources is reduced. Care should be taken in site selection and its security against damage. Awareness and education programmes to help people understand the impacts of their resource extraction on pasture quality, wildlife, and their own livestock. Given climate changes and increased summer precipitation which renders the traditional house architecture less suitable, there is an opportunity to encourage better water resistant construction (while retaining traditional designs) and reduce the use of local biomass such as <i>Canagana</i> , <i>Laniava</i> and <i>Patentila</i> in construction.	Broad approach Broad approach	community incomes as well as strengthen conservation in the landscape. It is thus particularly important to investigate the spread of tourism, its economic, ecological and social impacts and give direction to it in the landscape. The extant and potential threats to wildlife and human society from tourism also need to be understood.
Background information	an Disturbances Biomass is usually extracted for fuel, fodder, construction material and occasionally, for trade in medicinal plants. The magnitude of extraction and patterns for these vary across the landscape and need to be understood and documented Up to 70% of the winter fodder needs are met with agricultural residue and the rest needs to be extracted from pastures during autumn Over half of the fuel needs are met with from the subsidized Forest Department supplies Livestock dung is collected from the pastures throughout summer and autumn and is important for fuel (especially equid and yak- cattle dung) and sheep-goat and other dung as manure (Mishra, 2003)	Background information Information	domestic and international visitors since 1992-93 There has been a growth in restaurants and hotels in Spiti, especially in places like Kaza, Tabo & Kibber
Threats	4.1. Plant Biomass extraction	Threats 4.2. Uncontrolled	tourtism

A joint survey by NCF and Kibber Youth Council showed that in 2006 itself, there were 24 hotels/ guest houses in Kaza and 6 in Kibber.

- Contraction	MANAGEMENT PLAN FOR UPPE	R SPITI LANDSCAPE		
Broad conservation targets (in next 5 years)	Some of the 'core' landscapes can particularly be promoted for wildlife viewing and interpretation Set up at least three models of eco-sensitive tourism in the landscape that demonstrate the use of wildlife tourism to benefit local economy			Broad conservation targets
Broad approach	It is also important to put in place all necessary measures w.r.t. infrastructure, capacity and monitoring to set up model tourism initiatives that benefit both, the local community and wildlife, and that have minimal damaging impact on the environment, are facilitated and encouraged. A study is commissioned to understand the current tourism patterns in Spiti vis-à-vis environmental, social and economic impacts.			
Background information	Similarly there has been a growth in the number of taxies, catering to both, local people and tourists Tourism is a significant livelihood option for local people, especially in some places, while the potential in other areas is growing In the adjacent areas of Manali and parts of Ladakh, uncontrolled tourism has brought in a variety of negative impacts	Potential threats to the area from tourism are unclear but include spread of garbage (& related feral dog problem – see 3.4), camping in eco-sensitive areas, drug use & cultural pollution (Mishra, 2000) A study led by WWF-India & Ecosphere is already in place, which should help understand some of the issues and findings should be available in early 2011	Homestays are a good means of enabling community to benefit from tourism, but requires support in capacity, some infrastructure and marketing	
Threats	4.2. Uncontrolled tourism			j

Threats	Background information	Broad approach	Broad conservation targets (in next 5 years)
	In the adjacent areas of Manali and parts of Ladakh, uncontrolled tourism has brought in a variety of negative impacts		
	Potential threats to the area from tourism are unclear but include spread of garbage (& related feral dog problem – see 3.4), camping in eco-sensitive areas, drug use & cultural pollution (Mishra, 2000)		
	A study led by WWF-India & Ecosphere is already in place, which should help understand some of the issues and findings should be available in early 2011		
	Homestays are a good means of enabling community to benefit from tourism, but requires support in capacity, some infrastructure and marketing		

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See.	MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE	MANAGEMENT INTERVE
(in next 5 years)	Studies identify key needs for the habitat improvement & pilot studies are undertaken for testing those Experimentation in 'artificial glaciers' and other innovation in moisture retention for pasture development needs to be undertaken. Ladakh has already some experience in this. This knowledge needs to be investigated further, and local community consultants from Ladakh can be engaged to assist such initiatives in Spiti. Provisioning alternate sources of energy, fodder, etc; especially taking advantage of convergence possibilities with other agencies Set up grazing-free reserves (as detailed in the threat dealing with livestock grazing)	Broad conservation targets (in next 5 years) (in next 5 years) (compilation of local knowledge is developed regarding changes in climatic patterns in the past 4-5 decades Weather data are established in the landscape with a clear mechanism for data sharing Research studies involving irrigation and temperature variation experiments help develop a better understanding of climate change impacts on the rangelands. Co-operation with other departments and community personnel to see how local construction can be adapted to make them more suitable for the changing climate.
Broad approach	Habitat degradation is mostly related to threats discussed above. It is important to identify and mitigate the threat causing the degradation as a first step. Much research is still needed to understand how the rangelands can be restored or improved. Eg The suitable forage species for any given pasture, the cultural methods for them, soil nutrition and moisture regime needed. Grass species such as <i>Stipa</i> and <i>Festura</i> are important local forage plants, though an understanding of their habitat needs and propagation techniques is still poor. Particular research is needed to improve soil moisture retention that is said to help rangelands in cold arid areas. After perusal of relevant literature, pilot projects need to be taken up to understand rangeland/pasture improvement in Spiti. It is important to note that until these are understood, no full-scale restoration project should be taken up. Setting aside grazing-free areas can help in restoration of pastures (see threats from livestock grazing for more detail). Salt lieks or water holes, though not required, may only be developed where there is a need to promote predictable wildlife visibility for tourism.	Broad approach There is a need to monitor and document these climatic trends more systematically and understand the specific impact of increased summer precipitation on local communities. Establishment of a series of climate monitoring stations tied up with village councils/schools/NGOs can be very useful. Various Govt, agencies involved in collecting weather data need to coordinate and share their data to help evolve a better understanding of past/recent trends. Mechanism for data sharing need to be set up for easy access to data
Background information gradation	Habitat for species may degrade due to most of the above threats such as excessive grazing by livestock, excessive biomass extraction or other developmental pressures. Once these agents are removed or at least reduced from the area, there will be scope for habitat improvement. There is still a very poor understanding of vegetation dynamics, and how rangelands could be restored or improved In general, salt licks and waterholes are not needed for habitat improvement for mountain ungulates. These may be needed only where there is a need to promote their visibility for tourism. However, they pose the threat of increased disease transfer between livestock and wildlife, apart from overgrazing such sites. . In fact, the visibility of wild ungulates, especially in model Core Landscape Units, is excellent in this open landscape, and does not need to be promoted further.	Background information Recent local reports and metrological data suggest a marked change in weather patterns in Spiti such as an increase in summer precipitation and a decline in winter snow. 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 a threat to standing crop, doesn't really help rangelands that have entered senescence and can 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.
Threats 5.0. Habitat De	5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	Threats 6.0. Climate change

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	MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE		
Broad conservation targets	(in next 5 years) Identify suitable NGOs and Govt. departments to channelize funds for awareness generation among various target groups i.e. children, youth, teachers, armed forces and general public Set up/promote at least two pilot conservation education projects in/around the CLUs and/or emulate the existing good ones in other areas for specific target groups such as school students Prepare local biodiversity register based on Gadgil and Guha 1993) for each village council/ cluster and collate it to prepare a comprehensive register for the Upper Spiti Landscape Create institutions at school/ college and village council levels (e.g. nature clubs/eco clubs and youth awareness and safeguard the environment	Broad conservation targets (in next 5 years) Commission a study leading	to a technical report, popular publication (book) and media articles on Traditional Ecological Knowledge and Practices in the Upper Spiti Landscape
Record conservation	Documentation of traditional ecological knowledge of the local communities to re-learn the wisdom of the older generations Encouragement for long-term awareness and conservation education modules and activities in middle and high schools across all the regions Orientation and training of teachers to include environmental education in their respective subjects and motivate them to initiate programmes/activities in their schools Engagement of rural youth through training workshops and awareness-building activities in projects to monitor wildlife and local environmental factors, as well as nature interpretation skills Orientation and training of tour-operators and local people (especially youth) to promote eco-tourism to involve local communities in raising awareness and sharing greater stake in ecologically sensitive and sustainable livelihood generation Awareness raising activities for the armed forces, Government departments and NGOs for better condination and screening of developmental activities in the Himalyan high altitude region Promoting public debate on local conservation/ developmental issues	Broad approach Trivedi <i>et al.</i> 2006 provide numerous details on the need,	approach and possible activities that can be useful to all agencies carrying out awareness works in the landscape
Rodrominal information	The global strategic document called the Snow Leopard Survival Strategy, SLSS, identified lack of conservation awareness as an important threat for snow leopard conservation in the Indian Himalaya (McCarthy and Charon 2002) A comprehensive conservation education strategy prepared by NCF and SLT (Trivedi <i>et al.</i> 2006) outlined major threats to wildlife conservation and approaches/ activities to tackle these in the Himalayan high altitude region Pinalayan high altitude region Poor awareness exists at various levels and across all sections of the society from school-going children to youth, teachers, Government, local people and tourists At the most basic level, it is reflected as lack of/low knowledge about the local wildlife and conservation problems/issues; negative emotions and values about wildlife and wild habitats; and fading religious/ cultural and ethical dimensions concerning importance of conserving nature	Background information At other levels, this threat	is reflected in the lack of local institutions to counter environment related risks and impacts of developmental activities and collective voice at local level, and/or preservation of wildlife (except in few instances), however, there are examples of such institutions driven by religious values and ethical/ economic considerations in pockets
1 ¹	7.0. Lack of awareness	Threats	





SET UP MECHANISMS FOR COLLABORATIVE CONSERVATION IN THE LANDSCAPE INVOLVING ALL APPROPRIATE STAKEHOLDERS



7.1. CONTEXT AND OB-JECTIVES

The primary Government agency for wildlife conservation is the Wildlife Wing of the Forest Department. There are several NGOs and research institutions that also play a key role in conservation. Additionally, other Government departments are increasingly taking interest in conservation and 'green' activities (Table 7.1.). The Management Plan recognizes that particularly in the landscape context, where land use differs and ownership of land varies, facilitating convergence in a manner that all groups are able to contribute positively to conservation, based on their individual expertise, is important. Conservation goals must be achieved through direct threat reduction, protection of habitats and species. Local communities must be seen as an important stakeholder and potential driver of conservation efforts, and they

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need to be factored into any programme for its long-term success.

It is recognized in this plan that wildlife conservation in the Upper Spiti Landscape has to facilitate other core aspects of enabling conservation. These include better livelihoods for communities so that their dependence on local resources is reduced, energy efficient lifestyles, eco-development works by agencies incorporating environment friendly practices or causing less harm to the environment, and enhanced awareness about these issues among general public.

The scope of such goals naturally goes far beyond a conservation management plan per se. As is evident from the discussion below, many of the agencies are already mandated to use environment friendly approaches and based on a proper mechanism of coordination and discussion, this can be further strengthened and implemented. This chapter thus considers the options of mainstreaming conservation into the larger development agenda of Spiti. Perusal of Table 2.10 and Appendix 2.5 amply demonstrate the numerous avenues of conservation available in departmental priorities. They are further analyzed in Table 7.1 where some salient aspects of each sector are discussed in terms of conservation. It is evident from this table that there are already crosscutting themes across departments. For example, pasture development is carried out by the Forest Department as well as the animal husbandry, soil conservation and rural development departments. The areas of works are often the same and a synergy is possible to meet the needs of both wildlife and livestock. In this example however, as noted elsewhere, the best means of pasture development aren't always understood. Another example is the watershed development programme of various departments. Here too, the agriculture, forest, rural development, soil conservation, animal husbandry, along with Border Area Development Programme (BADP) and Desert Development Project (DDP) can synergize and contribute.

Capacity enhancement also is a common theme for different purposes from developing skills to tourism initiatives, to capacity for monitoring wildlife (forests, tourism, youth services and sports, rural development, HPSCSTDC). Study tours for different target groups are planned and conducted under the SSA, Science & Technology, Cooperatives and Industry. Rural energy through non-conventional sources of energy is a clear priority for *Himurja*, while it is a common means for eco-development used by the forest department. Organizing villagers into self-help groups is a common strategy for streamlining income options in wildlife areas by conservation agencies, and this is already being applied in the Spiti landscape by the Rural Development, Cooperatives, and Industry sectors. BADP and DDP contribute in all the above and more. What is thus stressed in this chapter is that resources can be utilized much more efficiently with synergy between different departments in carrying out works. The important point is that the Forest Department need not carry out all activities when other agencies are already mandated with similar work. They should however partner with relevant agencies so that its staff and resources can be utilized more judiciously and effectively, while the work also doesn't suffer. The current Management Plan hopes to set up mechanisms that enable this to

happen in Spiti.

It is also recognized that NGOs have an important role to play in both development and conservation. NGOs typically work at a smaller scale viz. individual village or village cluster(s). With their flexibility and limited scope, they are able to experiment to develop working models (e.g. conflict management model of NCF in Spiti that involves a combination of livestock insurance, better herding practices and grazing-free reserves; better herding and predator-proof corrals by Snow Leopard Conservancy in Ladakh) that can be adapted by Government agencies.

A common assumption made in developing conservation programmes is that with increasing prosperity, people's dependence on local resources for fuel, fodder and other local resources will decline. Whether or not increasing prosperity can benefit conservation depends a lot on the livelihood options that people adopt. In Spiti, the adoption of cash crops and orchards has indeed resulted in lower dependence on livestock, though livestock populations are still high overall. For example, the Tabo-Lari villages have reduced keeping livestock as it was getting difficult for the villagers to spare time from the flourishing apple fields, and untended livestock were damaging apple orchards. Also, as evident from Figure 2.14, villages along the main Spiti Valley and its highway tend to depend less on livestock compared to the villages that are away; their livestock holdings are less than half that of the villages in the side valleys.

The Plan also notes here that conservation actions are not always sacrosanct and constant in their significance over time. Every action may have both positive and negative consequences. For example, commercial organic farming is often suggested as a means for value addition to agricultural produce. While this clearly is an environment and health friendly activity, the need for manure may push communities to own more livestock, maintained mainly for dung. If the areas are unable to produce enough manure (see also Section 2.3.5), the pressure can shift elsewhere (Madhusudhan *et al.* 2005). It is thus recognized that good monitoring, crosscutting discussions and team effort are necessary even for seemingly environmentally sound initiatives, so that mid-course corrections can be applied, if need be.

The objectives for enabling convergence are stated below:

- 7.1.1. To develop structural mechanisms for role of community in conservation planning & implementation.
 For example, the Village Wildlife Conservation Committee (VWCC) under the Project Snow Leopard (PSL) need to be set up in appropriate landscape units (Primary PSL Objectives addressed: Nos. 1, 2, 3)
- 7.1.2. To develop mechanisms for convergence (& minimizing conflicts between conservation

and development) in activities with other Government departments and NGOs working for development. For example, the Landscape Level Implementation Committee (LLIC) under the PSL will serve this purpose and aid in providing a forum for facilitating convergence and avoiding conflict with conservation interests. (Primary PSL Objectives addressed: Nos. 1, 2, 3)

- 7.1.3. To build capacity of local staff and officers of the Forest Department and other concerned departments in collaborative and participatory functioning (Primary PSL Objectives addressed: Nos. 1, 2, 3)
- 7.1.4. To conduct targeted capacity enhancement of VWCCs in collaborative planning and implementation of conservation projects (Primary PSL Objectives addressed: Nos. 1, 2, 3)
- 7.1.5. To undertake Forest Department staff welfare activities to improve the capacity and morale of the frontline wildlife staff with incentives and better equipment (Primary PSL Objectives addressed: Nos. 1, 2, 3)

7.2. RECOMMENDED ACTIONS

7.2.1. Constitute the Village Wildlife Conservation Committees (VWCC) covering all villages in the Upper Spiti Landscape.

This committee will function under the directions of the LLIC, which in turn will function under the State Snow Leopard Conservation Society (SSLCS). The National Project Snow Leopard Steering Committee will direct the programme at a national level. The VWCC is the primary body with which micro-plans must be developed and implemented. The LLIC and VWCC will have participation of all relevant stakeholders and will look at options for convergence and tackling threats as discussed in Goal no. 2 (Chapter 6.0). Periodic meetings of these committees will be held to ensure effective convergences, other works and monitoring.

The staff and community members forming the VWCC should be trained from the entire landscape in 3-4 programmes on the micro planning skills and processes. The support of credible state and national organizations should be taken in developing the curriculum and resource persons for these training programmes. The micro-planning in all the eight councils (*Panchayats*) should be completed within two years.

7.2.2. Constitute the Landscape Level Implementation Committee (LLIC) covering all villages in the USL.

The LLIC is the body that is mandated to have representation of line agencies apart from the Forest Department and should help in coordination of works between sectors as outlined earlier in this chapter. This step has already been executed for the state, but the committee needs to be activated. It is important that this committee can work in synergy with the regular planning meetings under the Integrated Tribal Development Plan (ITDP). The purpose is to synergize in pooling resources and expertise for more efficient works and also help avoid environmentally (& culturally) damaging activities. It is important that the LLIC meets at least once every year, ideally towards the end of a financial year so that planning for the next year is more effective.

- 7.2.2.1. Encourage convergence activities, especially in the fields of agriculture, animal husbandry, education, tourism and employment that can help people's livelihoods and also in conservation goals.
- 7.2.2.2. Carry out activities such as habitat improvement and protection as per need in the Landscape Unit.

This activity, led by the Wildlife Department, will engage in experimental habitat restoration wherever needed, with the support of other agencies involved with 'pasture development', soil and water conservation. It will also carry out all measures for protection of wildlife and local resources using local community members, and by putting in mechanisms for monitoring and modification of developmental works by other agencies.

- 7.2.2.3. It will also help if the members are able to visit other landscape conservation sites in the country such as Periyar NP in Kerala and the Annapurna Conservation Area in Nepal.
- 7.2.3. Staff capacity in participatory planning and action, action research and wildlife monitoring will be provided through periodic workshops for the staff.

This activity will utilize some of the excellent syllabi already developed for the Great Himalayan NP Conservation Area (GHNPCA) in the state regarding participatory planning and action and by the Snow Leopard Trust (SLT) for wildlife and human society monitoring.

This activity will go on through out the planning period and be conducted by research organizations such as NCF and WII.

7.2.4. Staff welfare activities that include residential quarters, appropriate camping and survey equipments, and incentives will be instituted. Awareness programmes targeted at im-

proving motivation will also be put in place for the staff.

The Wildlife Wing of the Forest Department will review the staff needs and develop a programme for provisioning of all necessary facilities over the first five years of the planning period. The motivation of staff will need to be made a regular practice by involvement of senior forest officers along with scientists and sociologists of repute in structured interactions with staff.

Table 7.1: Sectoral convergence for conservation in Spiti based on mandates and thrust areas noted in interviews and by analysis of ITDP 2007-08 Annual Plan document (Table 2.10; Appendix 2.5). 'Convergence' here refers to the possibilities of using departmental mandates for wildlife conservation.

See clubbing together of the various line departments into sectors w.r.t. Spiti in Table 2.11.

Sector	Comments on Convergence or Divergence
	Cash crops such as green peas and recently, apple, have created major avenues of cash income for communities. A possibility of further diversification of cash crops such as apricots is also possible. These are likely to reduce direct dependence of people on local resources
	Agriculture & Horticulture Departments have laid emphasis on organic agriculture in their mandates. While this is a positive effort to preserve the traditional organic practices, additional areas under cultivation may put greater demand on rearing more livestock for dung alone; a practice that can potentially be detrimental for local rangelands. This needs to be monitored.
Agriculture & allied	Both the Agriculture & Horticulture Departments have excellent facilities for training and extension of farmers. These structures can be useful to convey environmental messages.
	The research and education facilities of the Y.S. Parmar University of Agriculture & Technology, and the Horticulture Department in Tabo, can be very useful in helping with conservation oriented agro-ecology research, monitoring and implementation.
	The Agriculture & Horticulture Departments are aware of their socioeconomic responsibility, especially of helping the economically poorer sections and women.

Sector	Comments on Convergence or Divergence
	The Horticulture Department in fact states a clear environmental objective as "Develop horticulture as an environment friendly enterprise for economic development, environment conservation and development of ecotourism"
	Irrigation projects appear to have both, positive and negative impacts on conservation. The economic resources generated from the fields mostly help in making the communities less dependent on other local resources. The seepage from the channels (khuls) often enrich the adjacent pastures. However, the labour force used to construct and often to maintain the channels are from outside, who are known to disturb wildlife or cause undue disturbance.
	Historically, harvest of water for agriculture has led to reduction in productivity of pastures, especially those close to glaciers and springs.
	Fodder development programmes are an important aspect of the Animal Husbandry Department and can greatly reduce grazing pressures from rangelands and confining pressures to limited areas near settlements
	Value addition of endangered livestock breeds such as the Chumurti horses is an important aspect, and can be leveraged in the tourism business
Animal Husbandry &	Prophylactic care and treatment of livestock against diseases and parasites is an important aspect of the department, something that clearly helps conservation of wild herbivores. Such care, especially close to the 'core' reserves identified in this plan can be very helpful for conservation
allied	Fisheries Department has had a slow growth in Spiti as local communities revere fishes and avoid eating or killing them. Some aspects of fisheries, such as angling can have potential in tourism and are recognized by the department
	Any move to increase livestock numbers can have damaging impacts on rangelands and wildlife in general and this needs to be avoided.
	Some exotic fishes such as the Arctic char are being introduced in rivers and streams of Spiti and can potentially wipe out the native fish fauna
Central	The BADP, DDP and SADA are all central resources with crosscutting priorities in particular areas. They provide inputs in fields of infrastructure, agriculture, animal husbandry, soil conservation, etc; all fields that have a significant environmental imprint
Disaster	Primarily flood control department. Mandated to help in emergencies with high potential for prevention of erosion



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Sector	Comments on Convergence or Divergence	Sector	Comments on Convergence or Divergence
	Industrial development and commercial activities through cooperatives remain primarily potential options for augmenting local incomes and can be leveraged for conservation activities Programmes for providing credit, skills training, marketing, transport and even tourism enterprise is possible Both departments have programmes for training of youth and others in	Employment	The Employment Assurance Scheme, the Jawahar Rozgar Yojna and the ongoing Mahatma Gandhi Rural Employment Guarantee Scheme (MGREGA) are major vehicles of bringing in employment opportunities in a fields in the landscape. Many of the civil works under the plan can potentially tap MGREGA resources
Cooperatives and Industry	 managing and running cooperatives or small-scale industry, including exposure visits to organizations of national repute. Locally prevalent skills in Thangka paintings, rock carving, woolen products and yak based products can be channelized under this initiative Scoping studies can be conducted to determine various environment friendly options of industry in the landscape, especially for agro based industries. The State Bank of India, Kaza provides loans for entrepreneurs, students and even for setting up self help groups 	Energy	Power is the backbone of development. There is however a major deficit of electricity in the landscape, with even the Sub-Divisional HQ having a constant shortage year round. Mini & Micro (and even Pico) Hydel projects in general planned by the HP SEB and Himurja should help overcoming this shortage Conservation agencies often try to invest considerably in the energy sector (solar power, wind power and LPG) with the assumption that these will reduce dependence on local fuel resources. <i>Himurja</i> has a comprehensive
	The Sarva Siksha Abhiyan has high potential in providing scholarships, infrastructure, but especially in facilitating nature camps on a regular basis. Production of education and awareness material is possible through the SSA that can have a large impact through out the landscape Education is the cornerstone for opening up the opportunity of employment, both in organizations and for self-employment, which in turn can help reduce local dependence		 mandate to provide solar devices free of cost or at substantial subsidy in the entire landscape. Works on community managed micro-hydel, solar lighting, and maybe even solar cookers and geysers can be complemented by the Management Plan process with some monetary contribution and with prioritization for communities participating in active conservation initiatives Large power projects aren't yet lined up in Spiti, but they often can cause serious environmental damage and need to be avoided.
Education	 Technical education can open up opportunities for youth to develop skills, especially in vocational fields The Public Library can be an important place to have interesting books and publications on wildlife and nature in general, which can help develop interest among the young and old alike. There is a need to revitalize the library in Kaza The Information & Publicity Department of the Government can help with information dissemination on wildlife values, do's and don'ts for outsiders as well as for local communities The Youth Services & Sports already recognizes the importance of environmental conservation and had kept it as its theme in 2006-07 priorities under ITDP The National Service Scheme (NSS) of the Youth can also be channeled for 	Environmental	The Wildlife Department is the main implementer of this Management Plan. Other departments such as agriculture, soil & water conservation, DDP, BADP also have a role in carrying out environmental works in the landscape The Forest Department provides fuelwood from outside the landscape (up to 70% of the need), which takes off pressure from at least the local shrubbery. They are also making efforts in habitat restoration, protection of wildlife and community-based catchment area protection to improve habitats and wildlife values The Wildlife Department is involved with development of pastures immediately around the village lands. This subject needs sounder research to develop ways of doing it most efficiently and using native species.
	environmental works		



Sector	Comments on Convergence or Divergence	Sector	Comments on Convergence or Divergence
	The Science & Technology (S&T) sector has a mandate to contribute towards solar passive heating of houses to conserve fuel use in winters and promote green houses to enable production of fruits and vegetables.		Herbal gardens as maintained by the Forest Department and agencies such as Pragya can become important tourist attractions where knowledge dissemination is arranged (also for local people)
	The S & T have proposals for rainwater harvesting, but in the Spiti landscape it may be wiser to develop means of tapping the snow/ice using innovative means such as artificial glaciers for both irrigation of crops and water for pasture development. This has been done in Ladakh for supplementing spring irrigation.	Health	Tremendous caution however needs to be observed for regulating the commercial use of the medicinal plants The Hospitals are already aware of the safe disposal of medical waste items and this needs to be maintained
	Products from seabuckthorn are an important aspect of S&T mandate and considerable research on the subject has already been done in the DRDO's High Altitude Lab in Leh, Ladakh (Field Research Laboratory). This can be channalized for use in Spiti, along with efforts of agencies like Ecosphere		Infrastructure is a top priority sector of the Government in Spiti, this is critical, but can have serious environmental consequences too The departments involved are PWD, Irrigation & Public health
Environmental	A word of caution regarding seabuckthorn harvest – local people have noticed that their harvesting the berries in autumn deprives numerous bird species of this fruit and have on their own reduced and regulated its harvest. The impacts of harvesting the berries (which in most cases is outside village land) needs to be understood S&T have a mandate to organize Children Science Congress and Science Clubs. These can be utilized effectively in conservation awareness programmes too. They also have a provision to take school children on study tours, which can be tanped for tours to other conservation areas that can halp children	Infrastructure	As of now no clear mechanisms for minimizing environmental impacts of roads and buildings are envisioned. These need to be brought into the agendas of the departments dealing with infrastructure. All these departments do most works through contractors who bring in outside labourers. The serious threats some of these people can pose to the local environment needs to be understood and mitigated as discussed elsewhere in this Plan (Table 6.1). It is important to have a mechanism for monitoring and addressing these issues
	appreciate their resources better S&T have programmes for capacity enhancement of local staff, awareness and community members in a variety of subjects and these resources can be channelized better for conservation initiatives based on this plan		Tourism infrastructure and systems are being promoted that should ultimately help communities. However, a clear linkage with how this will help the community isn't yet stated clearly. The schemes for preparing publicity and informative material in the form
Governance	The Panchayats will make an important interface in the negotiations between the planners and local communities for designating reserves and other related activities	Tourism	of both print and audio-video formats can be of great help in promoting responsible nature/wildlife tourism There is a scope of encouraging community based schemes such as homestays
Health	Since Spiti is an important site for medicinal plant production and traditional use (through the <i>amchi</i> system the <i>Bhot Chikitsa Paddhati</i>), this style of treatment and healing can be encouraged and channeled into tourism industry too		and eating places in the region that provide a good cultural experience to visitors Adventure sports can be encouraged that includes river rafting, mountaineering, etc Capacity enhancement of local youth is possible with the help of tourism and
			mountaineering departments/agencies



Sector	Comments on Convergence or Divergence
Transport	Transport facilities into Spiti are rudimentary at present and are often considered one primary cause of limited tourism in the region. Targeted improvement in local transport can help in this cause apart from the much needed help to the local communities
	The Rural Development, Civil Supply, The HP SC/ST Development Corporation (HPSCSTDC), Youth Services, etc are important parts of the Government machinery dealing with welfare of the population, an aspect critical to local livelihoods as well as conservation.
	Employment generation is an important focal area as also poverty alleviation. Channelizing these programmes in conservation areas through the Planning process can help build the constituency of conservation
	The Rural Development Department has already stated goals dealing with promoting environment friendly practices in all its areas of support that include soil conservation, moisture conservation, pasture development, horticulture and agricultural works
Welfare	Skill based capacity enhancement in a variety of vocational fields in provided for
	Promoting Self Help Groups (SHGs) and self employment (through Swarnajayanti Gram Swarozgar Yojnai, Sampoorna Grameen Rozgar Yojna (SGRY), and employment through MGREGA, etc
	The HPSCSTDC has schemes for promoting tourism enterprises (guest houses, taxi, dhaba, etc), handicrafts, agriculture and industry related initiatives by community members through SHGs
	There is support for skills development available with the HPSCSTDC
	Support for awareness generation through publicity material is available with the HPSCSTDC



RESEARCH, MONITORING AND TRAINING IN THE UPPER SPITI LANDSCAPE



8.1. BACKGROUND

India's Trans Himalayan regions had received very little conservation and research attention until the 1980's when some surveys (Fox 1994, Mallon 1991) and species ecology studies (Chundawat 1992) were initiated. Spiti, remained a rich source of literature on geology (Wadia 1966, Gupta 1994), but information on wildlife began to be generated only in the late 1990's through studies on the ecology of the ibex in Pin Valley National Park (Bhatnagar 1997, Manjrekar 1997). Later, more detailed insights into the interactions of wild and domestic herbivores clearly identified excessive livestock grazing as a cause of wild ungulate species declines (Bhatnagar et al 2004, Mishra et al 2002, Mishra et al 2004) and the possible mechanisms for these effects (Mishra et al 2001, Suryavanshi et al 2010). Bagchi (2009) further looked at ecosystem functioning aspects of rangelands in the sce-

nario of human land use. An understanding also developed regarding the extent of carnivore – human conflicts (Mishra 1997) and its possible causes (Bagchi and Mishra 2006). The flora (Aswal and Malhotra 1994) and fauna (ZSI, 2005, ZSI 2008) of the region was also explored, with good insights into the spread and use of medicinal plants (Kala 2000). There was a simultaneous development of ecological insights in the past two decades, as well as information on human ecology, particularly people's dependence on the landscape and socioeconomic transformations (Bhatnagar 1997, Mishra 2000, Mishra *et al.* 2003, Chandrasekhar *et al.* 2007).

Large-scale occurrence of wildlife in Spiti remained an area that wasn't explored much until the effort to develop the present management plan (see Section 2.2.3 & Chapter 4) was initiated. This exercise also focused on trying to understand the threats to wildlife populations and habitat in the Upper Spiti Landscape (Chapter 3 & Section 5.4). The management planning process has also compiled hitherto scattered information on the local institutions and their roles (Section 2.4).

While the past two decades have seen a quantum increase in research, there are still many issues pertaining to ecology, human society, and their interface, which need to be understood in greater detail to enable robust conservation planning, implementation and monitoring. The management Chapters (4 to 7) have already pointed out some such issues for information generation and these are further synthesized in this chapter.

8.1.1. Some more insights into livestock and native wildlife in Spiti based on recent studies.

The Spiti region of northern India (12,000 km²) is part of the larger Trans-Himalayan region spread over India, China and Nepal (2.6 million km²). 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 interactions between wildlife and livestock in Spiti region has unraveled a wide array of humanwildlife conflicts, and also helped formulate pertinent remedial strategies. These findings can be categorized into 3 groups.

1. 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 carnivorerelated 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.

2. Livestock predation and conservation of Spiti's carnivores

Surveys revealed that the economic losses due to livestock predation by snow leopards Panthera uncia, and wolf Canis lupus, were very high (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. Research into the biological and social aspects of human-wildlife conflict in Spiti has resulted in an incentive-based model for conflict mitigation (Mishra et al. 2003). Central to this model is a community-based and operated livestock-insurance programme that attempts to compensate the financial loss resulting from a predation event. Other features of the model include incentives for improving husbandry so that predation can be avoided. 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). These village reserves essentially represent examples of Core Landscape Units that are proposed to be developed under this management plan. Surveys at the beginning of the community-based programme indicated that 40-60% of snow leopard diet consisted of livestock in 2002 (Bagchi & Mishra 2006). But, after five years, data show appreciable increase in populations of wild herbivores (presumably

a direct effect of the 'village reserves'), and a reduction in snow leopard's dependence on livestock (presumably a reflection of diet shifts in response to increased availability of wild prey) (S. Bagchi and C. Mishra, unpublished data).

3. Livestock grazing and ecosystem functioning

Research has addressed the ecosystem consequences of livestock grazing in Spiti (Bagchi 2009). Grazing can exercise strong controls over material and energy flow through an ecosystem, which are mediated by numerous co-adaptations between plants, soils and grazers. Unlike the native herbivores, the livestock lack a long co-evolutionary history with the vegetation, and their behaviours (habitat use and ranging patterns) are heavily influenced by human decisions. 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.

8.2: OBJECTIVES

It is recognized that ongoing research, though not totally comprehensive, has helped gain considerable insights, and that a synthesis of these has led to the formulation of the Project Snow Leopard in the country. It is also observed that the region has pervasive wildlife values, but also pervasive human presence and resource use. At the same time, it should also be mentioned that threats to wildlife and their habitat are dynamic in nature. A sound understanding of the mechanics, timing and magnitude helps mitigate or manage these threats better. Further conservation action itself can lead to changes, often positive, but occasionally negative. These changes and their impacts on human society need to be monitored, so that appropriate corrective action can be taken based on the lessons learnt.

Research needs capacity, which is mainly available with a few academic institutions of repute at present. Crucial role of trained researchers and academic institutions must be acknowledged and encouraged at all times, while local state universities and other agencies are encouraged to enhance their capacity for wildlife field based research. Partnerships between research agencies, the forest departments and local communities are important. The research agencies can carry out independent research work, while generating monitoring protocols and conducting or leading relevant analyses as well as training. Most research projects should be based on detailed peer reviewed research proposals that can be proposed independently by agencies or coordinated by the Forest Department. Training of selected local people and Forest Department staff can greatly help in collecting simple, but useful monitoring data over larger landscapes. The purpose of this chapter is to provide pointers to the research needs. Given this background, the following objectives are stated:

- 8.2.1. To monitor the abundance and distribution of snow leopards, and monitor their population in the entire Upper Spiti Landscape using advanced and emerging techniques such as camera trapping and genetic sampling in a mark-recapture framework. Recent work by the Nature Conservation Foundation (NCF) and its partners (Snow Leopard Trust (SLT) and National Centre For Biological Sciences) with support from the HP Forest Department has helped improve camera-trapping designs, and advances have been made in population monitoring using genetics tools.
- 8.2.2. To monitor abundance of key snow leopard prey species such as ibex and bharal using improved and scientifically robust methods (e.g. modified double observer surveys that have been recently developed and tested in Spiti by NCF and the SLT).
- 8.2.3. For each Core and Buffer Landscape unit, develop a better understanding of the threats to wildlife and their habitats; understand their root causes, history, mechanics, timing and patterns of the threats. The threats need to be prioritized for mitigation based on their urgency, extent (area of impact), and severity (extent of damage to wildlife or their habitat).
- 8.2.4. To periodically monitor aspects of human ecology, human society and socioeconomics using sociological and anthropological research tools.
- 8.2.5. To encourage and conduct further distributional surveys of medicinal plants, other wildlife taxa or important microhabitats.
- 8.2.6. To develop and implement monitoring programmes for wildlife species and rangelands in each Landscape Unit, especially the Core Landscape Units. Monitoring of biological indicators (such as snow leopard abundance/use, wild prey populations etc.), threats, and socio-economic and attitudinal indicators is important.
- 8.2.7. To carry out capacity enhancement of Wildlife Department staff, youth and local people in monitoring and wildlife laws.

8.3. RECOMMENDED ACTIONS

8.3.1 To monitor the abundance and distribution of snow leopards, and monitor their population in the entire Upper Spiti Landscape using advanced and emerging tech-

niques such as camera trapping and genetic sampling in a mark-recapture framework.

Over the past four decades snow leopard population estimates world over have remained mostly guesstimates. The primary reason for this has been the remoteness of its habitat, elusive nature, rarity and some peculiarities of its habitat where even tracks are not easily detectable. Adequate technology was also not available. More recently, camera trapping is being successfully employed for monitoring snow leopard abundance (Jackson *et al.* 2006), especially at medium spatial scales such as habitats of up to 2000 sq km. There has also been advancement in genetics tools that can help monitor populations using DNA extracted from scats. This technique can effectively work at larger spatial scales (Janecka et al 2008), though extreme care needs to be exercised in following scientific sampling and scat collection protocols. NCF and the Himachal Pradesh Forest Department initiated a test phase for camera trapping in the Kibber WLS in the summer of 2009 and have now developed a detailed protocol that will be used to obtain credible snow leopard population estimates across the landscape. As a follow up, this exercise will be extended to cover the entire Upper Spiti Landscape. Such an exercise, if repeated every two to three years, will be very valuable. Capacity enhancement regarding this method is a crucial part of this Management Plan (see also 5.6.3, 7.2.3).

8.3.2 To monitor abundance of key snow leopard prey species such as the ibex and bharal using improved and scientifically robust methods

Prey species monitoring in the mountains has limited to block counts in most cases (also a part of SLIMS), but now more robust methods such as occupancy surveys for coarse scale distribution information (MacKenzie 2006) and double observer surveys (Magnusson, *et al.* 1978, Forsyth & Hickling, 1997) for population abundance information are possible. The latter has been improved by NCF in Spiti, and further training of staff and youth regarding these protocols is envisaged in this Plan (see also 5.6.3, 7.2.3). Population monitoring of wild ungulates, especially in all the Core Landscape Units, must be undertaken either annually or every two years.

8.3.3. For each Core and Buffer Landscape unit, develop a better understanding of the threats to wildlife and their habitats, understand their root causes, history, mechanics, timing and patterns.

Wildlife and their habitat in Spiti face threats from local use of natural resources and development pressures. These pressures vary across the landscape and can be acute in places. The current understanding of the threats is limited and magnitude, root causes, and effects are often not clear. To complicate this, the nature and severity of threats changes over time. For instance, development work such as road construction or buildings, apart from being damaging when undertaken in important wildlife areas (Core Landscape Units), also attract migratory labourers, who are known for hunting. We have a very limited understanding of how widespread the problem is. Similarly, while tourism brings benefits, what is the impact that it has on wildlife and their habitats? How are the impacts distributed across the Upper Spiti Landscape?

Some studies indicate the detrimental impacts of livestock grazing on wild ungulate communities, but mere presence of livestock grazing in a landscape unit cannot always be construed as detrimental to wildlife. It is also clear that conflicts are not distributed randomly across the landscape, but there is usually a pattern to it. There are some villages, pastures, seasons, animal or crop age classes, which are more vulnerable; and this information is critical in addressing the issue.

Thus, conservation action must be preceded by first developing a good understanding of threats in a given Landscape Unit. In Table 6.1, a specific threats-dependent conservation strategy is outlined (see Section 6.2.1). This includes:

- 1. Understanding conflicts related with both livestock depredation by wild or feral carnivores and crop damage by wild ungulates. As said above, the magnitude of losses, the vulnerable seasons, villages, pastures, species, circumstances of loss (in corral, pasture, etc.) needs to be documented.
- 2. Database of livestock use of areas that include information on species composition and abundance, and seasonal stocking densities across time
- 3. Diseases affecting livestock, their occurrence in the landscape, mortality, etc, which should be compared with occurrence of important wildlife populations
- 4. Database on developmental projects that are ongoing and proposed. This should include information on their sites, project duration, labour force, campsites, etc.
- 5. The causes, consequences and spread of the feral dog population and its damage to livestock and wildlife needs to be assessed and documented
- 6. Quantification of the extraction of fuel, fodder, and other local resources by the local people needs to be documented
- 7. Studies to understand the tourism potential in the area primarily dealing with the current patterns, potential trends and their impacts on the environment, society and local economy
- 8. Experimental studies to ascertain causes of rangeland degradation and reversing this trend. Developing an understanding of pasture development or habitat improvement that include appropriate site-specific plant species for restocking, their cultural practices, response to fertilization and irrigation. Testing of the 'artificial glaciers' in soil moisture conservation also needs to be tested.
- 9. Collecting good representative information on local climate through weather monitoring stations spread across the landscape

8.3.4. To encourage research on ecology, human society and socioeconomics by agencies of repute

Information on species ecology, which includes information on habitat quality, diets, home ranges and movements, population size, composition, and critical seasonal areas are very help-ful in developing conservation programmes for these species. Studies on predator-prey relationships will also help in understanding some important aspects of conflicts. The Himachal Pradesh Forest Department and NCF have already proposed pioneering studies on the flagship of the area, the snow leopard (Appendix 8.2) based on the use of advanced telemetry tools. This study will reveal the first ever detailed information on the snow leopard in the Himalaya. Since this document highlights identification and management of cores, meta-population dynamics i.e. patch quality and connectivity, source-sink dynamics and role of barriers that constrain movement can be a potential framework for future work.

An important aspect of conservation is local human dependence on natural resources and their impacts. The advent of cash crops, primarily green peas and apple, has improved the economic condition of many villages and households. These are often accompanied by positive environmental consequences such as reduction in livestock population or reduced dependence on the local resources. However it may also lead to some negative consequences such as use of migrant labour for cultivation and herding, etc. It has been discussed elsewhere (Table 6.1) that these immigrants or seasonal immigrants can be a serious conservation threat in Spiti due to their involvement in hunting. It is thus important to understand the agricultural economics of the region, which can provide numerous solutions to conservation problems as well as pose new threats. Organic farming was practiced in the region since millennia but a reduction in livestock in some pockets is leading to demand for importing manure and pesticides from outside. There is a possibility that encouraging organic farming (which is desirable), may lead to increase in livestock populations in some areas. The potential of organic farming thus needs to be studied and possibilities of using other means such as vermicomposting need to be tested.

8.3.5. Further distributional surveys of medicinal plants, other wildlife taxa or important microhabitats.

As indicated on numerous occasions earlier in this document, Spiti, like most Trans Himalayan sites has wildlife values spread across the landscape, whether right next to a village or a very remote valley. This Planning process has already identified 15 sites of high conservation importance based on their value to the snow leopard, and its two primary prey species (ibex and blue sheep). These surveys have attempted to incorporate information from direct field studies with information based on key local informants (see Chapter 4). Since mountain wildlife often tend to have separate seasonal habitats, and knowledge from the key informants may still be incomplete, it is emphasized that further surveys should be undertaken to refine

information already included in this Plan.

It is recognized that there are many other taxa such as invertebrates, herpetofauna, birds and medicinal plants regarding which existing information is insufficient to identify priority sites or initiate any relevant conservation work. This plan should thus encourage, and support the generation of such information through rapid surveys followed up with more detailed study on these taxa (see also 5.6.2).

For all identified sites and also elsewhere, it is important to commission robust status surveys for the target species that establish baselines. A related subject is the development of appropriate monitoring protocols for each identified species/taxa, so that the information has repeatability and comparability across areas and time (see also 5.6.3).

The identification of important wildlife areas uses an important layer of information, which is the local human demography, socio-economy and its changes. This information is needed to prioritize areas as also to assess threats (see also 5.6.1, 5.6.4).

8.3.6 To develop and implement monitoring programmes for wildlife species and rangelands in each Landscape Unit, especially the Core Landscape Units.

Wildlife populations and rangeland condition are likely to change due to human pressures, conservation action and even climate change effects. A constant understanding of these changes is essential to adapt the conservation strategy. Developing and implementing long-term monitoring protocols is thus essential for effective management in Spiti. The monitoring protocols for some key large mammals and birds are being developed (see 8.2.1), while those for invertebrates and flora needs to be developed. For a beginning the species to be monitored should be the snow leopard, Tibetan wolf and their primary prey, the Asiatic ibex and the blue sheep. Apart from these bird communities can be monitored in different comparable areas with differing human pressure.

Monitoring of rangeland condition would involve studying vegetation communities across gradients of grazing pressures from wild herbivores and livestock. Ongoing work by NCF in the Kibber region has already established sampling plots (exclosures) that have been monitored since 2004. These plots will be continued to be monitored to evaluate long-term trends in plant communities in response to grazing. Such continued long-term monitoring will also provide insights into additional aspects such as response to climatic factors including potential changes in precipitation patterns. Information on rangeland vegetation, when evaluated along-side data on socio-economic aspects and population trends of wildlife and livestock, will likely be of key importance for addressing overarching concerns over sustainable use and conservation. Monitoring of biological parameters must also be accompanied by monitoring of threats,



and socio-economic and attitudinal indicators.

8.3.7. To carry out capacity enhancement of Wildlife Staff, youth and local people in non-technical aspects of monitoring and wildlife laws.

Basic monitoring of the wildlife species, birds and flora is possible by local youth and Wildlife Department staff once they have suitable capacity and simple protocols. Such periodic capacity enhancement workshops need to be carried out for staff in field. Ideally there should be at least one comprehensive workshop once every two years for the staff and refresher courses also should be encouraged (Section 7.2.3).

Bulk of the work under the Management Plan in villages is going to be done under the micro plans. It is extremely important to identify suitable individuals in each village or village cluster who are trained in participatory approaches. Such training is also important for the local Forest Department staff and VWCC members (Section 6.2.2, 7.2.3).

There are numerous successful examples of participatory conservation in India i.e. Periyar NP, Kerala; Kanchendzonga NP, Sikkim; Great Himalayan NP, HP; while excellent models of rural development and education exist in Ladakh. Ladkah in particular, has a long history of work by civil society organizations in the fields of rural development (Ladakh Ecology Group or LeDEG (http://ledeg.org/)) and education (Students' Educational and Cultural Movement of Ladakh (SECMOL), http://www.secmol.org). Forest Department staff, youth and VWCC members from Spiti can greatly benefit from exposure visits to such areas for exchange of ideas and improvement of practices in the landscape (Section 7.2.3).

8.4. AGENCIES WITH EXPERTISE

Scientific and technical expertise regarding research and capacity enhancement is limited to a few organizations active in the landscape (see Table 2.10). Ecological research in Spiti is led by the Nature Conservation Foundation (NCF), Mysore (www.ncf-india.org), with some earlier contributions from the Wildlife Institute of India, Dehradun (www.wii.gov.in) and the G.B. Pant Institute of Himalayan Environment & Development (gbpihed.gov.in). NCF has expertise regarding wildlife ecology, monitoring, floral monitoring, rangeland dynamics, human-wildlife conflicts, conservation action and conservation planning. WII has similar expertise while the GBPIHED specializes in vegetation studies. Universities have not yet gained much expertise on conservation issues in the region, although the Jawaharlal Nehru University does have a few studies completed in Spiti and the Y.S. Parmar university of Agriculture & Technology, Solan, has established a research centre in Tabo to carry out research in various facets of horticulture and agriculture. Encouraging more national and state level universities to work here will be beneficial.

Ecosphere and WWF-India have developed programmes for community based tourism and augmenting local economy with innovative products. The NGO - Pragya has documented local traditions and set up small museums for better awareness generation targeted at visitors and local people.



ORGANIZATION AND ADMINISTRATION



9.1: BACKGROUND

The Upper Spiti Landscape is the first area designated in Himachal Pradesh under MoEFs newly formed flagship conservation programme for the high altitudes called the Project Snow Leopard (more details in Chapter 1). The planning, implementation and monitoring of the programme is based on innovative participatory approaches. The PSL further recognizes that participatory work in such vast areas with far-flung villages, with numerous Government and other institutional stakes requires considerable structuring of the processes so that effective consultation and participation can be ensured. For this, the PSL has developed a 4-tier structure from the Central Steering Committee to the Village Wildlife Conservation Committee (see Appendix 9.1). Three of these entities, the State Snow Leopard Conservation Society, the Landscape Level Implementation Committee and the

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Village Wildlife Conservation Committee are based within the state. Details about these are reproduced below from the Project Snow Leopard document itself (Anon 2008; p. 33-38).

9.1.1. *National-level*: At the MoEF, a national steering committee with representation of MoEF officials, Governmental and Non-governmental research institutions, and the Forest Departments of Jammu & Kashmir, Himachal Pradesh, Uttaranchal, Sikkim and Arunachal Pradesh, will co-ordinate the Project Snow Leopard. This body may also identify and invite a qualified scientist specializing in human ecology/ sociology/ tribal affairs to be a part of the steering committee. The steering committee will be responsible for general direction setting, overseeing, funds generation and disbursement, and facilitating periodic monitoring and evaluation of the Project Snow Leopard. The steering committee will also ensure transparency and periodic information dissemination pertaining to the programme at a national level. The steering committee will also administer a small grants programme aimed at enabling the direct participation of community based organizations, NGOs, and research and conservation institutions in effecting research and conservation initiatives and capacity enhancement particularly at the local community-level.

The Nature Conservation Foundation and the Wildlife Institute of India will respectively be the primary non-governmental and governmental institutions providing constant technical support and advice to the national steering committee and the states. At the initiation of the Programme, they will jointly work to develop guidelines and frameworks for landscape-level, knowledge-based and participatory management planning as outlined in section 5 & 6 above.

9.1.2. State-level: At the state-level, the Chief Wildlife Warden will set up a State Snow Leopard Conservation Society for this purpose, including senior forest officers managing snow leopard landscapes, other relevant governmental departments such as tourism and animal husbandry, the army and paramilitary forces, representatives of NGOs active at the state-level, and community-based organizations. The Society may also seek the advice, support, participation and assistance of reputed individuals and institutions that it believes can provide scientific and technical expertise. The Society, chaired by the Chief Wildlife Warden, and represented by diverse stakeholders such as other government departments and community-based organizations, scientists and conservationists, will provide greater focus and thrust to the programme, as well as enable the states to raise additional funds for wildlife conservation in the snow leopard landscapes. This Society will be the primary body responsible for implementation of the Project Snow Leopard at the state-level. It will send consolidated proposals and annual budgets and obtain funds from the national steering committee and provide it to the landscape-level management committees (see below). The Society will also be responsible for ensuring transparency and information sharing regarding the programme at the state-level, as well as get periodic financial and work audits by appropriate and reputed research bodies or committees.

Once in five years, the Society will facilitate a work audit by the national steering committee or any other body designated by the latter for this purpose.

ORGANISATION

Each State Snow Leopard Conservation Society will designate landscape-level implementation committees with representation of serving officers (CF/DCF level) from the various wings of the Forest Departments, other appropriate governmental departments including the relevant senior officials of District Administration, locally active NGOs, a single representative of tourism operators, community-based organizations and the member secretary of each of the local village-level committees nominated by the Village councils/ Gram Sabhas (that are important stakeholders at the landscape-unit level; see below). The committee will be headed by a senior officer of the Forest Department (CF/DCF). It is recognized that the role of local NGOs, and community-based organizations including religious bodies is extremely important for effecting Programme activities, and these must be given adequate representation in the landscape-level committees. These committees will assist in the development of integrated landscape-level management plans based on the landscape-level management planning guidelines mentioned above. The committees will be responsible for implementation of landscapelevel conservation activities, mobilizing and capacity enhancement of village/ landscape unit-level bodies (see later) and in formally organizing them in case they are traditional and informal village management bodies, selection and training of community-protection forces, and for overseeing, facilitating and monitoring the conservation activities and management programmes at the community/ village/ landscape unit-level. Where the landscape is large and jurisdictionally divided between different wings of the Forest Department, more than one implementation committee may be designated. These committees will also serve as the link between village/landscape unit-level bodies and the State Snow Leopard Conservation Society. The committees will collate and submit annual work and financial reports to the Society, as well as provide annual work proposals and budget estimates.

It is recognized that over most of the snow leopard landscape within India, the local communities have a near pervasive presence and are amongst the most important conservation stakeholders. It is also recognized that considerable village and land use administration and decision-making in this landscape is the responsibility of traditional and democratic, albeit informal, village councils. In all areas where local human communities have a presence, traditional rights or resource use access, these hitherto informal village councils or the gram sabha becomes one of the primary institutions, alongside the Forest Department, for planning and implementation of the Project Snow Leopard at the landscape unit level. The village councils/ gram sabhas, together with the Forest Department, will constitute village-level management and implementation bodies, to be called Village Wildlife Conservation Committees, for implementation of the Project Snow Leopard activities. Facilitating the capacity development of these village-level committees, including assistance in formally organizing them, training in accounting and bookkeeping etc. will be the responsibility of the landscape-level committees.

One front-line Forest Department staff will be represented in these village committees. The village council/ Gram Sabha may choose to either take on the responsibilities of the committee itself, or designate any existing village-based institution (such as youth clubs) for this purpose. One member from each family in the village will have the option of becoming a member of such a body, which will also ensure the equitable representation of existing classes and gender. Where the village size is very small (< 10 families), the village council/Gram Sabha may, together with the Forest Department, decide to have a combined Village Wildlife Conservation Committee with one or more neighbouring villages. On the other hand, if the quality and area of wildlife habitat within the resource use catchment of the village is relatively high, independent village committees may be desirable even in small-sized villages. The Village Council/Gram Sabha will designate either a Panchayat member or any other collectively chosen suitable person from the village as a member secretary of this body.

All landscape unit-level wildlife conservation and community-based management initiatives will be undertaken and implemented by the Village Wildlife Conservation Committees and their capacity enhancement will be one of the primary responsibilities of the larger landscape-level committee. The committees will participate integrally in developing landscape unit-level management micro-plans. The work of the Village Wildlife Conservation Committee will include but need not be restricted to community-based management of human-wildlife conflicts, incentive and alternate income generation programmes, setting up of small 'core' areas on traditionally used rangelands with community participation (see Chapter 5, Anon 2008), participation in monitoring programmes for wildlife habitats, populations and human socio-economy, and nomination of suitable members for community protection forces. It is recognized that a different approach will be needed in the case of nomadic pastoralism, as well as in the few areas where high altitude landscapes are habitation free but people in the lower altitude villages use the higher altitude landscape for certain kinds of natural resource extraction.

9.2. LOCAL LEVEL IMPLEMENTATION

In the Upper Spiti Landscape, there are *c*. 30 villages in 6 panchayats (Table 2.5c.). Given the heterogeneity of the village communities it is visualized that at least 15 VWCCs with similar number of micro plans will need to be developed over a period of a few years to cover all areas. The LLIC is a collaborative body that can provide directions for work, while taking up specific tasks, but regular sustenance of works, implementation and coordination among the 15 or so VWCCs will be difficult for such a committee. It is thus suggested that under the aegis of the Management Plan, a new local NGO is set up that is dedicated to the management plan implementation and is manned by well trained local youth and other people. This NGO is tentatively referred to as the 'Spiti Conservation Society' or SCS. Regarding this, the closest comparison is with the Kanchendzonga Conservation Committee (KCC) in Sikkim that was

set up by a conservation agency with active involvement of the Forest Department for managing tourism in the Kanchandzonga NP. The KCC has evolved from being sustained by numerous grants to a position where they are able to raise resources through tourism and independent grants for the works (http://www.sikkimkcc.netfirms.com/kcc/). Similarly, in the Great Himalayan NP clear mechanisms were set up for collaboration with newly set up NGOs such as SARAHA.

Key actions:

- 1. Set up the VWCC in the 15 village clusters as per compositional guidelines given in the PSL document and reproduced above (Section 9.1.1). Set up at least five committees during the first year, followed by an expansion in the second year in other village clusters.
- 2. Identify at least one member in each panchayat ward who is trainable and can be the primary contact person in the VWCC. Ensure that this person(s) is trained effectively and periodically, apart from the other members. This is one of the key learnings from the GHNP plan implementation (Pandey, 2008).
- 3. Set up a local level NGO, the Spiti Conservation Society (SCS) for local coordination and implementation. Some specific features of the SCS are given below:
 - a. Manned by local people, especially youth (about 8-10 in the beginning). These are people who have a local standing regarding conservation issues and ideally are educated to at least matriculate.
 - b. Dedicated to implement conservation under the purview of the Spiti Management Plan(s) as a local technical support team. This will include building self's capacity in participatory planning and action and wildlife monitoring, and conducting periodic training programmes for VWCC members, Forest Dept. frontline staff, and other youth.
 - c. External agencies and Forest Dept provide technical, capacity and financial help.
 - d. Primary interface between VWCC's, LLIC and FD, research agencies & other NGOs
 - e. Registered as 'society' under the appropriate state Government Act.
 - f. Key skills the new NGO needs to have include:
 - i. Skills for participatory planning and action and micro planning
 - ii. Skills for wildlife and social monitoring
 - iii. Coordinating between various VWCC, LLIC, FD, research agencies and concerned NGOs
 - iv. Effective fund raising abilities from domestic, private, Government and international agencies
 - v. Proper accounting of expenses

- 4. Provide Grant in Aid (GIA) as per provisions of the Sanji Van Yojna, 2001 and the PFM rules 2001 to the VWCC.
- 5. Provide GIA to the SCS for a period of the first five years, within which their fund raising and revenue generating abilities need to be built and enhanced. This can include salary of core staff, travel, infrastructure, and capacity enhancement. The SCS can also be provided grants for the designated works under the forest departments APOs, based on annual work plans developed before March every year. The SCS should develop these work plans in consultation with the Forest Dept., NCF and other agencies.

In Himachal Pradesh, the Sanji Van Yojna 2001 (See Appendix 9.2) stipulates the formation of a Village Forest Development Society (registered under section 3 of the Societies Registration Act, 1860 (Act No.21 of 1860)) for participatory forest management and Village Forest Development Committee (VFDC) and in the context of the PSL, the VWCC is treated equivalent to the VFDC.



Table 9.1: Broad outline of the structure of the Project Snow Leopard. In this Management Plan a suggestion is made to bind all landscape level activities through an NGO set up with community members for sharing roles and responsibilities of planning and implementation.

PSL Body	Constituents
National	
Project Snow Leopard National Steering Committee	MoEF officials, Governmental and Non-governmental research institutions, and the Forest/Wildlife Depart- ments of five Himalayan states. Qualified scientist specializing in human ecology/ sociology/ tribal affairs to be a part of the steering committee. (For the first 5 years this the PSL drafting committee will serve as the steering committee)
State	
State Snow Leopard Conservation Society	Chaired by the Chief Wildlife Warden, including senior forest officers managing snow leopard landscapes, other relevant governmental departments such as tourism and animal husbandry, the army and paramilitary forces, representatives of NGOs active at the state-level, and community-based organizations. The Society may also seek the advice, support, participation and assistance of reputed individuals and institutions that it believes can provide scientific and technical expertise
Landscape	
Landscape-Level Implementation Committees	Field officers (CF/DCF level) from the appropriate wings of the Forest Departments, other appropri- ate governmental departments including the relevant senior officials of District Administration, locally active NGOs, a single representative of tourism opera- tors, community-based organizations and the member secretary of each of the local village-level committees nominated by the Village councils/ Gram Sabhas. Local leaders may be special invitees for the meetings as seen appropriate
Village /Village Cluster	
Village Wildlife Conservation Committee	Traditional village councils/gram sabhas, frontline For- est Department staff representative





SUMMARY OF PRESCRIPTIONS AND BUDGET



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Broad Activity	Timelines	Lead Agency	Budget Section(s)
Zonation			
Carry out meetings with relevant stakeholders to develop and implement agreements for the designation of the 'core' reserves already identified in this plan (5.6.1)	At least 5 per year	New CBO, VWCC. Agencies of National repute to assist	1(i) 4 (xi)
Carry out targeted surveys to identify areas of high plant endemism or with significant concentration/diversity of medicinal plants for possible inclusion in the network of cores in the landscape (5.6.2)	2-3 surveys in year 2 to 5	Agencies of National Repute with local collaborators	1 (i), 1(ii) 4 (xiii)
Institute wildlife, vegetation and human society monitoring programmes for each reserve for establishing the baseline estimates. (5.6.3)	Cover 8-10 sites each in the year 1 & 2	Forest Dept. with Agencies of National Repute with local collaborators	1(i), 1(ii)
Carry out targeted wildlife and dependence surveys in any gap areas of the landscape to identify further 'cores' (5.6.4)	2-3 surveys in year 2 to 5	Agencies of National Repute with FD & local collaborators	1(i), 1(ii) 4(xiii)
Tackling Threats			
Carry out pure and action research on topics of management interest (6.2.1)	2-3 short studies per year	Agencies of National Repute with FD & local collaborators	1(ii)
Build local capacity and structures for carrying out works by community (6.2.2)	2-3 training programmes (micro planning) each in year 1 & 2	Agencies of National Repute with FD & local collaborators	4(xii)

Broad Activity	Timelines	Lead Agency	Budget Section(s)
Carry out awareness programmes for important stakeholders especially local school children, teachers, youth and general public. (6.2.3)	8-10 programmes per year	Agencies of National Repute with FD & local collaborators. Himalayan Nature Clubs of NCF	1 (ii)
Staff capacity of the Forest and Police Depts. in wildlife protection, offense detection, case handling and legal issues will be provided through specialized workshops. (6.2.4)	1 workshop per year from year 1-3	Agencies of National Repute with FD & local collaborators	2(v)
Provide economic opportunities wherever possible to reduce people's dependence on local resources. (6.2.5)	At least 5 microplans per year (synchronous with 5.6.1) 1 meeting of agencies under the LLIC per year	New CBO, VWCC. Agencies of National repute to assist. LLIC annual meetings	4(xi), 4(xii), 4(xiv)
Set up incentive programmes and self-help groups that help reduce the threats by local people and other users of natural resources in the USL. (6.2.6)	At least 5 microplans per year (synchronous with 5.6.1)	New CBO, VWCC. Agencies of National repute to assist.	4(xi), 4(xii), 4(xiv)
Collaborative Landscape Based Conservation	Mechanisms		
Constitute the Village Wildlife Conservation Committees (VWCC) covering all villages in the USL and provide necessary skills training. (7.2.1)	2-3 programmes per year in the years 1 & 2	Forest Dept. along with the LLIC to constitute VWCC Agencics of National Repute & Forest Dept. to impart micro planning training	4(xii), 4(xiii)

MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE

Broad Activity	Timelines	Lead Agency	Budget
Constitute the Landscape Level Implementation Committee (LLIC) covering all villages in the USL. (7.2.2)	At least 1 meeting per year	Forest Department	Section(s) 4(xii)
Encourage convergence activities, especially in the fields of agriculture, animal husbandry, education, tourism and employment that can help people's livelihoods and also in conservation goals (7.2.2.1)	At least 1 meeting per year	LLIC	2(vii) 4(xii), 4(xiv)
Carry out activities such as habitat improvement and protection as per need in the landscape. (7.2.2.2)	At least 2 assessments per year	Forest Dept.	3(ix)
Exposure visits to areas relevant to enhance knowledge (7.2.2.3)	At least 1 tour per year in year 1, 3 & 5	Led by the Forest Dept. and by the LLIC	1(iii)
Staff capacity in participatory planning and action, action research and wildlife monitoring will be provided through periodic workshops for the staff. (7.2.3)	1 programme per year in the years 1 & 2	Forest Dept. along with the LLIC to constitute VWCC Agencies of National Repute & Forest Dept. to impart micro planning training	1(iii) 2(viii)
Staff welfare activities that include quarters, appropriate camping and survey equipments, and incentives will be instituted. (7.2.4)	Equipment in year 1, 3 & 5 Buildings in year 2 & 4	Forest Dept.	2(vi), 2(viii)

Table 10.2: Detail of work proposed for the year 2011-16 detail of physical (years 2-5 indicative) & financial target in respect of the Upper Spiti Landscape, including the Kibber Wildlife Sanctuary (amount in lakh re.)

	VFAP 1	VFAP 2	VFAD 3	VFAP A	VFAD <	< Voor
TT M IT ITCARS	I WUTI	TTUN 7	CARTI			J-ICAI
1 Management Planning and capacity bu	uilding:					Total
i Management Planning	3.0	3.0	3.0	1.5	1.5	
ii Strengthening wildlife research, education and nature awareness:	10.0	7.0	6.0	6.0	6.0	
iii Staff development and capacity building:	4.0	4.0	4.0	4.0	4.0	
iv Independent evaluation and status					4.0	
2. Anti-poaching & infrastructure developm	ent					
(v) Anti-poaching activities	4.0	4.0	4.0	4.0	4.0	
(vi) Strengthening of infrastructure	15.0	15.0	15.0	3.0	3.0	
(vii) Wildlife Veterinary care:	2.0	2.0	2.0	2.0	2.0	
(viii) Strengthening Staff welfare activities	4.0	4.0	4.0	4.0	4.0	
3. Restoration of habitats						
(ix)Habitat improvement	2.0	2.0	2.0	2.0	2.0	
4. Eco-development and community oriente	d activities:					
(xi) Addressing man-animal conflicts:	4.0	4.0	4.0	4.0	4.0	
(xii) Strengthening co-existence agenda	15.0	10.0	10.0	10.0	10.0	
(xiii) Determining inviolate spaces and relocation of villages from core-critical/crucial	1.0	1.5	1.5	1.5	1.5	
wildlife habitats:						
(xiv) Fostering Eco-tourism:	2.0	2.0	2.0	2.0	2.0	
	99	58.5	57.5	44.0	48.0	274

SUMMARY

Table 10.3: Detail of work proposed for the year 2010-15 detail of physical & financial target in respect of Kibber Wildlife Sanctuary & the Upper Spiti Landscape (Details as per IDWH Appendix IX)

W IIUIIIC DAILCHAILY OF LIC UP	her ohm r	alluscape (meral	is as per rip will appendix into	
IDWH Heads	Amount (Lakh	LOCATION	SITE SPECIFIC JUSTIFICATION	SECTIONS
	Rs)			
1 Management Planning and	d capacity	building:		
. Management Dlanning	7	USL including	Surveys to identify further 'core' areas; Stakeholder consultations (micro planning) (5	5.6.1, 5.6.2,
	C	KWLS & fringe villages	per year); generate baselines within identified 'cores'	5.6.3, 5.6.4
ii Strengthening wildlife	C	USL including	Support research and monitoring programmes (3-4 studies); support to at least one long-term	5.6.2, 5.6.3,
nescarul, cuucation and nature awareness:	01	KWLS & fringe villages	research study; 4 nature camps for children & youth; awareness material for youth groups	6.2.3
iii Staff development and		Kaza;	Workshops for staff on PLA tools, wildlife monitoring (1 per vear for vear 1&2): study	7.2.2.3.
capacity building:	4	Ladakh/ Periyar	tours to outside Spiti areas (eg. Ladakh) to study innovative approaches to conservation	7.2.3
2. Anti-poaching & infrastrue	cture devel	opment		
		NSL	Training workshops (at least 1 per year for	
(v) Anti-poaching activities	4	including	first 3 years) for FD staff and Police; Hiring	6.2.4
α	I	KWLS &	informers & daily-wage labourers; POL for	
		tringe villages	vehicles	
			Staff quarters: vehicle purchase; camping	
(vi) Strengthening of	2	KWLS &	and menu equipment, procurement of physical	7 C T
infrastructure	1)	Kaza, Tabo	capture and restraint equipment (drop nets and finnel fence), chemical canture drugs and	1.2.4
			darts; award programmes	
-) 1	

IDWH Heads	Amount (Lakh	LOCATION	SITE SPECIFIC IUSTIFICATION	SECTIONS
	Rs)			
	•	ISU ISU	- - - -	
(vii) Wildlife Veterinary care:	2	including	Vet disease surveillance & vaccination drive in	7.2.2.1
		KWLS &	tringe villages	
		fringe villages		
(viii) Strengthening Staff		KWLS &	Maintenance of some staff quarters in Kaza and	
welfare activities	4	Kaza, Tabo	field sites	+.7. / .7.7
3. Restoration of habitats				
		NSL	Experiments of raising important wildlife	
(ix) Habitat improvement	2	including	fodder plants in nurseries (at least at 2 sites); experiments for use of artificial glaciers to	7.2.2.2
4		K W L S & fringe villages	augment soil moisture in pastures (at least at 2 sites)	
4. Eco-development and com	munity ori	iented activities:		
		nsl	Study the livestock depredation & crop damage	
(xi) Addressing man-animal	4	including	patterns in USL; take up at least two conflcit	6.2.5, 6.2.6
CONNICUS		fringe villages	resolution activity (improved protection $\infty/0r$ insurance)	
			Micro planning (meetings) in 5 village clusters	
() Consumptioning 20			(under micro plans); set up SHGs; skills based	5.6.1, 6.2.2,
(XII) SUCHIGUICIIIIB CO-	15	Fringe villages	training to VWCC; LLIC meeting (once	7 2 1 7 2 2
caiscille ageilda			annually); incentive programmes; maintainence	7 2 2 1
			of medicinal plant nurseries; reaching solar	1.7.7./
			efficiency in fringe villages	

MANAGEMENT PLAN FOR UPPER SPITI LANDSCAPE

SITE SPECIFIC JUSTIFICATION	LOCATION SITE SPECIFIC JUSTIFICATION	(Lakh LOCATION SITE SPECIFIC JUSTIFICATION
SITE SPECIFIC JUS	LOCATION SITE SPECIFIC JUS	(Lakh LOCATION SITE SPECIFIC JUS Rs)
ourveys and consultations ¹ mportant wildlife areas/co n the buffer zone and also see 1i & 1 ii above); study only if necessary)	Surveys and consultationsUSLUSLimportant wildlife areas/coincludingin the buffer zone and alsoKWLS(see 1i & 1 ii above); study(only if necessary)	Surveys and consultationsUSLSurveys and consultationsUSLimportant wildlife areas/coincludingin the buffer zone and alsoKWLS(see 1i & 1 ii above); study(only if necessary)
Exploring the tourism pot arrying out works deterr blanning (eg. Guide traini stablishment, etc)	USLExploring the tourism pot includingKWLS & fringe villagesplanning (eg. Guide traini establishment, etc)	USLExploring the tourism pot2USLincludingcarrying out works deternKWLS &planning (eg. Guide trainifringe villagesestablishment, etc)
)	66
	USL including KWLS KWLS USL USL Including KWLS & Fringe villages	1 USL i 1 including i including i i 2 KWLS i 1 USL I 2 KWLS & i 66 fringe villages e

APPENDIX

APPENDIX

APPENDIX 2.1. LIST OF BIRDS REPORTED FROM SPITI. '1' INDI-CATES CONFIRMED REPORT BY STUDY AND '?', UNCONFIRMED REPORT'

		1	1	1		
Order	Family	Common Name	Scientific Name	Reported from Pin NP (Manjrekar 1997; Tak & Paliwal 2008)	Reported from Lahaul & Spiti district (Mahabal 2005)	APPENDIX
		Snow Partridge	Lerwa lerwa		1	
Galliformes	Phasianidae	Himalayan Snowcock	Tetraogallus himalayensis	1	1	
		Chukar	Alectoris chukar	1	1	
A	٨	Ruddy Shelduck	Tadorna ferruginea	1		
Anseriformes	Anatidae	Common Teal	Anas crecca	?		
Piciformes	Picidae	Eurasian Wryneck	Jynx torquilla	1		
Upupiformes	Upupidae	Common Hoopoe	Upupa epops	1		
	Coraciidae	Indian Roller	Coracias benghalensis	1		
Coraciiformes	Alcedinidae	Common Kingfisher	Alcedo atthis		1	
Cuculiformes	Cuculidae	Pied Cuckoo	Clamator jacobinus		1	
Psittaciformes	Psittacidae	Rose-ringed Parakeet	Psittacula krameri	1		
		Himalayan Swiftlet	Collocalia brevirostris	1		
Apodiformes	Apodidae	White- throated Needletail	Hirundapus caudacutus	1		
		Alpine Swift	Tachymarptis melba	1		

VIUIX	Order	Family	Common Name	Scientific Name		Keported from Pin NF	(Manjrekar 1997; Tak & Paliwal 2008)	Reported from Lahaul & Spiti district	(Mahabal 2005)
	Apodiformes	Apodidae	Common Swift	Apus apus	1				
	•		House Swift	Apus affinis	1				
-			Eurasian Eagle Owl	Bubo bubo				1	
	Strigiformes	Strigidae	Tawny Owl	Strix aluco	1				
			Long-eared Owl	Asio otus				1	
			Rock Pigeon	Columba livia	1			1	
			Hill Pigeon	Columba rupestris	1			1	
			Snow Pigeon	Columba leuconota	1			1	
	Columbiformes Colu	Columbidae	Oriental Turtle Dove	Streptopelia orientalis	1				
			Spotted Dove	Streptopelia chinensis	1			1	
			Eurasian Collared Dove	Streptopelia decaocto	1				
	Gruiformes	Rallidae	Common Moorhen	Gallinula chloropus	1				
	Ciconiiformes	Scolopacidae	Solitary Snipe	Gallinago solitaria				1	
			Green Sandpiper	Tringa ochropus	1				
	Circumitformer	Characteria	Lesser Sand Plover	Charadrius mongolus				1	
	Ciconiiformes	Charadriidae	Northern Lapwing	Vanellus vanellus	1				

					(draft).	1.2
Order	Family	Common Name	Scientific Name	Reported from Pin NP (Manjrekar 1997; Tak & Paliwal 2008)	Reported from Lahaul & Spiti district (Mahabal 2005)	ENDIX
		Black Kite	Milvus migrans		1	
		Lammergeier	Gypaetus barbatus	1	1	AP]
	Accipitridae	Himalayan Griffon	Gyps himalayensis	1	1	
Ciconiiformes		Cinereous Vulture	Aegypius monachus		1	
		Steppe Eagle	Aquila nipalensis		1	
		Golden Eagle	Aquila chrysaetos	1		
	Falconidae	Common Kestrel	Falco tinnunculus	1	1	
Ciconiiformes Ar		Grey Heron	Ardea cinerea	1		
	Ardeidae	Indian Pond Heron	Ardeola grayii	1		
	Laniidaa	Long-tailed Shrike	Lanius schach	1		
	Laniidae	Grey-backed Shrike	Lanius tephronotus	1	1	
		Red-billed Chough	Pyrrhocorax pyrrhocorax	1	1	
Passeriformes		Yellow-billed Chough	Pyrrhocorax graculus	1	1	
		House Crow	Corvus splendens	1		
	Corvidae	Large-billed Crow	Corvus macrorhynchos	1		
		Common Raven	Corvus corax	1	1	
		Eurasian Golden Oriole	Oriolus oriolus	1		

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VINIA	Order	Family	Common Name	Scientific Name		Reported from Pin NP	(Manjrekar 1997; Tak & Paliwal 2008)	Reported from Lahaul & Spiti district	(Mahabal 2005)
			Ashy Drongo	Dicrurus leucophaeus	1				
Α		Corvidae	Asian Paradise- flycatcher	Terpsiphone paradisi	1				
		Cinclidae	White- throated Dipper	Cinclus cinclus	1			1	
			Brown Dipper	Cinclus pallasii				1	
			Blue Rock Thrush	Monticola solitarius	1				
			White-tailed Rubythroat	Luscinia pectoralis				1	
	Passeriformes Muscica		Black Redstart	Phoenicurus ochruros	1			1	
			White-winged Redstart	Phoenicurus erythrogaster	1				
		Muscicapidae	Blue-fronted Redstart	Phoenicurus frontalis				1	
			White- capped Water Redstart	Chaimarrornis leucocephalus	1			1	
			Pied Wheatear	Oenanthe pleschanka				1	
			Desert Wheatear	Oenanthe deserti	1			1	
			Great Tit	Parus major				1	
		Paridae	Eurasian Crag Martin	Hirundo rupestris	1				
			Barn Swallow	Hirundo rustica	1				

					and a state of the	
Order	Family	Common Name	Scientific Name	Reported from Pin NP (Manjrekar 1997; Tak & Paliwal 2008)	Reported from Lahaul & Spiti district (Mahabal 2005)	NDIX
	Paridae	Asian House Martin	Delichon dasypus	1		Idd
		Brownish- flanked Bush Warbler	Cettia fortipes	1		A
		Common Chiffchaff	Phylloscopus collybita	1		
	Sylviidae	Tickell's Leaf Warbler	Phylloscopus affinis		1	
Passeriformes		Sulphur- bellied Warbler	Phylloscopus griseolus	1	1	
		Lesser Whitethroat	Sylvia curruca		1	
	Alaudidae	Hume's Short-toed Lark	Calandrella acutirostris		1	
		Lesser Short- toed Lark	Calandrella rufescens	?		
		Eurasian Skylark	Alauda arvensis	1	1	
		Horned Lark	Eremophila alpestris	1	1	
		House Sparrow	Passer domesticus	1	1	
		Tibetan Snowfinch	Montifringilla adamsi	1	1	
	Passeridae	White- rumped Snowfinch	Pyrgilauda taczanowskii	1		
		White Wagtail	Motacilla alba	1	1	

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ENDIX	Order	Family	Common Name	Scientific Name	Renorted from Din ND	(Manjrekar 1997; Tak & Paliwal 2008)	Reported from Lahaul & Spiti district (Mahabal 2005)
APP			White- browed Wagtail	Motacilla maderaspatensis	1		
			Citrine Wagtail	Motacilla citreola	1		
			Grey Wagtail	Motacilla cinerea	1		
			Tree Pipit	Anthus trivialis			1
		Passeridae	Rosy Pipit	Anthus roseatus	?		
		1 assertate	Upland Pipit	Anthus sylvanus	1		
			Robin Accentor	Prunella rubeculoides	1		
			Rufous- breasted Accentor	Prunella strophiata			1
	Passeriformes		Brown Accentor	Prunella fulvescens	?		
			Fire-fronted Serin	Serinus pusillus	1		1
			European Goldfinch	Carduelis carduelis	1		
			Twite	Carduelis flavirostris			1
		Fringillidae	Plain Mountain Finch	Leucosticte nemoricola	1		1
			Brandt's Mountain Finch	Leucosticte brandti			1
			Spectacled Finch	Callacanthis burtoni			1

	Order	Family	Common Name	Scientific Name	Reported from Pin NP (Manjrekar 1997; Tak & Paliwal 2008)	Reported from Lahaul & Spiti district (Mahabal 2005)	ENDIX
			Dark-breasted Rosefinch	Carpodacus nipalensis		1	[dd
			Common Rosefinch	Carpodacus erythrinus	1	1	A
			Pink-browed Rosefinch	Carpodacus rodochrous		1	
	Passeriformes	Fringillidae	Red-mantled Rosefinch	Carpodacus rhodochlamys		1	
			White- browed Rosefinch	Carpodacus thura		1	
			Great Rosefinch	Carpodacus rubicilla	1	1	
			Red-fronted Rosefinch	Carpodacus puniceus	1	1	
			Rock Bunting	Emberiza cia	1	1	
			Black-headed Bunting	Emberiza melanocephala		1	
			Red-headed Bunting	Emberiza bruniceps		1	

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APPENDIX 2.2A: PROFILE OF SPITI VIS-À-VIS SOCIAL AMENITIES AND FACILITIES. (REPRODUCED FROM CENSUS DATA ONLINE, CENSUS OF INDIA, 2001)

Area details	Total Number	Number of villages where the facility is Available	Number of vil- lages where the facility is Not Available
Number of inhabited villages	95		
Education facilities			
Number of primary schools	65	59	36
Number of middle schools	13	13	82
Number of secondary schools	8	8	87
Number of senior secondary schools	6	6	89
Number of colleges	0	0	95
Number of adult literacy class/centres	6	6	89
Number of industrial schools	0	0	95
Number of training schools	1	1	94
Number of other educational schools	0	0	95
Medical facilities			
Number of allopathic hospitals	1	1	94
Number of ayurvedic hospitals	1	1	94
Number of unani hospital	0	0	95
Number of homeopathic hospital	0	0	95
Number of allopathic dispensary	1	1	94
Number of ayurvedic dispensary	9	9	86
Number of unani dispensary	0	0	95
Number of homeopathic dispensary	1	1	94
Number of maternity and child welfare centre	3	3	92
Number of maternity home	2	2	93
Number of child Welfare centre	2	2	93
Number of health centre	2	2	93
Number of primary health centre	3	3	92
Number of primary health sub centre	7	7	88

Area details	Total Number	Number of villages where the facility is Available	Number of vil- lages where the facility is Not Available
Number of family welfare centre	1	1	94
Number of T.B. clinic	2	2	93
Number of nursing home	0	0	95
Number of registered private medical practitio-	0	0	95
Number of subsidized medical practitioners	0	0	95
Number of community health workers	0	0	95
Number of other medical facilities	0	0	95
Drinking water facilities	0		<i>)</i>
Tap water		85	10
Well water		0	95
Tank water		0	95
Tubewell water		0	95
Hand pump		6	89
River water		7	88
Canals		1	94
Lakes		0	95
Spring		24	71
Other drinking water sources		4	91
Post, telegraph and telephone facilities			
Number of post office	17	17	78
Number of telegraph office	3	3	92
Number of post and telegraph office	1	1	94
Number of telephone connections	200	17	78
Communication facilities			
Bus services		49	46
Railways services		0	95
Navigable water way including river, canal etc.		0	95
Banking facilities			
Number of commercial bank	5	5	90

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XIO	Area details	Total Number	Number of villages where the facility is Available	Number of vil- lages where the facility is Not Available
Ξ	Number of Co-operative commercial bank	3	3	92
Z	Credit societies			
H	Number of agricultural credit societies	1	1	94
	Number of non agricultural credit societies	1	1	94
7	Number of other credit societies	5	5	90
4	Recreational and cultural facilities			
	Number of cinema/video-hall	5	2	93
	Number of sports club	2	2	93
	Number of stadium/auditorium	1	1	94
	Land use (Two decimal) in hectares			
	Number of forest land	1,685		
	Number of government canal	124		
	Number of private canal	783		
	Well (without electricity)			
	Well (with electricity)			
	Tube-well (without electricity)			
	Tube-well (with electricity)			
	Tank			
	River			
	Lake			
	Waterfall			
	Others	103		
	Irrigated Area	1,010		
	Unirrigated Area	7,444		
	Culturable waste (including gauchar and			
	groves)	144,327		
	Area not available for cultivation	540,735		

APPENDIX 2.2B: ORGANIZATION OF THE VILLAGES OF SPITI INTO KOTHIS AND PANCHAYATS AS PER THE CENSUS OF INDIA

2001. Villages may consist of hamlets called *doksas*. Villages are clubbed together in *panchayats* and these are further clubbed into *kothis*, which are traditional divisions of the Spiti Valley. *Khas* usually refers to the main village and is given a unique village number (column 4), and hamlets attached to this village are numbered separately. Not all villages have hamlets. It was noticed that some hamlets may have become all-year settlements now. The spelling of the names of villages and hamlets often appears differently in different Government records and it may be required to identify names phonetically.

Kothi	Panchayat	Village name	Village code	Hamlet code
	Demul	Demul-khas	155	1
		Gangdo-demul	155	2
		Kunge	154	
		Lara	71	1
		Lidang	72	
		Molche	155	3
		Rizing		
	Kaza	Kaakti	70	3
		Kaza-khas	70	1
		Kaza-soma	70	2
		Kuiling	74	
		Kwang		
		Naikid		
D		Shego	71	2
Darji	Lalung	Chobrang	152	1
		Kibri	163	3
		Lalung	163	1
		Lingti	152	2
		Phanwe	163	2
		Phipuk		
		Rama	151	1
		Sanglung	153	
		Tarbole	151	3
		Tishu		
		Tulsepna	151	2
		Yulshipo		
	Langza	Hikam	68	
		Kaumik	69	
		Langza	66	

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Kothi	Panchayat	Village name	Village code	Hamlet code
Choji	Hull	Chikzar		
		Hull	51	
		Jugmothang		
		Pangmo	52	1
	Losar	Chichong	40	2
		Hansa	44	
		Kholaksa		
		Kyamo	42	
		Kyato	46	
		Losar	40	1
		Gyu		
		Hicheche		
		Hurling	181	
Gyu	Gyu	Kaurik	78	
		Kun		
		Lirit	180	2
		Sumdo	183	2
		Guling	91	
		Kaa	100	
		Kongkong	95	
		Kungri	97	
		Mikim	98	
		Minsar	101	
		Pharpa		
	Kungri	Phukchum	99	
		Polele		
		Shidang		
		Siling	90	
Pin		Tangti-Kongma	146	1
		Tangti-yongma	146	2
		Upparla-guling	96	
	Sagnam	Chomoling	131	
		Dul		
		Ensa		
		Haroniri	132	
		Khar	142	
		Kilmur	128	3
		Mudh	128	1
		Pharka	128	2
		Dhilte		

Kothi	Panchayat	Village name	Village code	Hamlet code
		Pilsur		
	Sagnam	Rajgaon	105	
		Sagnam	106	1
		Shan	126	
Pin		Shaptan	106	3
		Takshen	106	2
		Thango	106	4
		Tiling	130	1
		Tudnam	141	
	Dhankar	Dhankar	149	1
		Doksa		
		Galnak		
		Kaale	167	2
		Lar		
		Lundupdin	166	
		Mane-Kongma	169	
		Mane-yongma	167	1
		Niyurpur	149	5
		Piyuche		
		Samling	149	6
C1		Shichiling	149	4
Snam		Shoshna	149	2
		Siluk	149	3
		Tipta		
	Tabo	Dhupuk	177	2
		Kyurit	173	4
		Lapcha	174	2
		Lari	177	1
		Nidang	173	3
		Poh	173	1
		Pomarang	173	2
		Tabo	174	1
	Hull	Morang	80	
		Khurik		
Totpa	Khurik	Margon-rangrik	77	1
		Sumling	79	
		Yargon-rangrik	77	2

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Kothi	Panchayat	Village name	Village code	Hamlet code
		Chicham	56	1
,		Dumle		
		Gyete	62	2
-		Kee	62	1
	Kibber	Kibber	61	1
Totpa		Ladarja	56	2
5		Pinjor	61	2
•		Tashigang	63	
•		Thinam	64	
	Demul	Shego	71	2
-	Kungri	Bharya	92	

APPENDIX 2.3: UNDERSTANDING A WAY OF LIFE: THE AGRO-PASTORAL SYSTEM IN SPITI VALLEY, INDIAN TRANS-HIMALAYA

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In Mishra, C. (2001). High Altitude Survival: Conflicts between Pastoralism and Wildlife in the Trans Himalaya. Doctoral Thesis. Wageningen University, Netherlands

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The high altitude Spiti Valley in the Trans-Himalaya is characterized by a short growing season. Most of the area remains snow-clad in winter (right). Snowmelt is an important source of soil moisture for agriculture as well as for rangeland production.



The agro-pastoral people of Spiti Valley have constantly experimented and evolved their production system. There have been radical changes in economy and land use especially over the last two decades. Yet, Spitians maintain strong Buddhist values, and retain several aspects of their traditional way of life. Part of the indigenous population comprises of celibate monks who are associated with any of the several monasteries in the region (right). The agro-pastoral way of life described in the Chapter is perhaps still characteristic of many regions in the Trans-Himalaya.

ABSTRACT

We describe the diversity and dynamism of social, agricultural, and livestock husbandry practices in a traditional mountain production system in the Indian Trans-Himalaya. These are interpreted in the context of their role in mediating environmental risk. The production system is a little known Buddhist agro-pastoral system in the Spiti Valley (ca. 12,000 sq. km) in the Himalayan state of Himachal Pradesh. The local population (ca. 10,000) belongs to one of the three Buddhist sects Gelukpa, Shakyapa, or Ningmapa, is related by blood, and shares a common Tibetan dialect. Family is the basic unit of production, though families are highly dependent upon the community to meet production goals. A village council appointed on rotation and functioning democratically is responsible for village administration, and is the arbiter of all decision-making pertaining to collective work and settling disputes. The council ensures equal access of families to common resources, as well as equitable distribution of responsibilities among them. Systems of primogeniture, celibacy, and polygamy seem to have prevented the fragmentation of land holdings and limited population growth. The diversity of practices in the agropastoral system seems adapted to the risk-prone mountainous environment, the risks being climatic, geological, and those posed by wildlife. The system seems to aim at maximizing production while mediating environmental risk. The production system comes forth as highly dynamic, characterized by continuous innovation and experimentation.

INTRODUCTION

The diversity of practices and dynamism (ease of change) in traditional mountain production systems of south Asia have been the focus of recent studies (Bishop 1998, MacDonald 1998). 'This (diversity) reduces risk in an environment where there is high dependence on natural forces and maximizes access to the full range of resource available. Flexibility in response to the stresses of mountain habitats is also a key to successful human adaptation to mountains' (Bishop 1998, p. 22). The emerging consensus seems to be that indigenous production systems are generally efficient and well adapted to the mountainous environment (e.g. Brower 1990, Miller and Bedunah 1993, Bishop 1998, MacDonald 1998). As expressed by MacDonald (1998, p. 289) '...such diversity is a contextually rational response to local environmental conditions as it acts to reduce environmental risk and minimize the vulnerability of local villagers'. In this article, the diversity and dynamism in a little known Trans-Himalayan production system are described and interpreted in the context of their risk-mediating roles. We define risk as the possibility of suffering loss or harm from environmental causes (both natural and human induced) or social disparity. Risk mediation is the reduction or elimination of this possibility, as well as the minimization of its impacts in case such a loss or harm does occur. The production system in question is a Buddhist agropastoral one in Spiti region of the Indian Trans-Himalaya bordering Tibet. In the concluding part of this article, we analyze several examples of local experimentation, innovation and change, all of which point to a highly dynamic and

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adaptive production system in Spiti. A single large village, Kibber (altitude 4200 m), was the focus of intensive study. Most of the information on the agro-pastoral system comes from a participant-observation study of this village (1996 and 1997 to 2000), combined with extensive, semi-structured interviews of the local villagers. Periodic, though not extensive, observations and interviews were also conducted in the village Sagnam (3700 m) of the Pin Valley region of Spiti. This was done to get a better representation of the entire region, since Pin Valley harbours a different social setup than the rest of Spiti.

Valley harbours a different social setup than the SPITI AND ITS PRODUCTION SYSTEM

The 186,000 km² of the Indian Trans-Himalaya, the rain-shadow region of the Greater Himalaya, includes parts of the Tibetan Plateau and the Tibetan Marginal Mountains. Spiti region (31°35' to 33°0' N and 77°37' to 78°35' E; altitudinal range 3350 to 6700 m) in the Trans-Himalayan Lahaul and Spiti District spans an area of over 12000 sq. km in the catchment of the River Spiti. The Greater Himalaya in the South, Ladakh in the North and Tibet in the East flank the region. The present-day Sino-Tibetan speaking inhabitants belonging to the Mongoloid stock are thought to have occupied the rain-shadow regions of the Greater Himalaya around the beginning of the first millennium BC, and the earliest written records for Spiti date back to 630 AD (Handa 1994). Buddhism was introduced in the region in the 8th century AD. The present local human population (ca. 10,000) is entirely Buddhist, belonging to the Gelukpa, Ningmapa, and Shakyapa sects. The inhabitants are agro-pastoral, though in some villages, the men also work as guides for trekking tourists and mountaineers. A few people have jobs in the local state Government offices or work as daily wage laborers in Government departments. The region is visited in summer by transhumant pastoralists from Ladakh in the north (largely for barter trade) and from the main Himalaya in the south (for grazing). Locally, families own most of the agricultural land, whereas the grazing land is common to the village with equal access. The village community may own some agricultural land collectively, and in Pin Valley, some families own small pastureland where they have priority access to fodder. Lineage allegiances and associations through marriage (more common within the village rather than outside, especially in larger villages) are quite strong. The climate in Spiti is arid, with most of the precipitation in the form of snow. The agricultural production is thus entirely dependent upon snowmelt, brought to the terraced fields around villages from glacial ponds by long channels (several km) dug along the contours. Limited irrigation water and early autumn frost are the main climatic constraints on agriculture. Crop diseases are very rare, and pest outbreaks unheard of. The main crops presently grown are barley, green pea, and a local variety of green pea (henceforth called black pea, translated from the vernacular). The black pea is grown largely for fodder, although people do consume a fraction of the seeds. In addition, potato, and mustard are also grown. There are fruit (apple and apricot) orchards in a few of the lowlying downstream villages.

The main agricultural activities begin around mid-April with ploughing and sowing, following which the irrigation channels are repaired and the sown fields levelled for irrigating. The fallow lands are also ploughed around this time. In Pin Valley, no fallow is left, and the ploughing is done only once in the beginning of the season. Irrigation starts around mid-May. Fields with green peas are weeded after three bouts of irrigation, while the barley fields after seven or eight. In Pin Valley, barley fields are weeded thrice, after first irrigation, third or fourth irrigation, and the fifth, when the seeds are about to set. Similarly, black pea is weeded only once, before irrigating. The plant is uprooted and stored around the first week of July as winter fodder. The fallow is ploughed around the same time. Mustard and potato are planted a month later than the other crops, and harvested around the end of September. Green pea is harvested thrice between mid-August and early October before it is uprooted. Barley harvest starts around the third week of September and is complete by the first week of October. The fallow is ploughed once again after the harvest. The fields are manured around the first week of November. There is a period of rest up to March as far as the agricultural activities are concerned. Towards the end of March, dust and ash are sprinkled on the fields to accelerate snowmelt, and once again the main agricultural cycle begins. Winter is the time for festive occasions (such as marriages and local festivals) as well as devoted to the reading of Buddhist scriptures.

Livestock reared includes yak, cattle, dzo and dzomo (male and female hybrids respectively of yak and cattle), horse, donkey, sheep and goat. Yak and dzo are used for ploughing, and donkeys are used as draught animals. All species except horse and donkey are used for milk and meat. Horses, apart from their role in religious ceremonies, are mainly kept for trade. Sheep provide wool, while yak hair is used for making ropes. Horses and yaks are free ranging over most of the year, especially in summer. The other animals are penned in the houses, and herded every day communally to the pastures. In extreme winter, all animals (including yaks and horses) may be penned and stall-fed.

All decision-making pertaining to collective work, settling disputes, and access to common resources (such as grazing practices, collection of fuel and fodder, water for irrigation, etc.) is done by a village council. Kibber Village is administratively divided into three groups of houses (Dhontoth, Dhonsham, and Dhonhar groups). The council includes one member called a numberdaar from each of the three groups, and an additional 'head' numberdaar, all appointed on rotation for one year. The decision-making is based on majority. Serious decisions are made in consultation with 5-10 village elders.

Diversity in the production system

In the present section, we analyse the diversity and flexibility in Spiti's agro-pastoral and social systems, respectively. Together these embody a production system befitting the region's inherently risk-prone mountainous environment. The risks are largely climatic, geological, and those posed by wildlife. However, it must be clarified that while discussing the risk mediating

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effects of this diversity, we do not impute causality, i.e., the original motivation for adoption of some of the practices may not have been related to risk mediation, though they serve the purpose nevertheless. Another word of caution pertains to the representativeness of the study villages. Mishra (1998) has pointed out the difficulty in describing "typical" Indian villages, a problem arising from high diversity at the countrywide level. In Spiti, even at the level of half a district, the problem remains. There are differences in the production system even between adjoining villages. However, as shall be seen later, these differences are only an extension of the high diversity and dynamism that characterise Spiti's production systems at the village level. The picture of the production system that emerges from this section should at best be viewed as an abstraction approximating the gamut of Spiti's varied village systems.

Social mechanisms of risk mediation

Most of Spiti has been traditionally characterised by a primogeniture system of inheritance where the eldest son inherits all the land and property, while the younger siblings become celibate monks and nuns. The number of nuns is much smaller, as a result of which a section of the female population remains unmarried in their natal homes. As elsewhere in the Trans-Himalaya, there is no evidence of female infanticide (Wiley 1997). The systems of primogeniture and celibacy prevent the fragmentation of land holdings and limit population growth. In a sample of thirteen villages including Kibber, the population growth rate in the last two decades was only 0.09 %, as compared to the countrywide average of 2.17 % over the same period (Mishra 2000). In Pin Valley, similar effects are accomplished through a flexible system that allows polygyny as well as polyandry. Part of the celibate population also emigrates to monastic schools in other distant parts of India.

The flexibility and diversity of labour arrangements in Spiti's production system allow efficient and timely mobilisation of manpower, while stringent locally enforced (at the village level) regulations ensure equitable distribution of responsibilities. All communal endeavours (maintenance of irrigation channels and roads within the village, cultivation of crop-fields belonging to the village temple, renovation of the common meeting house or temple etc.) necessitate the participation of at least one member from each family. Depending upon the perceived seriousness of the task, the village council may impose fines ranging from US\$ 1.70 to 11.90 (1 US\$ = 42 Indian Rupees; the per capita income for Himachal Pradesh being US\$ 248 in 1994-95, see Mishra 2000) daily on families failing to participate. However, the system is flexible enough to allow proxy labour arrangements which may be arranged privately among families. Peak or unforeseen labour demands of a family are met by voluntary work groups that, like in other tribal highland communities of India, operate on a reciprocal exchange basis (Mishra 1985). These include activities such as manuring, sowing, weeding, harvest, threshing, repair of houses, slaughtering of animals etc. Such a system allows amelioration of periodic labour shortages and the control of further loss in case of hazards (MacDonald 1998).

There is a high potential for disparity in access to common resources such as dung and forage (for stall-feeding) collected from the pastures, with larger families having the obvious advantage due to their larger labour base. Does this cause asymmetric exploitation of common resources, or is such disparity neutralised? Stringent regulations operate to ensure equitable access of families to common resources. Kibber pastures have been divided into two groups. While dung collection is not regulated in one of these, the village council decides upon the period of collection in the other. In Sagnam, regulations on dung collection from pastures, which was earlier restricted to the months of May and October, broke down about six to seven years back. Out of date collection by members of 20 families in Kibber in 1998 resulted in imposition of fines equivalent to approximately US\$ 4.80 per 100 kg of dung. Similarly, after the harvest, when livestock are grazed in the crop fields for a few days, dung collection is prohibited. The village council announces the date for the commencement of dung collection, and the owners of respective crop fields have no priority over the accumulated dung. In Pin Valley, on the other hand, the owners do have exclusive rights, but these rights last only for the first three hours of collection.

Regulations on collection of plant biomass from the pastures, apart from equalising access, also reflect conservation objectives that try to reduce the risk of pasture degradation. In Kibber, as many as seven species are collected from the pastures. Among these, the collection of Allium and Cousinia sp. for fodder is allowed only for one day each in a year. Similarly, the exploitation of two other fodder species collected together is restricted to two days. Grass collection is allowed for three days. There is no temporal regulation on the collection of the two shrubs (Caragana and Lonicera sp.) used for house building and fuel. However, Caragana collection is spatially regulated in that currently it is totally prohibited in one of the two groups of Kibber pastures. All collection dates, pertaining to both dung and plants, are restricted to periods with the lowest labour demands of agriculture and other activities, thus neutralising to a substantial extent the potential disparity in access to these common resources. At the same time, no collection is allowed on days of festivity such as marriage celebrations. This is to ensure the participation and collective sharing of responsibilities during such occasions by the entire village. There are similar regulations on fodder collection in Pin Valley. Collection of Cousinia in the nearby pastures and of Artemisia (also for fodder) in the distant ones is restricted to the month of October, the dates decided by the village council. In the privately owned collection areas (usually collectively owned by four or five families), the owner families have exclusive rights for the first five days of collection, after which collection is open to all families.

Regulations also pertain to livestock causing crop-damage. Despite communal herding, the onus is on respective families to prevent their livestock from entering the fields. In Kibber, two families earlier shared the responsibility, rotating among all families daily, to catch such straying animals. The animals would be released only upon payment of fines (ranging from US\$ 0.12 to US\$ 0.36 per animal depending upon the species) by the owner, the amount to be

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shared between the two families on duty. Since the last six years, the system has changed with one family being responsible for the entire year, and duties to be rotated among families annually.

Thus, while the risk mediating characteristics of the above practices and regulations are evident, the social system in Spiti also comes forth as rational (sensu Macdonald 1998). The rationality is evident in the practices that prevent land fragmentation and control population growth; both necessitated by the near impossibility of creating additional agricultural land in the arid mountainous landscape. Similarly, the amelioration of consequent labour shortages through flexible mobilisation of manpower is equally rational in the local context of extremely low human density (0.78 per sq. km compared to a countrywide average of over 300 per sq. through flexible mobilisation of manpower is equally rational in the local context of extremely low human density (0.78 per sq. km compared to a countrywide average of over 300 per sq. km; Mishra 2000). Furthermore, in such a system where the family, despite being the basic unit of production, is highly dependent upon the community to meet production goals, maintaining community integrity is paramount. This is achieved through regulations that ensure equitable distribution of collective responsibilities as well as access to common resources. Having written about equality, however, it is important to mention that the community is caste-divided. The families belonging to the second caste, together with those of recent settlers and younger siblings who shunned celibacy (see later), have much smaller or no land holdings. Disregarding the moral issues involved, the second caste may be considered a 'service class' (sensu Mishra 1998), providing essential services such as blacksmithing and labour and others such as butchery and music. This is a patron-client relationship (ibid.) in which the families belonging to the second caste are paid customarily fixed shares of the agricultural produce and

belonging to the second caste are paid customarily fixed shares of the agricultural produce and fodder. In addition, these families have usufruct agricultural rights in crop-fields owned by the village community.

The agricultural system

As mentioned before, early autumn frost is one of the main climatic risks to agriculture in Spiti. How has the production system traditionally mediated this risk? Polyvarietal planting increases genetic diversity and is believed to reduce the risk of disease and pest outbreaks common to monocultures, and of climate by distributing crop phenology temporally (Morren and Hyndmann 1987, MacDonald 1998). As many as four varieties of barley, locally called kneu, soa, nenak, eumo, were traditionally grown in Spiti. Among these, kneu was the most preferred for human consumption, while soa had a marginally higher yield. The diversity brought about by polyvarietal planting of the staple crop seems to have been a strategy to mediate climatic risk. While all varieties were planted together, kneu, the most favoured, was also among the last maturing ones (usually only by the third week of August), thereby facing utmost risk from early autumn frost. Soa became harvestable a week earlier, while nenak was the earliest maturing variety, harvestable by the last week of July. The latter was especially planted in those fields in which the crops would mature late.

Loss of arable land to erosion is a constant problem in most mountain production systems.

In Spiti, such potential loss is reduced by the construction of stone embankments and walls at the edges of terraced fields. In addition, transplanting wetland sedges into the water channels has also traditionally reduced potential erosive threats. The latter practice also reduces water losses to evaporation, which can be very high in this arid landscape. Runoff is reduced by spreading a species of Polygonum collected from the pastures on the fields before the first irrigation. Thus, as in the case of the social system, the agricultural practices in Spiti seem to aim at mediating climatic risk.

The livestock production system

The diversity of the livestock assemblage in Spiti and associated herding practices not only distribute risk spatially and among species, but also ensure an efficient utilisation of the limited plant biomass in the Trans-Himalayan pastures. The gradient of livestock body masses (mean ranging from 34 to 298 kg for adults; see Chapter 7) and the combination of ruminants and hindgut fermenters presumably enable the exploitation of a wide range of forage in terms of species and quality (Hofmann 1973, Van Soest 1982, Van Wieren 1996, Prins and Olff 1998). In terms of pasture use, the adult yaks and horses range free, and confine themselves to distant high altitude pastures (above 4600 m). These pastures are usually too far away for the central place foragers, the remaining livestock, which are herded to relatively nearby low altitude pastures (up to 5 km, 4200 to 4650 m) and brought back to the village daily. Risk of livestock losses to wild carnivores necessitates that all the individuals of the latter group, even if not being used on a daily basis, are penned inside the villages. This risk is substantial; in Kibber presently estimated at an annual loss of 12 % of the livestock holding (Mishra 1997). Traditionally, villagers have also reduced the magnitude of this risk by eliminating wolves, a practice encouraged through a system of collective rewards for successful hunters (ibid.). In the case of adult yaks and horses, the villagers choose to favour efficient pasture use at the cost of escalated risk from wild carnivores. This spatial distribution of livestock also redistributes climatic risks among species. For instance, in the village Mane of Spiti, even as 24 free ranging yaks died together in an avalanche in early winter of 1998, the remaining livestock remained unharmed.

There are other arrangements for reducing risks to livestock. Sub-adult horses, which are too small to be left free-ranging, but impose high fodder demands if stall-fed, can be given to professional herders who camp in far-away pastures and graze them in summer (nowadays) in exchange for money (at a rate of US\$ 9.50 per horse for the season; 1 US\$ = 42 Indian Rupees). During winter, the risk of starvation is high. In the event of very heavy snowfall, adult yaks and horses are also brought back to the villages and stall-fed. Even in less inclement weather, throughout winter, horses are herded back every ten days to the village, a responsibility each family shares on rotation. This allows the owners to assess the body condition of their animals; the weak ones are kept behind and stall-fed, while the others are herded back and left in the pastures. Pastures are periodically checked in winter, and as the forage biomass gets depleted, the horses and yaks are guided to better ones. In the Pin Valley region where horses are espe-

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cially valued, two people herd sub-adult horses for two days each, on rotation among all horseowning families. While this is compulsory during the snow-free period of winter, in summer families are free not to graze communally. This is another flexible arrangement that allows families to opt out of the herding responsibilities, though at an increased risk to their horses, during the season when there is maximal labour demand for agriculture and other activities.

Within the pastures around Kibber, rotational grazing in summer spreads the grazing pressure equitably, distributing the risk of pasture degradation. Three pastures closest to the village are not grazed over most of the season, but are kept for winter when snow cover precludes long-distance movement, thereby improving the efficiency in pasture use. Every family tries to maximise its herd size, constrained mainly by the ability to supplement livestock feed in winter. This limit is extended through the cultivation of black pea, which is grown primarily for forage. Despite the fact that the green pea is such a lucrative cash crop, it has not replaced black pea. This is because of the belief that forage production of black pea is relatively higher.

The system of communal herding reduces the labour investment per livestock head, again allowing the maintenance of larger holdings. In Kibber, three herders are appointed together for six months, who rotate their herding duties on a daily basis. Any one of these three herders daily accompanies the livestock to the pastures, helped by three more people belonging to each family in the village, again rotating on a daily basis. Thus, instead of having to herd their stock daily, the system reduces the demand from each family to an investment of roughly one man-day a month. The three herders are compensated by each family, depending upon the size and composition of their livestock holdings, as well as the condition (dry or in milk) of adult female animals, in grain and butter at the end of their six-month term. Their duties are again rotated among all the families. However, this is a flexible system in which families are free to exchange duties. Thus, the landless, or families with more members willingly take up herding duties, while smaller families are spared this substantial labour investment.

Dynamism in the production system

Mountain production systems are generally characterized by diversification, flexibility and dynamism (Bishop 1998). In this section we quote several examples of experimentation, innovation, and change, which point to a highly dynamic and adaptable agro-pastoral system in Spiti.

Social changes

Contemporary changes in socio-economy in Spiti have been the subject of an earlier discourse and we will not expound upon them here, though one point needs to be mentioned (Mishra 2000). There, the concern that the human population of Spiti was likely to escalate soon, despite the negligible growth rate in the previous two to three decades, had been expressed. This concern was drawn from the experience of other Trans-Himalayan Buddhist communities that are undergoing rapid population growths following a breakdown of social population regulation mechanisms (Goldstein 1981, Fox *et al.* 1994). Closer examination shows that such a process is already in effect in Spiti. With new job opportunities (with the Government, the army, and also catering to the new markets) and consequently lowered dependence on agricultural land, the system of celibacy among younger siblings is breaking down. In Kibber, presently 47 % (n = 36) of younger adult male siblings are no longer monks. Similarly, while 13.6 % of Spiti's total human population (n = 1414) was comprised of celibate monks in the year 1845 (Handa 1994), a sample of 40 villages shows that such monks comprise only 6.5 % of the present population. It is evident that the rate of population growth is likely to escalate in the near future.

Agricultural innovations

Experimental planting of green pea by a single Kibber family in the year 1983 initiated a small agro-economic revolution in Spiti. The economics of this change has been discussed elsewhere (Mishra 2000). It would suffice here to say that this was one of the most successful experiments of the past few decades, its swift and radical effect being the transformation of a barter based economy to a market driven, cash based economy. By 1986, most families in Kibber were planting the crop, and presently, it is one of the most significant exports from Spiti, it's per family return as high as the per capita income of Himachal Pradesh in general (ibid.). In Pin Valley, the first villages adopted this crop ca. 5 years back, and many others are currently in the process of doing so. This change has affected the traditional risk mediating practice of polyvarietal planting. The green pea crop has largely replaced barley, thereby reducing the area available for barley production. Consequently, in Kibber and surrounding villages, the practice of polyvarietal barley planting is completely abolished, with only kneu now being cultivated. In Pin Valley region, where green pea cultivation has not yet become widespread, two to three varieties of barley are still planted, except the eumo that was given up a decade ago.

Experiments with wheat in Pin Valley were not successful. In Sagnam, it was first tried 15 years ago, and once again subsequently. Failure of the crop to reach maturity each time has now led to its rejection as a potential crop. Potato, on the other hand, was adopted here some time in the early 1970s. Together with mustard, it is especially planted in those fields where, in a given year, black pea is to be planted (decided by the system of crop rotation) but the latter's yield is known to be marginal. Another recent change has been in the timing of mustard sowing, which traditionally was delayed, usually done about a month after green pea and barley. This was done to reduce the risk of damage to the crop by snowfall in spring. However, for the past few years, this laborious practice has been given up in favour of simultaneous planting which is much easier. This has obviously augmented the risk, with 75 % of the crop getting damaged in the spring of 1997, all of which had to be resown.

One more interesting, partly successful agricultural experiment merits mentioning. Kibber and surrounding villages, being among the highest in the region, harvest their green peas the

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After word

The present analysis suggests that the agro-pastoral production system in Spiti, at the level of the family, represents a repertoire of locally appropriate practices that strives to maximise production while mediating environmental risk. The system is highly dynamic and consequently adaptable to changing natural and socio-cultural environments. By the time this study was over, of the 70 odd families in Kibber, more than 40 had televisions in their homes and were watching satellite tv. Most houses got telephone connections that are functional for a few months in a year. More than six small locally run hotels have sprung up in the village to cater to increasing tourism. The present state of agropastoralism in Spiti is perhaps best described by reiterating Bishop (1998, p. 9) who studied an agropastoral system in the Nepal Himalaya, '…even in a place as seemingly isolated…, people are changing in response to global patterns, while maintaining knowledge and activities that have been part of people's lives in these mountains for generations.'

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last. This harvest, stretching into the month of October, is 'off-season' for the rest of the country, a time when no other region produces green peas. Thus, the harvest from these villages yields maximum monetary returns. Since 1998, the entire village of Kee, which is 300 m lower than Kibber, have been delaying the sowing of green pea by two months, with the objective of delaying harvest to par with Kibber. The objective has been fulfilled, in fact, their harvest is even later than Kibber's. However, this is at a cost of marginally reduced yield.

Changes in the livestock production system

Evidence for increase of livestock holdings in Spiti has been presented elsewhere (Mishra 2000). Apart from this overall enlargement of livestock population, several other changes have taken place. In Kibber and surrounding villages, until two decades back, female yaks were not reared. All yaks (males) were procured in barter from the adjoining Changtang. This practice has subsequently changed, presently, 40 % of Kibber's adult yak population comprises of females. Thus, the yaks are now bred in this region and rarely procured from Changtang. This might be the cause of Spiti's increasing yak population, as opposed to most other yak rearing communities in the Himalaya where its population is known to be declining (see ibid.). In Pin Valley however, the traditional practice continues, and even today, there are no female yaks there.

Other changes in the livestock production system represent responses to a changing environment. In Sagnam, as in Kibber, all livestock of the village except horses and yaks (also, unlike in Kibber, donkeys) was earlier herded together. However, unlike in Kibber, the herders were permanent, though they would be accompanied by two people rotating among all the families daily. Increasing demands for grain by the herders led to the termination of their services by the village council three years back. Presently, three people rotating daily among all the families herd the livestock.

The remaining examples of such adaptation pertain to intensified killing of livestock by wild carnivores. Prior to 1997, there were no wolves in Pin Valley. After wolves moved in, there was a sudden escalation in the rate of livestock depredation. Donkeys, which earlier used to range free, became the common victims. Now, since 1998, donkeys are taken to nearby pastures by the owners every morning, brought back in the evening and penned inside the house. Similarly, prior to colonisation by wolves, all adult horses used to range free, while sub-adult horses were collectively herded. Presently, many owners willing to take up additional duties of collective herding graze even the adult horses along with the sub-adults. In the village Gete where a similar human-wildlife conflict related to livestock depredation by the snow leopard intensified in the last decade, people responded by improving their summer corrals. All families covered their corrals with chain-link fences, an act that totally eliminated the risk of losing livestock to wild predators once penned (Mishra 1997).

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APPENDIX 2.4: SPITI WILDLIFE MANAGEMENT PLAN: LAND SCAPE LEVEL CONSULTATION WITH LINE DEPARTMENTS

(DRAFT) ADC Office, Kaza 23 November 2009 (11:00 to 14:30hrs)

The Wildlife Wing of the HP Forest Dept (HPFD) and the Nature Conservation Foundation (NCF) are preparing the Management Plan for the Spiti Wildlife Division since August 2008 based on the principles set out by the Ministry of Environment & Forest's, Project Snow Leopard (PSL). An important feature of this plan is that it clearly identifies the importance of designing and implementing conservation with wider participation of local communities, Government departments and civil society organizations. In this context the HPFD-NCF proposed this meeting to present the findings of their work to the departmental heads and obtain their critical inputs to make the Plan widely acceptable and useful. The meeting was chaired by Shri Priyatu Mandal, ADC, Spiti, and Shri Sanjeeva Pandey, Chief Conservator of Forests (PAs and Biodiversity) presided over the meeting. The meeting covered the following topics:

- 1. Introduction to the Project Snow Leopard and innovations for high altitude conservation
- 2. The Spiti Management Plan, its objectives, site identification and zonation, threat analysis at landscape and local levels, broad strategies & activities to overcome the threats and overall approach for local consultations to formulate site level (valley or village cluster) micro-plans
- 3. Institutional setup in Spiti (line departments and NGOs) and convergence of their activities with conservation goals
- 4. Discussions and inputs from departmental heads or their representatives

BRIEF POINTS FROM THE PRESENTATIONS:

Shri Hari Singh, DFO, Spiti welcomed the participants to the workshop and explained about the partnership between the HP Forest Department and NCF.

Shri Priyatu Mandal, ADC, Spiti spoke about the need for an integrated conservation-development framework for Spiti, which is endowed with unique conservation values. He then briefly spoke about the Project Snow Leopard and NCF to the line department representatives. He talked about NCF's approximately 20 year involvement with Spiti and the continuing work on snow leopard ecology. He sought cooperation from all line departments for the development of the Spiti Management Plan.

Shri Sanjeeva Pandey, CCF (PAs and Faunal Diversity), Govt of HP, presented a series of



three snow leopard posters prepared by the HPFD-NCF and SLT (Snow Leopard Trust) to the ADC, Shri Mandal.

🔀 Dr Yash Veer Bhatnagar, Senior Scientist, Nature Conservation Foundation (NCF) & Director, Snow Leopard Trust, India, made a presentation introducing NCF and PSL. While thanking the ADC for taking keen interest in the Management Planning and organizing the meeting, he first introduced NCF and its high altitude programme that includes long-term research and conservation efforts in Spiti and other high altitude areas. He subsequently explained the genesis of the PSL and its salient features that recognize the unique qualities of the snow leopard range where most of the traditional conservation approaches are not very ap-propriate. Wildlife is spread in the larger landscape where local people and other stakeholders propriate. Wildlife is spread in the larger landscape where local people and other stakeholders also have heavy dependence. Conservation should not be wildlife protected area specific and should involve landscape level and participatory approaches. The PSL accounts for enabling this through careful identification of important wildlife areas, preparation of scientific participatory management plans and its implementation through a definite structure that incorporates stakeholders at the village, landscape, state and central level. He then explained about the Management Plan being developed based on the principles set out by the PSL which proposes management and practices that can help in both conservation and conservation-sensitive development in the entire landscape, not limited to the existing two wildlife protected areas of Spiti. He explained the process followed for gathering information on biodiversity, human society and local institutions, the threat assessments and the strategy for alleviating them. The activities will need to be identified through participatory micro-plans where the line departments also will have an important role. He stressed that the departments may already be involved in works that are conservation friendly such as propagation of energy efficient equipments and veterinary disease control. Recognition of both, the convergence and divergence of existing works of the departments need to be recognised and synergised into the management plan.

Dr. Bhatnagar concluded his presentation with a request to the line departments to provide necessary information about their respective departmental mandate, thrust areas of work and recent flagship projects. All the representative of the line departments provided details of their departments vis-à-vis the mandate, thrust areas and flagship projects in a form supplied by the organizers. It was agreed that the information provided will be followed up if need for further clarification arose. This was followed by a discussion on the presentations and the departmental mandates, etc as outlined below:

Shri Sonam Angdui (CBPO, Kaza), strongly emphasized the need to deal with the problem of feral dogs. He said that in his village Quiling, sheep and goat have nearly ceased to exist due to predation by feral dogs and asked whether the Management Plan addresses this issue as it may not directly deal with wildlife. Dr Bhatnagar clarified that this has been recognized as an important threat in the Plan and would form an area of intervention. He also explained how this

issue is gaining importance all across the snow leopard range in India, from J&K till Sikkim, where efforts are already being taken to control the menace.

Mr Angdui also suggested that dependence of local communities on livestock and the associated problems are an important area for intervention. He mentioned that breeding of horses has declined substantially which was culturally important.

Dr Bhatnagar asked Shri Vijendra, representative of the Agriculture Department, about the promotion of organic farming in the region. The traditional way of farming for barley and black peas was entirely organic, but recently the switch over to green peas is bringing in intensive chemical farming into the region. Shri Vijendra explained that fertilizers and pesticides were introduced to increase crop yield, but his department is now beginning to look at organic farming solution too, although at a modest level at present. He was well aware about the harmful effects of chemicals in farming and that the increase in the region was largely due to lack of awareness of the harmful effects of pesticides and chemical fertilizers. Shri Sanjeeva Pandey emphasized that agricultural planning should be done based on local needs and incorporating traditional knowledge and beneficial traditional practices. He also spoke about the need to revive organic farming and add value to this produce.

Shri Sanjeeva pandey concluded the meeting with thanking the ADC Shri Mandal and all the representatives of the line departments present there. In the concluding remarks he said that traditional knowledge and ethics need to be incorporated in conservation strategies. He said that the new should be welcomed without discarding the good in the old. He urged that traditional use of manure and pesticides should be revitalised. He was particularly impressed by the Innovation schemes of the Sarvashiksha Abhiyan and the Shepherd Insurance Scheme of the Animal Husbandry department, which clearly has linkages with conservation goals too. Learning of such schemes was an important part of this meeting. He said that mountain areas are sacred and their purity should be maintained.

S.No	Name	Designation
	Departmental Heads/ Representatives	
1	Sonam Angdui	CDPO
2	Abhishek Hans	Assistant Director, AHB, Kaza
3	Hari Singh	DFO
4	R.P.Singh	BDO, Kaza
5	Jeet Singh	Kanungo
6	Dr. Shiv Prakash	BMO, Health and family welfare
7	Narinder Rana	Sarva Shiksha Abhiyan
8	Vinay Chander Mankotia	D.D.P

The following were present at the meeting.

Contraction of the second

	9	Y.R.Thakur	Clerk- Horticulture
	10	Tanzim Dawa	Field Kanungo
	11	Prem Chand	Patwari
X	12	Gatuk Chering	Kanungo
Ι	13	Sonam Angrup	Patwari
П	14	Vijendra	Agriculture
Z		Organizers	
H	1	Sanjeeva Pandey	CCF, (PAs and Faunal Diversity)
2	2	Priyatu Mandal	ADC, Spiti
2	3	Yash Veer Bhatnagar	Director, SLT India and Sr. Scientist, NCF
A	4	Rashid Raza	Research Associate, NCF
ſ	5	Rishi Sharma	Research Scholar, NCF
		Members of NCF field staff & the	
		Kibber Youth Club	

APPENDIX 2.5: THE SECTOR-WISE STRATEGY/OBJECTIVES AND DETAILS OF PROGRAMMES/SCHEMES DERIVED FROM THE ITDP ELEVENTH FIVE YEAR TRIBAL SUB-PLAN (2007-2012) (ANON. 2007).

Agriculture	
Strategy/objectives	Programmes/Schemes:
1. Increase the productivity of food crops and diversification of area under uneconomical crops like low value millets to cash crops/ high value crops like vegetables beans etc. besides seed production of peas, cabbage_cauliflower to receive high priority	 Improved seed program- creation of seed stores, 100% transport subsidy on improved seeds and 50% subsidy on cost of seed, staff and expenditure on farms Manure and Fertilizers- Distribution of
 Encourage seed production and certification programme to enable farmers to get better price for certified produce Render technical know-how to farmers regarding 	 Analitic and Perturbers' Distribution of fertilizers at 100% transport cost subsidy and free soil sample testing Plant Protection- Farmers to be provided with plant protection equipment and
 Active technical know now to familers regarding increasing production of vegetable and vegetable seeds Increase productivity of potato crop. Introduce agriculture technologies like sprinkler irrigation and green houses for production of seedlings of vegetable crops Supply inputs including seeds of farm crops, plant protection material/equipment/implement/tarpulines at 50% cost. For fertilizer, continued subsidy on selected fertilizers on cost, transportation Provide regulated markets/ construction of markets Provide 50% subsidy and 50% loan to farmers for soil and water conservation measures on their lands. Tie up with H.P SC/ST Development Corporation for ensuring loan at subsidized rates to registered agricultural societies for purchase of vehicle for transportation of agricultural produce. 	 while plant protection equipment and chemicals at 50% cost. 4. Development of commercial crops- Seed Potato, Pulses, Vegetables. 5. Diagnostic sample, survey and study-build precise and reliable agricultural statistics. 6. Extension and Farmers Training - Training regarding improved farm technology and establish linkages between agriculture scientists and farmers. 7. Agriculture implements and machinery-Distribution of agricultural implements at 50% cost subsidy and 100% transport subsidy. 8. Massive assistance to Small and Marginal Farmers-Distribution of free minikits of improved seeds with the
 10. Effective and timely arrangement of supply of inputs 11. Large scale testing of soil fertility 12. Increase infrastructural facilities like godowns and buildings for staff. 13. Ensure effective, timely and location specific dissemination of technical know-how through sound networks of extension including training, demonstrations and distribution of minikits. 14. Promote use of micro-nutrients. 15. Promote Organic Farming 	 minikits of improved seeds with the objective of increasing production of cereals pulses and vegetables and oil seeds. 9. Agricultural exhibition. 10. Sprinkler irrigation scheme- to increase productivity per unit area 11. Farm women Empowerment- Ensure women participation in agricultural activities through financial support and technical training to women self-help groups

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	Animal Husbandry
Strategy/objectives	Programmes/Schemes:
	1. Cattle show/sheep rallies
	2. Stipend to trainee candidates undergoing vety. training
	courses.
	3. Maintenance of vety. dispensaries and hospitals providing
	following facilities.
	a.) Treatment of animals at the hospital as well as at the
	doorstep of the farmer.
	b.) Prophylactic vaccination against contagious diseases like
	FMD, Haemorrhagic septicemia, Black quarter etc.
	d.) Dipping and drenching of animals against ectoparasites
	and endoparasites
	e) Castration of indigenous buils.
	4. Sheep and wool development- sheep and wool extension
	Rambouillet sold at nominal rates from Sheep breeding
	farm Kagsthal (Karcham) for cross breeding. Post breeding
	season, the rams can be returned to the Sheen & Wool
	extension center to save the farmer from maintenance costs.
	5. Veterinary Extension programme- Mini Liquid Nitrogen
	Plant for artificial insemination network.
	6. Horse Breeding Farm – Breeding of Chumurthi horses at
	breeding farm at Lari.
	Special Central Assistance (S.C.A, programmes)
	1. 100% freight Subsidy on livestock feed.
	2. Yak breeding- Providing male Yaks for hybridization.
	3. Breeding facilities through natural services- Provide Jeresy
	bulls free of cost and freight to concerned panchayats.
	4. Supply of pack animals at 50% subsidy.
	5. Fodder development and (fodder) minikit testing- Fodder
	test plots are provided by the farmer, dept. provides seeds
	and fertiliser free of cost.
	6. Prophylactic vaccination for FMD- vaccines are purchased
	Fisheries
	1. Development and management of sport fisheries (status in
	Spiti not mentioned)
	2. training- to popularize pisciculture among farmers.
	50% assistance for construction of pond (may Do 5000 por
	farmer) and 100% subsidy on fish and transportation
	farmer) and 10070 subsidy on fish seed transportation.

in the			Taxeto
	Forestry and Wildlife		Cooperation (Cooperatives)
Strategy/objectives	Programmes/Schemes:	Strategy/objectives	Programmes/Schemes:
prestry Development:	Forest conservation and development:	To improve the living	1. Direction and administration: It has been proposed in ITDP 07-11 to
To raise plantations of	1. Survey and demarcation: fix boundary pillars to protect against	standards of the tribal	establish a post of ITDP level officer in Kaza to develop the Spiti area.
fuel, fodder and small	encroachment due to ill defined boundaries.	people and bringing	D.C Lahaul & Spiti has also stressed the need to open an Assistant
timber species including	2. Working plan organization: revision and update of working plans.	economic improvement	Registrar, cooperative societies at Kaza.
sea-buckthorn with	3. Forest protection: Protection of forests against increasing biotic pressure.	among them. (by	2. Cooperative training and education: Training to be implemented by H.F.
involvement of people.	Social & Farm forestry:	meeting their credit	state Cooperative Development Federation Ltd. Shimla. Trainees of
To improve the existing	1. Development of pasture and grazing land- Fodder plantation around	needs through Co-	scheduled tribes to be provided stipends. Cooperation related literature
pastures.	villages and development of high lying pastures	operative banks and	to be published.
To introduce	2. Improvement of tree cover- in place of production forestry scheme and	involvement of Primary	3. Share capital contribution to be provided to Primary Agricultural
economically important	social and farm forestry schemes. Components are:	Agriculture Credit	Societies in order to enable them to seek assistance from bank as well
species.	a.) Afforestation scheme: covering blank areas by tree plantation to achieve	Societies and marketing	as increase their turnover. PAC's are not eligible for assistance from
To prolong life of	optimal landuse. Fencing, soil and moisture conservation, planting and	societies)	NABARD due to low turnover.
reservoirs of River	limited bush cutting to a limited extent to facilitate establishment and		4. Managerial subsidy to Primary Agricultural societies to enable them to
Valley Projects by	growth of plants.		hire full time paid secretaries.
taking soil conservation	b.) Enrichment planting- in areas of poor density with inadequate stocking		5. Interest subsidy to credit cooperatives (PAC credit cooperatives) to
measures.	(density range 5% to 20%) to improve stocking and productivity.		provide loans to tribals below poverty line at 4% concessional rate, the
To carry out survey of	(maybe not relevant to spiti?)		difference between the market rate paid by the state govt. as subsidy.
medicinal and aromatic	c.) Raising nurseries for departmental public distribution: to raise		6. Interest subsidy/enrolment subsidy provided to IRDP families Short
herbs to conserve and	genetically superior and healthy plants for planting, distribution and to		term and medium term loans to be provided at 4% rate of interest. S.T
develop them further	achieve right balance of mix of suitable species.		families admission fee subsidized.
	Sanjhi Van Yojna:		7. Warehousing, Marketing and Storage:
	To ensure participation of local communities in natural resource		a.) Share capital to marketing societies to marketing socities marketing
	management in general and forests in particular. The scheme is		agricultural, horticultural, MFP and arranging sub-wholesale
	community oriented with aims of empowerment of people and giving		distribution of agricultural requisites and consumer articles. (status in
	communities greater role and responsibilities in management of natural		Spiti unclear)
	resources. Main objectives are:		b.) Managerial subsidy to marketing societies to hire full time secretaries.
	1. Involvement of grass root institutions; Gram panchayats, Mahila		c) Price fluctuation fund- Incentive to marketing cooperatives to purchase
	mandals, Yuvak mandals, schools, Village Development Committees,		produce, which at present is in private hands. Incentive 5% of annual
	NGO's etc in eco-restoration.		turnover.
	2. Regeneration of degraded forest areas through community involvement.		d.) Working capital subsidy- to be implemented trough nonplan.
	3. Creation of social assets for the benefit of the communities.		8. Consumer cooperatives. To provide to consumer stores, marketing co-
	4. Increasing productivity of forest areas by improving nursery stock.		operative Primary Agriculture Credit Societies:
	5. Re-orientation of forest staff for facilitating community participation.		a) Share capital contribution
	6. Employment generation in rural areas		b.) Managerial subsidy/furniture fixture
	7. To bring more area under tree cover by encouraging rehabilitation/		c.) Interest Subsidy
	plantation of private wastelands on cost/benefit sharing basis.		d.) Share capital and subsidy for construction of rural/marketing godowns.
	Wildlife Sector:		9. Industrial cooperatives- share capital contribution and managerial
	Efforts for conservation of snow-leopard and other high altitude species.		subsidy.
	Activities (Works)- construction of buildings, bridle paths, water		10. Transport cooperatives. (Status in Spiti unclear)
	ponds, water harvesting structures, pasture improvement, habitat		11. Cooperative training and Education.
	improvement, fire protection measures.		12. Dairy cooperatives (status in Spiti unclear).

pastures. 3. To introduce

4. To prolong life of

5. To carry out survey of

Forestry Development:

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APPEND

		Rural Development			Rural Development
	Strategy/objectives	Programmes/Schemes:		Strategy/objectives	Programmes/Schemes:
	Alleviation of acute poverty	1. To treat the identified area through soil moisture conservation,			Elected Panchayats implement the programme with the approval of Gram
\mathbf{X}	and generation of rural	water harvesting, afforestation, pasture development, horticulture/			Sabha in the following manner:
H	employment.	agriculture development.			a.) 22.5% of funds for exclusive creation of assets for SC/ST Poor.
	Main objectives are	Special Programmes for Rural/Area Development:			b.) 7.5% or Rs. 7500 whichever is less for administrative expenses.
F	Ensuring overall	Desert Development Programme (DDP) As implementation of			c.) 15% of funds for maintenance of assets created under various
	development of rural areas	Watershed development programme.			employment programmes.
H	through:	The cost of treatment of area Rs. 6000/ Hectare.			d.) 55% towards creation of rural infrastructure.
C	a) Rainwater harvest	Projects under "Haryali" guidelines, implemented through Panchayti			3. National Rural Employment Guarantee Act (NREGA):
	b) Employment	Raj institutions.			The act ensures livelihood security of households by guaranteeing 100 days
	generation				of employment, each year to every household whose members offer to
ŗ	c) Poverty alleviation	Indira Awas Yojna schemes:			do unskilled labour. In case the applicant is not provided employment
	d.) community	Assistance of Rs. 27500 provided to Below Poverty Line families. The			within 15 days, she/he is entitled for a daily unemployment allowance,
	empowerment	selection of beneficiaries done by Gram Sabha.			for first 30 days 25% of the daily wage and after that 50% of the wage
	e.) development of human	Rural employment/ Self Employment programmes:			rate.
	and other economic	1. Swarnajayanti Gram Swarozgar Yojna:			Community Development:
	resources	Emphasis on groups starting joint projects. Improvement of skills			1. Total Sanitation Campaign: Promotes full sanitation coverage in
	f.) Mitigation of adverse	through in-built training component. Up-gradation of technology,			rural areas and to eliminate the practice of open defecation. Program
	effects of extreme	availability of infrastructure and better marketing arrangements.			implemented through active participation of masses and Panchayati
	climatic conditions and	Subsidies- 30% of the project cost (upper limit Rs. 7500), in case			Raj institutions. Technical manuals about low cost technologies for
	development of natural	of SC/ST and disabled persons 50% (upper limit Rs. 10000). For			sanitation.
	resources.	groups of "swarozgaries" (Self Help Groups) 50% of the project			The program is convergent with National Rural Health Mision. The
		cost subject to per capita subsidy of Rs. 10000 or Rs. 1.25 Lakh			District Health Mission guides the activities and through Village health
		whichever is less.			committees promotes household toilets and school sanitation.
		Emphasis on training at the district and block levels by			2. Mahila Mandal Protsahan Yojna:
		strengthening training institutions for implementation of			Objective: To encourage Mahila Mandals towards involvement in
		employment generation and social welfare programmes.			development programmes.
		2. Sampoorna Grameen Rozgar Iojna (SGRI)- 10 create additional			Aims:
		gainful wage employment particularly to the weaker sections of the			a.) To create awareness of various development programmes through
		The priorities area			b) Cenerate awareness among the rural women regarding family planning
		a) Infrastructure for SC/ST habitation			and child care, promotion of small savings, participation in literacy/post
		b) Infrastructural support for SCRV			literacy campaigns, education about social evils like drinking, dowry and
		c) Infrastructure for supporting agricultural activities			crimes against women
		d) Community/Social infrastructure for education health and roads			3 Construction/completion of official residential buildings- Staff
		e) Other physical infrastructure to improve welfare of people			residential buildings and Gram Sewak huts. Funs provided to each
		Main objective:			block
		Creation of durable assets/infrastructure at the village level			4. Grant-in-Aid to Panchavat Samities – for "Executing Minor Irrigation
		creation of productive assets exclusively for SC/ST's for sustained			Schemes" and "Executing DWS/drainage". Proposed to give Rs 1 Lakh
		employment and generation of supplementary employment to the			per Panchavat samiti.
		unemployed poor living below poverty line.			
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	Rural Development		
	Strategy/objectives	Programmes/Schemes:	
VINTI IIV		 Housing: 1. Rajiv Gandhi Awas Yojna- State sponsored scheme for poor houseless. administered on the lines of Indira Awas yojna. Assistance of Rs. 27500 provided to Below Poverty Line families. Criterion for selection of families by Gram Sabhas, as under: a.) First priority to totally houseless families and divorced women. b.) Second priority to families who have lost their houses in fire, flood or other natural calamities. c.) Third priority to families with damaged and unsafe houses. d.) Families living in slums or sheds etc. e.) Families with inadequate living space for family members. Indira Awas Yojna: Centre sponsored Scheme for BPL families. Assistance of Rs. 27500 for construction of new hoses and Rs.10000 for convesion/upgradation of kutcha houses to pucca/semi-pacca houses. The selection of beneficiaries done by Gram Sabha. 	
		Revenue (Land Records)	
	Strategy/objectives	Programmes/Schemes:	
	Strengthen Primary and Supervisory Land Records Agency to enhance the efficiency of agency to maintain land records, collection of agricultural statistics and other development activities.	 Maintain land records, collection of agricultural statistics and other development activities. Maintain records of epidemics such as cholera small pox etc. Maintain records of calamities and pests affecting crops. Issuing various certificates such as old age pension eligibility, low income, caste certificates and distribution of Kisan passbook etc. Prepare cases of grant of land to landless, providing house sites to houseless and other connected duties. 	

Panchavats			
Strategy/objectives	Programmes/Schemes:		
To function as	Office expenses for Gram Panchayat, Panchayat Samiti & Zila Parishad		
institutions of Self	- to meet day to day expenses. Honorarium to elected members of		
Governance	Panchayati Raj Institutions		
Governance	Construction/Repair of Panchayat Samiti Bhawan		
	Grant in Aid for the Municipal function by the gram panchayats- for activities such as pavement of streets, street light, village path, drainage etc.		
	Infrastructure expenditure: Gram Panchayats have to raise resources by way of taxes for infrastructure expenses such as maintenance of Panchayat Ghar Veterinary dispensary, primary schools and health sub-centers.		
	 Honorarium to tailoring teachers/ maintenance of Sewing machines/ purchase of raw material for sewing machines Tailoring centres in each Gram Panchayat. Honorarium of Rs. 700 to tailoring teacher, Rs. 1000 per centre for purchase of raw material such as thread, clothes etc. and maintenance of sewing machines. Grant in Aid to purchase of Library books, periodical, journals etc for purchase of Giri Raj and other govt. publications. Panchayati Raj dept. also supplies books an pamphlets regarding guidelines and programmes. Loan to Panchayats for creation of remunerative assets- Interest free loans provided for creation of assets which can be source of permanent income to panchayats. Honorarium to panchayat Sahayak/Takniki Sahayak/JE/AEs and chowkidars. Panchayat Sahayaks @ Rs. 600 per month honorarium. Construction of PRIs office and Panchayat ghars. 		
	Grant in Aid to 12th Finance commission recommended functions.		
S	Irrigation and Flood control		
<u>Strategy/objectives</u>	<u>Programmes/Schemes:</u>		
Kapid development of irrigation a key development strategy	No Major or Medium Irrigation projects. Greater need for minor irrigation, 48% of cropped area is irrigated in tribal areas (as against 20% of H.P)		
in tribal subplans and a key element in alleviation of poverty in	R.D.D scheme- funds provided for the construction of water harvesting and impounding structures and remodelling/ restructuring of old Kuhl and other minor schemes.		
20 point programmes.	Flood control- Not a major issue. But flash floods do create distruction in Spiti Embankments for protection of dwellings and cropland.		

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	Power
Strategy/objectives	Programmes/Schemes:
X: <i>i</i>	The state govt. policy to develop projects under State, Central and private
	sectors and joint ventures. State govt. encourages Co-operative sector
	by reserving sites in the small and micro-hydel sectors to involve local
	communities and increase employment opportunities to locals.
	1. Rural electrification- under PMGY/ Bharat Nirman Yojna/ Rajeev
	Gandhi Grameen Vidyutikaran Yojna.
	Electrification of left out villages/hamlets (identified and unidentified)
	tribal and Dalit bastis
Hi	muria (IREP- Integrated Rural Energy Program)
Strategy/objectives	Programmes/Schemes:
Two main schemes in	Based on actual field surveys conducted by HIMURIA it has been found
Tribal areas:	that majority of energy is consumed in the domestic sector, hence there
1 Area bound Block level	is considerable scope for Non-Conventional Energy Devices
Planning (Integrated	Demonstration and sale at subsidized rates of Solar cookers. Solar water
Rural Energy Planning	besters SPV lanterns SPV domestic light etc
Programme)	1 Solar Energy programme:
Development of New	1. Solar Thormal Solar water besting and Solar cookers
2. Development of New	a.) Solar Dhotovaltaia – Domostia solar DV lighta solar DV streat lighta and
and Kenewable sources	b.) Solar Photovoltaic – Domestic solar P v lights, solar P v street lights and
of energy (INRSE)	anterns.
including promotion	2. Rural Energy Programmes:
of Small Hydro	a.) Integrated Rural Energy Planning Programme (IREP)- Committed
Programme	to evolve an energy plan in the rural sector to reduce consumption
	of conventional energy. Area specific thrust to Solar energy. Create
	awareness about renewable energy by constituting District Advisory
	Committee.
	b.) Wind energy- Efforts being made to strengthen Wind Database through
	wind monitoring system. Scope for development of Wind Energy for
	power generation and mechanical uses like lifting of ground water.
	c.) Upgradation of Watermills under UNDP (MNES) – Development/
	upgradation of watermills to generate electricity upto 5 KW or for othe
	mechanical uses.
	d.) Energy efficient devices: Popularization of energy efficient devices. BPL
	families provided with Pressure cooker and CFL bulbs at subsidized
	rates.
	e.) Hydrams popularisation- Hydrams (Hydraulic Rams) are impulse
	pumps based on water hammers. By popularising Hydrams hydro
	power can be utilized at micro level. Facilitate installation under
	Swarnajaynti Gram Rozgar Yojna and under Development of Marginal
	and Wasteland through application of appropriate technology.
	3. Small Hydro power Development through private sector participation:
	Incentives to private sector

	Himurja (IREP- Integrated Rural Energy Program)
Strategy/objectives	Programmes/Schemes:
x : <i>i</i>	4.Mini/Micro Hydel projects under UNDP-GEF Hilly Hydro Programme of
	Ministry of Non Conventional Energy sources, GOI.
	Lingti Project (400KW) commissioned and functional. Proposal to upgrade to 600
	KW.
	Portable Micro hydel Generation Sets: 12 sets in Pangi and 2 in Dora Kawar.
	None in Spiti. Operated and maintained by HIMURJA.
	Industry and Minerals
Strategy/objectives	Programmes/Schemes:
Develop small	1. Incentives and Subsidies to SSI units-
sector and	S.T entrepreneur entitled to 90% subsidy on preperation of feasibility report
implement various	(max Rs. 25,000), 100% subsidy for carrying and installation of machinery, 10%
handloom and	special incentive subsidy on fixed assets (maximum Rs.1,00,000 per unit) for
handicrafts schemes/	establishment of Tiny Units.
programmes.	5% interest subsidy on loans (on "specified Category of Activity") subject to a
	cieling of Rs. 50,000 per year for 3 years.
	Entire Tribal Area is designated as a Tax Free Zone.
	GOI incentives package- 100% Excise duty exemption for 10 years, 100% income
	tax exemption for 5 years, capital investment @ 15% of investment in plant and
	machinery subject to a ceiling of Rs. 30 lakhs.
	2. Rural industrial Programme/ Rural Artisan Programme-
	Aims to upgrade the skills of rural artisans by providing them training of improved
	techniques, tools and local trades.
	Trainee is paid a stipend of Rs. 100 and the master-craftsman is paid Rs.50 per
	Trainees are provided toolkits on 100% subsidy with a ceiling of Rs 500
	3 Deen-Daval Hathkargha Protsahan Voina - Centrally sponsored scheme
	Aime
	a) Ungrade skill and knowledge of weavers along with basic inputs for
	product development and diversification to have easy access to indigenous and
	international markets
	b) To strengthen the Handloom Organisation to provide necessary support to
	weavers
	c) To ensure availability of infrastructure and facilities for development of better
	products
	d) To provide assistance for publicity for marketing of handloom goods
	e) To provide suitable incentives to attract buyers towards handloom goods
	Financial assistance in the form of margin money to avail credits to implementing
	agencies @ Rs. (000 per weaver Contro and State share Ds. 2000 and 1000
	agencies (Ks. 4000 per weaver Centre and State snare Ks. 2000 and 1000,
	weaver to pay KS 1000. Margin money to be deposited in the bank account of the
	implementing agency to be used as deed money to enhance their credit limit.

E.

Industry and Minerals			Science Technology and Environment				
ŀ	Strategy/objectives	Programmes/Schemes:	Strategy/objectives	Programmes/Schemes:			
Ē		Financial assistance for basic inputs like looms and accessories with a maximum of		Passive Solar retrofitting of Primary school building at Kee will be undertaken			
		50% of cost restricted to ceiling of Rs. 2000 for loom, 1500 for dobby, 2000 for		along with survey of traditional houses and training for rural artisans.			
		jacquard and Rs. 1000 for other accessories.		b.) Low cost Green House technology for cold climates: Lean to wall			
		Work-shed cum Housing scheme- Assistance of Rs. 12000. Centre and state		Greenhouse technology will be installed for demonstration.			
5		sponsored.		Proposed:			
		Grant for Thanka painting at Tabo by centrally sponsored scheme.		1. Scientific awareness through visit of tribal students to the institutions of			
H		Industrial Promotion and Training:		scientific excellence Study tour of tribal students to scientific institutions at			
		An employment generation programme. Aims at promotion of industrial		Dehradun, Roorkee, Shimla, Palampur, Chandigarh and other parts of the			
		activities in the form of guidance, policy formulation, improvement of		country depending on the resources.			
		productivity, dissemination of informaion, consultancy and training to prospective		2. Natural disaster mitigation- Mapping of hazard prone areas and zoning of			
		entrepreneurs through:		risk levels. Workshops on the use of Geotextile in slope stabilization for road			
		a.) Entrepreneur Development Programmes (EDP)		management, earthquake preparedness with the help of University of Roorkee,			
		b.) Industrial Awereness programmes (IAP)		Wadia Institute of Himalayan Geology, Dehradun and coordination with various			
		c.) Industrial Awareness Workshops.		scientific institutions in the field of disaster management.			
		2-25 trainees trained under a single programme.		3. Popularization of roof top rain water harvesting structures.			
		Development of industrial Estate/Area: Basic amenities, sneds plots made		Lechnical guidance of Structural Engineering Research Centre Chariabad			
		available at nominal fent/price and fease. (status in Spiti not known, peniaps not		Introduction/demonstration of cheap and simple feed cement technology for			
		Large and Medium Industries Schemes:		storage of water and foodgrains			
		a) Arts and exhibition- held at state national levels to popularize products		Identification of sites for construction of rooftop rain water harvesting structure.			
F		Transport		Organise training and workshops in ferro cement technology.			
F	Strategy/objectives	Programmes/Schemes:		4. Sea-buckthorn ecological regeneration-			
-	<u>otrategyrobjectives</u>	Construction of cableways for goods transport under transport department		Under the first phase field surveys conducted for status, distribution and use			
		Spiti specific information not available		of Sea-buckthorn in tribal areas. Fruits collected and processed at Post-harvest			
ŀ		Science Technology and Environment		Technology Dept of Solan univ.			
ŀ	Strategy/objectives	Programmes/Schemes		Action plan by State Council of Science and Technology prepared to coordinate			
ŀ	Science	1 Science & Technology:		Sea-buck thorn programme through various govt. and non govt. agencies. Under			
	popularization and	Science popularization programme:		the action plan awareness campaign and resource material has been developed.			
	promotion.	a.) To include activities for improving economic condition, sanitation, hygiene in		The Sea-buckthorn Task force will collect fruits for processing. Plantations to			
	I	programmes for schools and farmers.		be undertaken through cuttings and seed by Forest dept, Desert Development			
		b.) Organize Children Science Congress at Sub-division, District, state and		Program and people. Nursery propogation to be standardized by university			
		National level.		research stations. Efforts to be made to sensitize the processing industry in the			
		c.) Children Science clubs in Govt. Secondary Schools with grant of Rs. 1000		country.			
		per club. Clubs will also promote science programmes in Middle and Primary					
		schools.	Strategy/objectives	Programmes/Schemes:			
		Infrastructure and scientists of HPKVV, Palampur and Dr. Y.S. Parmar Univ.,		Construction of Tourist complexes, Yatri Niwas and wayside facilities. Printing			
		Solan to be involved in promotion of science in tribal areas.		of brochures on tribal areas, training to people, sophisticated equipment for			
		2. Appropriate technology Dissemination programme:		Dreparation of films on specific themes like Buddhist monosteries and publicity			
		a.) Programme tor passive heating of building/houses- Provided Passive Solar		campaign			
		design for Tabo monastery Sarai, school buildings at Kee an attached Solar		Campaign			
		space heating in Hansa.					

APPENDIX

Civil Supply						
	Strategy/objectives	Programmes/Schemes:				
	Watch on price-line, to enforce price	Civil supplies godown functional at Tabo.				
X	control regulation and regulate public	Gas distribution point at Kaza.				
Π	distributions.	Regulate rates and quantities of subsidized items per				
	Strategy:	month.				
F	1. Augmentation of administrative	Wheat @ Rs. 2.80 per Kg- 6 Kg for adult, 3 Kg for child.				
H	machinery for effective enforcement	Rice @ Rs. 4.50 per Kg- 1 kg for adult, ½ kg for child.				
H	of essential commodities act and other	Salt @ Rs. 0.25 per Kg, 1 Kg per family.				
C	central acts					
2	2. Creation of infrastructure for supplying					
	essential commodities especially in remote					
ſ	areas.					
	3. Strengthening of Public distribution					
	System					
	4. Supply of wheat, Rice and Salt to					
	families at subsidized rates under IRD					
	programme.					
	We	eight and Measures				
	Strategy/objectives	Programmes/Schemes:				
	To maintain accuracy and standards in	Enforces following consumer protection laws:				
	all weights and measures, weighing and	1. State law – The standards of Weights and Measure				
	measuring instruments by verifying them	(Enforcement) Act, 1985/ Rules 2004.				
	with working standards.	2. Central Law- The standards of Weights and Measure				
		Act, 19/6 and packaged commodities Riles, 19//.				
	Education a) Elementary					
	<u>Strategy/objectives</u>	Programmes/Schemes:				
		Incentives to bring all eligible children to school and				
		Primary classes (LV)				
		IRDP scholarship @ Rs. 150 per student per year "Labul				
		Spiti pattern scholarship" @ Rs. 8 per month and Rs 30				
		per annum.				
		Free textbooks, writing material and uniform for girl				
		students.				
		Middle classes (VI-VIII):				
		Scholarship @ Rs. 50 per month with an initial grant of				
		Rs. 200 per annum to S.T girls whose family income is				
		less than Rs.11000 per annum.				
		Target scholarships (IRDP)- Boys Rs. 250 and girls Rs.				
		500 per anum.				

Education a) Elementary				
Strategy/objectives	Programmes/Schemes:			
	"Lahul Spiti pattern scholarship" @ Rs. 4 to day scholars and			
	Rs. 15 to hostellers per month.			
	Merit scholarships @ Rs. 400 –boys and Rs. 800-girls per			
	anum.			
	Free textbooks, Free hostels (free boarding and lodging) and			
	Rs. 100 per anum for writing material.			
	Education is free to all upto VIII. Girl's education free upto			
	University including professional courses.			
	Directorate of Elementary education implemented schemes:			
	1. Opening of primary/middle schools.			
	2. Employment generation for unemployed educated youth			
	and provision of part-time water carriers in primary schools.			
	3. Strengthening of administration/supervision			
	4. Appointment of regular and para teachers			
	5. Infrastructure facilities.			
	6. Teacher training			
	7.Cold weather charges			
	8. Free textbooks, writing material and clothing to girl			
	students.			
	9. IRDP scholarship from I to VIII.			
	10. Provision of Tat-patti, wooden patras			
	11. Toilets for girls and water facilities for chilren.			
	12. Hot mid-day meals.			
	Sarb-Shikska Abhiyan-			
	Universalization of elementary education			
	100% enrolment of school going age children			
	100% retention, zero dropouts			
	To provide quality education, improve infrastructure and			
	innovative schemes.			
	Education b) Secondary			
Strategy/objectives	Programmes/Schemes:			
	Secondary Education (IX-X)- Schemes:			
	1. Infrastructure improvement			
	2. Incentives – to attract and retain students			
	3. Cold weather charges.			
	4. Free Hostels – Operational at Tabo			
	5. Scholarships.			
	a.) Scholarship @ Rs. 50 per month with an initial grant of			
	Rs. 200 per annum to S.T girls whose family income is less			
	than Rs.11000 per annum.			

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Education a) Elementary					
	Strategy/objectives	Programmes/Schemes:			
		b.) Target (IRDP) scholarships to boys and girls from 9th till			
		college.			
		c.) Post Matric Scholarship for various courses provided by			
		centre ranging from Rs. 140 to Rs. 740 per month			
7		d.) "Lahul Spiti pattern scholarship" ranging from Rs. 4 to Rs.			
H		25 per month.			
Ч		e.) Merit scholarships ranging from Rs. 1000 to Rs.2500 (per			
1		anum?)			
Ì		f.) Thakur Singh Negi meritorius scholarship @ Rs. 11000(??)			
4		per month to boys and girls securing merit in matric exam.			
•		University and Higher education:- includes diploma in Bhoti			
		language.			
		Yashwant Gurukul Awas Yojna- To provide accommodation to			
		teachers of higher and secondary schools.			
		Technical Education			
	Strategy/objectives	Programmes/Schemes:			
		Technical education: -			
		Industrial Training Institute (111) for vocational training			
		functional at Kangrik near Kaza.			
		Rural Development Department run training centers to train			
	women in tailoring and cutting				
	Strategy/objectives	Drogrammes/Schemes:			
) Procernation documentation and	1 Davelonment of Hindi			
	a.) Freservation, documentation and	1. Development of Timur			
	b) Contemporary creativity	2 Promotion of art and culture			
	b.) Contemporary creativity.	a) Grant in aid to Himachal academy of Art language and			
		culture for activities in tribal areas.			
		b.) Celebration of Fairs/Festivals – Ladarcha of Spiti is a state-			
		level festival. Rs. 5000 per festival.			
		c.) Grant in aid to voluntary organisations and exchange of			
		cultural troups.			
		Others:			
		Archeology, Archives and Museum (museum construction in			
		Spiti)			
		Youth Services and sports			
	Strategy/objectives	Programmes/Schemes:			
		General schemes of Youth Services and Sports:			
		1. Organisation of training camps an coaching for players			
		selected in national sports competitions.			

Youth Services and sports				
Strategy/objectives Programmes/Schemes:				
	2. Stipend/scholarships to talented your undergoing training			
	in NSC Patiala.			
	3. Mobile coaching camps for children			
	4. Opening/maintenance of rural sports centres.			
	5. Grant in aid to state youth board to organize district, inter			
	district and state level youth festivals (non-student youth)			
	6. Inter state tours of non-student youth.			
	7. Organize work camps for non-student youth to undertake			
	community development work, organize training camp for			
	training in latest agriculture/horticulture technology.			
	National Service Scheme (N.S.S)			
	Main thrust during 2006-7 was regarding importance of			
	environmental conservation. Blood donation camps and			
	participation in various health program (e.g Pulse Polio).			
Mou	intaineering and allied sports			
Strategy/objectives	Programmes/Schemes:			
	Department trains in mountaineering, camp craft, mountain			
	rescue, skiing and high altitude trekking (Spiti)			
Health	and Family Welfare a) Allopathy			
<u>Strategy/objectives</u>	Programmes/Schemes:			
	1. T.B control- State and Centre under UNFPA.			
	2. National Leprosy control Programme.			
	3. Health guides- Honorarium of Rs. 50 per month by GOI.			
	4. National family welfare- Couples are motivated to adopt			
	family planning.			
	5. National rural health mission. – Himachal is one of the			
	18 states chosen for implementation of NRHM. Focus on			
	decentralized implementation and seeks active community			
	participation.			
	Centre sponsored Milk Feeding Centres.			
Health	and Family Welfare b) Ayurveda			
<u>Strategy/objectives</u>	Programmes/Schemes:			
	Department of Indian System of Medicine and Homeopathy			
	nodal agency for rejuvenation and conservation of herbal			
	resources.			
	Aims:			
	1. Promotion of Indian system of medicine by providing			
	better and improved medical facilities.			
	2. To improve the standard of the medical and paramedical by			
	providing inservice training.			

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Health and Family Welfare b) Ayurveda						
	Strategy/objectives	Programmes/Schemes:				
		3. To improve the working condition of govt. owned Ayurvedic				
		pharamacies by better management and latest technology.				
		4. To improve facilities for better running of Panchkarma Units				
		and Nature cure centers.				
		5. To remove stagnancy among the medical/para-medical staff of				
-		the department.				
Ц		State govt. has opened new Amchi clinic and Ayurvedic health				
		centres.				
		Proposed to open one hospital at Kaza.				
		Bhot Chikitsa Padhati- Training to local traditional practitioners				
7		to make them aware about National Health programmes. Rs. 4				
		lakhs as Special central assistance for Bhot Chikitsa.				
		Establishment of herbal garden:- Establishment of herbal				
		gardens, develop and transfer agro-technology to farmers for				
		cultivation at commercial scale. Extensive publicity and training.				
	Wate	er supply, Housing and Sanitation				
	Strategy/objectives	Programmes/Schemes:				
		All villages have been provided safe drinking water.				
		Sewerage and Sanitation:				
		a.) Work on sewerage in Kaza.				
		b.) Rural sanitation: Top Priority. Financial assistance of Rs. 2000				
		for construction of sanitary latrines.				
		Housing:				
		Housing for govt. employees.				
		Low and Middle income group.				
		Replacement of wooden sheets by G.I sheets (subsidy)				
		Subsidy for development of house sites.				
	Town and country planning					
	Strategy/objectives	Programmes/Schemes:				
	To regulate haphazard and	1.Develop and implement plan				
	unplanned growth	2. Acquire and develop land				
		3.Construction to provide basic amenities such as water,				
		sewerage, electricity, drainage and road network etc.				
		4. Provide municipal services such as street light, disposal of				
		garbage etc.				
		Plan has to be developed for Kaza.				
		The ITDP headquarters (Kaza) comes under Special Area				
		Development Authority. SADA implements schemes such that				
		rural character of these places are retained.				

Janes-					
Information and publicity					
Strategy/objectives	Programmes/Schemes:				
	1. To disseminate and ensure flow of information to public on				
	policies, programmes and development activities, at the same				
	time assess reaction of people take feedback and apprise the govt.				
	2. To identify source and targets of relevant information.				
	3. To initiate required and positive steps to earn goodwill for				
	Govt.				
	4. Take action to safeguard image of Govt.				
	5. Relationship building.				
	6.Explain the concept of democratic government and its				
	functions.				
	Plans:				
	1. Ensure wide publicity of Govt. policies and plans				
	2. Installation of DTH antenna for better reception of				
	Doordarshan.				
	3. Create awareness regarding prohibition and social evils.				
	Proposal to develop video cassettes about life culture and impact				
	of development in tribal areas for display trough Video Display				
	units and national telecast.				
Welfare					
Strategy/objectives	Programmes/Schemes:				
Social and economic uplift of SC/	1. Follow-up programme (Economic betterment of ST's)- For				
ST's	trainees and artisan's- assistance for tools @ Rs. 800 per head,				
	loans on easy terms from SC/ST Development Corporation.				
	2. Housing subsidy- for construction and repair Rs. 25,000 for				
	construction of house conditional on the beneficiary contributes				
	25% of the cost in cash, labour or kind.				
	Rs. 12,500 per household for repair. Assistance for procurement				
	of land.				
HP:	SC/ST Development Corporation				
Strategy/objectives	Programmes/Schemes:				
Nodal agency for financing	1. Swarozgar Yojna (see in Rural development)				
various loan schemes for economic	2.Himswablamban Yojna- Loans for higher cost schemes (cost				
betterment.	exceeds Rs. 50,000), in collaboration with National Scheduled				
	Tribes Finance and Development Corporation (NSFDC) for				
	purchase of transport vehicles, agricultural implements, dairy				
	farming, hotel-Dhaba, Guest houses, cottage and small scale				
	industries.				
	3. Interest free study loan: For post matric study in technical/				
	protessional course (tamily income below 1 lakh per anum).				
	Maximul limit Rs 2.5 lakh for the entire course, Rs. 75000 is				
	interest free amount exceeding at 4% simple interest.				

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	HP SC/ST Development Corporation					
	Strategy/objectives	Programmes/Schemes:				
,		4. Hast-Shilp Vikas Yojna- Working capital assistance to artisans. Upto				
		Rs. 5000 per artisans, (required to form groups/association or society),				
		for 2 years and interest free.				
		5. Laghu-Vikray Kendra YojnaLoans to municipal committees/				
~		Notified area committee, Block Samities and Gram Panchayats for				
1		construction of shop/sheds at 4% interest. Rentals from SC/ST's not				
		to be higher than 60% of market rate. Loan amount upto Rs. 50- 60 000				
		6. Award for inter-caste marriage : to remove the practice of				
		untouchability, cash award of Rs. 25,000.				
ł		7 Improvement of Harijan Basties: Provide basic amenities				
		8. Proficiency in Typing and Shorthand: SC/ST candidates registered				
		with the employment exchange are engaged as steno/typists at various				
		offices to maintain their proficiency (for a period of one year).				
		monthly stipend of Rs. 500				
		9. Publicity campaigns: Camps, pamphlets, posters about programmes				
		10. Bal-Balika ashram at Killar- Orphanage for orphans and destitute				
		children. Grant in aid to voluntary organizations.				
	Labour and Labour Welfare					
	Strategy/objectives	Programmes/Schemes:				
		1. Implementation of labour laws.				
		2. Extension coverage of employment services in tribal areas.				
		3. Employment services in tribal areas: Employment assistance and				
		vocational guiding. Sub-office employment exchange at Kaza				
	Social Welfare and Nutrition					
	Strategy/objectives	Programmes/Schemes:				
		1. Scholarships to handicapped students- upto Rs. 125 per month.				
		2. Marriage grant to handicapped: Award of Rs. 5000 to spouse of				
		handicapped.				
		5. Child wehate – Grant III Aid to voluntary oraganizations running				
		4 Aid for purchase of artificial limbs 50% to 100% aid				
		Women welfare- Marriage of destitute girls and women: grant upto Rs				
		2500.				
		5. Welfare of Leprosy patients: monthly aid of Rs. 170.				
		6. Old age/widow pension: Aid of Rs. 200 per month.				
		7. Anugrah yojna: Ex-Gratia payment to IRD family in case of death				
		of earning member.				
		8. Special nutrition Programme: Supplementary containing prescribed				
		calories and proteins provided to children below 6 yrs and to nursing				
		and expectant mothers of poor families.				

Building Construction Program (Public works)					
Strategy/objectives	Programmes/Schemes:				
	Mainly construction of offices				
7	ribal Development Machinery				
Strategy/objectives	Programmes/Schemes:				
Mainly to deal with secretarial and	1. Nucleus Budget for tribal Areas: Rs. 10 Lakh/ITDP, funds for				
ministerial work	local development work with no recurring liablity and for which				
	other funds are not available.				
	2. Vidhayak Kshetra Vikas Nidhi Yojna: MLA's recommend small				
	works of capital nature such as construction of schoolrooms,				
	Ayurvedic dispensaries, Vet. dispensary, handpumps etc.				
Bord	ler Area Development Programme				
Strategy/objectives	Programmes/Schemes:				
For areas sharing international					
boundary.					
Objective: To meet special needs					
of people of remote areas. Funds					
not to replace normal state plan					
flow. Rs. 743 lakhs for four tribal					
blocks					

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APPENDIX 2.6: RANGE WISE DISTRIBUTION OF BLOCK AND BEATS IN SPITI. ALSO GIVEN ARE THE NAMES OF PROMINENT STREAMS IN EACH BEAT ALONG WITH THE VILLAGES THAT DE-PEND ON THE BEAT AREA. This is data obtained from a meeting with all Forest Staff of Spiti in the presence of the CCF (PAs & Biodiversity) and the DFO, Spiti during November 2009.

Range	Block	Beat	Nallas	Villages	
1. Tabo	Sichling	Sichling	Chubuk	Sichling, Dankhar, Siluk	
			Lungmuche		
			Nipte (Lundupdin)		
		Lallung	Tutti	Rama, Lallung	
		(buffer)	Lingti		
		Mane	Barang tokpo	Mane gogma, Mane yogma, Kal	
			Lumtse		
	Tabo	Pooh	Pooh	Pooh, Kurith, Nadang, Pomrang	
			Pomorang nala		
			Rasati nala		
		Tabo	Tabo	Tabo	
			Chunpa phu		
		Lari	Lari	Lari	
				Mamtang	
			Khasa	_	
			Tipta		
		Gyu	Gyu	Gyu, Hurling	
			Chumik?		
2. Kibber	Kibber	Kibber	Rong	Kibber, Gete, Tashigang,	
WLS			Thumle	Chichim	
		Langza Kibri	Shilla	Langza, Hikkim, Komik Kibri, Lingti, Lallung	
			Khunge		
			Zingchung		
			Sina zangpo		
			Tseru tokpo		
			Sibuk		
3. Kaza	Kaza	Shego	Ule	Lara, Lidang, Demul, Shego	

Range	Block	Beat	Nallas	Villages
Kaza	Kaza	Kaza	Shilla (also in Langza beat)	Langza, Hikkim, Komik, Kaza
			Kakti	
		Куе		Kibber, Kye, Tashigang, Gete, Chichim
		Rangrik	Ratang	Quiling, Quang, Rangrik
			Takna	
			Saan lungba	
			Hung	
			Tariyak	
		Sumling	No nala	Khurik, Sumling, morang
	Hanza	Pangmo	Gyundi	Hal, Pangmo
			Unknown	
			Unknown	
			Neun lungba	
		Hansa	Thudna	Hansa, Kyoto
			Takli	
			Hansa	
			Thangmar	
		Lossar	Khibzang	Chichong, Kholaksa, Kyamo,
			Kabji	Mundaksa, Lossar
			Chud	
			Takcha	
4. Pin	Pin	Mudh	Darbang	
Valley			Larbangla	
NP			Pin Parvati	
			Chaurak – Bhawatop	
		Khamingar	Kocho	Thango, Gechang, Bhursetiktik,
			Rilong	Shaktang (dogri)
			Debsa	
			Choyam	
		Ka	Kidul chu	

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	Range	Block	Beat	Nallas	Villages
	5. Pin	Pin	Sagnam	Thanak chau	Sagnam, Khar, Todnam, Telling,
	Valley	(Guling)		Kolmo shud	Mudh, Mudh pharka, Ensa
	(Tabo)			Ensa	(dogri), Phika (dogri), Haroo
Q				Unknown	(dogri), Snan (dogri), Rachakao (dogri)
Z			Guling	Kirtokpo	Guling, Chidang, Selling, Chud,
H				Guling	Bhar, Kungri, Tangti yogma &
					Teha, Minsar (dogri)
V					

METHODS. THE TOTAL THREAT RANKINGS FOR ALL THE CORE LANDSCAPE UNITS IS USING AN ABSOLUTE SCALE FROM 0 TO 3. SEE SECTION 5.4.2 FOR DETAILS ON THE APPENDIX 5.1: THREAT RANKING DONE FOR THE 15 CORE LANDSCAPE UNITS **GIVEN IN TABLE 5.4**

Threats	Area	Urgency	Intensity	Total
Pillung or Gaddi area reserve				
1.0. Livestock Grazing				
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	2	2	2	6
1.2. Excessive grazing by migratory herders (Competition, degradation and disease				
transmission)	Э	3	3	6
2.0. People-Wildlife Conflicts				
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative				
perceptions and retaliatory killing)	3	3	3	6
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory				
persecution)	0	0	0	0
3.0. Developmental Activities				
3.1. Development – Roads & channels	1	1	1	3
3.2. Development – Outside labour	Э	2	1	9
3.3. Development - Poaching	1	1	1	3
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	1	1	1	3
4.0. Other Human Disturbances				
4.1. Plant Biomass extraction	1	1	1	3
4.2. Uncontrolled tourism	0	0	0	0
5.0. Habitat Degradation				
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	2	2	2	6
6.0. Climate change				
7.0. Lack of awareness				

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	N	PEN	VIDIX		-
Threats	Area	Urgency	Intensity	Total	
10 Timetrals Conting					1
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	6	
1.2. Excessive grazing by migratory herders (Competition, degradation and disease transmission)	, ,) 	"	6	
2.0. People-Wildlife Conflicts	,	,)		
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative perceptions and retaliatory killing)					
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory persecution)	0		0	0	
3.0. Developmental Activities					
3.1. Development – Roads & channels		0	0	1	
3.2. Development – Outside labour	-			33	
3.3. Development - Poaching	0	0	0	0	
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0	0	
4.0. Otner Human Disturbances					
4.2. Uncontrolled rourism					
5.0. Habitat Degradation					_
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)		1	1	0	_
6.0. Climate change					
7.0. Lack of awareness					
Hansa		-	-	-	
1.0. Livestock Grazing					
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	-	1	1	ĉ	
1.2. Excessive grazing by migratory herders (Competition, degradation and disease rransmission)	<i>c</i>	0	6	9	
The second secon	A	I Laconation	Intensiter		
2.0. Deconde_Wyildlife Conflicts	JICa	UIBCIIC	THICHISTIC	ТОГАТ	
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative bercentions and retaliatory killing)	-	-	-	"	
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory	1	•	4	2	
persecution)	0	0	0	0	
3.0. Developmental Activities					
3.1. Development – Roads & channels	\mathcal{C}	3	1	7	
3.2. Development – Outside labour	ŝ	33	ŝ	6	
3.3. Development - Poaching	(-		ε, i	
5.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0	0	
4.1 Plant Riomass extraction	-	-	-	6	
4.2 Throutrolled tourism					
5.0. Habitat Degradation					
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	2	3	2	7	
6.0. Climate change					
7.0. Lack of awareness					
Takli 1.0. Livestock Grazing					
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	1	1	1	3	
1.2. Excessive grazing by migratory herders (Competition, degradation and disease transmission)	ŝ	ς.		6	
2.0. People-Wildlife Conflicts	,	,	,		
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative	-	-	-	, C	
perceptions and retailatory kuiling) 2.2. Cron Damage (monetary losses to neonle negative nercentions and retaliatory	-	T	1	0	
2.2. Upp Damage (municial) 100000 to propity ingainer privepitoria and remainery persecution)	0	0	0	0	

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	AI	PEN	XIUX		
Threats	Area	Urgency	Intensity	Total	Contraction of the second
3.0. Developmental Activities					100
3.1. Development – Roads & channels	1	0	0	1	
3.2. Development – Outside labour	0	0	0	0	
3.3. Development - Poaching	0	0	0	0	
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0	0	
4.0. Other Human Disturbances					
4.1. Plant Biomass extraction	0	0	0	0	
4.2. Uncontrolled tourism	0	0	0	0	
5.0. Habitat Degradation					
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	5	3	2	~	
6.0. Climate change					1
7.0. Lack of awareness					
Pangmo	-	_	_	_	
1.0. Livestock Grazing					
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	7	-	1	4	
1.2. Excessive grazing by migratory herders (Competition, degradation and disease					
transmission)	0	0	0	0	
2.0. People-Wildlife Conflicts					
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative					-
perceptions and retaliatory killing)		0	0		
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory	-	ſ	C	0	
persecution)	-	7		c	
3.0. Developmental Activities	,			,	
3.1. Development – Roads & channels		0	0		
3.2. Development – Outside labour	0	0	0	0	
3.3. Development - Poaching	0	0	0	0	
	_		_		_
Threats	Area	Urgency	Intensity	Total	
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0	0	
4.0. Other Human Disturbances					
4.1. Plant Biomass extraction	0	0	0	0	
4.2. Uncontrolled tourism	0	0	0	0	
5.0. Habitat Degradation					
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)		0	0	1	
6.0. Climate change					
7.0. Lack of awareness					
Guindi nala		-			
1.0. Livestock Grazing					
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	-	1	-1	Э	
1.2. Excessive grazing by migratory herders (Competition, degradation and disease	,	,	, ,		
1 (14(15)(1)) 2 (1 People-Wildlife Conflicts	0	n	0	r	
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative perceptions and retaliatory killing)	1	0	0	1	
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory	Ċ	c	c	C	
persecution)	0	D		D	
3.1 Dandanmart Dorde & channels	-	C	-	-	
3.1. Development – Roads & channels		> -	> -	1	
3.2. Development – Outside labour	-	-	_ ,	c	
3.3. Development - Poaching	-		-	ω	

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3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs

4.0. Other Human Disturbances4.1. Plant Biomass extraction4.2. Uncontrolled tourism

	A	PEN	VIDIX		
Threats	Area	Urgency	Intensity	Total	3
5.0. Habitat Degradation 5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)				5	
6.0. Climate change					
7.0. Lack of awareness					
10 Livestock Grazino					
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)		1	1		-1
1.2. Excessive grazing by migratory herders (Competition, degradation and disease					
2.0. People-Wildlife Conflicts					ſ
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative nercentions and retaliatory killing)	-		C		1
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory					1
persecution)	0	0	0	0	
3.0. Developmental Activities					
3.1. Development – Roads & channels	7	<u> </u>		<u>v</u>	
3.2. Development – Outside labour	- 17			~ ~	
2.5. Development - Foacming 3.4. I ivestock denredation and wildlife discurbance/denredation hv feral dows					T
4.0. Orher Human Disturbances					
4.1. Plant Biomass extraction	-		0	1	
4.2. Uncontrolled tourism	0	0	0	0	
5.0. Habitat Degradation					
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	2	<i>c</i>	0	5	rT
7.0. Lack of awareness			_		
Threats	Area	Urgency	Intensity	Total	
Nakshung-Shego		`			
1.0. Livestock Grazing					
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	2	2	1	5	
1.2. Excessive grazing by migratory herders (Competition, degradation and disease transmission)	0	0	0	0	
2.0. People-Wildlife Conflicts					
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative perceptions and retaliatory killing)	1	0	0	1	
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory	C	0	C	C	
3.0. Developmental Activities					
3.1. Development – Roads & channels	2	1	0	3	
3.2. Development – Outside labour	2	1	0	Э	
3.3. Development - Poaching		0	0	1	
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0	0	
4.0. Other Human Disturbances	-				
4.1. Flant Diomass extraction 4.2 Uncontrolled fourtism					
5.0. Habitat Degradation					
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	-	0	0	1	
6.0. Climate change 7 0. Lack of awareness					
Demul					
1.0. Livestock Grazing					
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	5	3	2	~	
1.2. Excessive grazing by migratory herders (Competition, degradation and disease transmission)	0	0	0	0	

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	H	I'LLI'	VIN		_
Threats	Area	Urgency	Intensity	Total	-
 2.0. People-Wildlife Conflicts 2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative perceptions and retaliatory killing) 					6
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory persecution)	, -				~ -
3.0. Developmental Activities					
3.1. Development – Roads & channels	0	0	0		0
3.2. Development – Outside labour	0	0,			0
3.3. Development - Poaching	0			_	-
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0		0
4.1 Plant Riomass extraction	C				
4.2. Uncontrolled tourism					$\circ \circ$
5.0. Habitat Degradation					
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	-	0			
6.0. Climate change					
7.0. Lack of awareness					
1 0 1 :					
1.0. LIVESTOCK Grazing	-	-	-		1
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	-	-			\mathcal{O}
transmission)	2	3	0		Ś
2.0. People-Wildlife Conflicts					
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative	-	-	-		ç
	-				1
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory persecution)	0	0	0		0
Threats	Area	Urgency	Intensity	Total	
3.0. Developmental Activities					
3.1. Development – Roads & channels	-	ŝ	33		
3.2. Development – Outside labour	-	33	3		
3.3. Development - Poaching	0	1	0		
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0		0
4.0. Otner Fluman Disturbances	-	C	0		-
4.2 Uncontrolled routism	- 0				
5.0. Habitat Degradation	>				
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	-	3	0	4	4
6.0. Climate change					
7.0. Lack of awareness					
Langza					Γ
1.0. Livestock Grazing		,			
1.1. Excessive grazing by local herders (Competition, degradation and disease transmission)	ω	<i>w</i>	3		6
1.2. Excessive grazing by migratory nerders (Competition, degradation and disease transmission)	0	1	0	1	-
2.0. People-Wildlife Conflicts					
2.1. Livestock Depredation by wild carnivores (monetary losses to people, negative perceptions and retaliatory killing)	ŝ	ω	3	5	6
2.2. Crop Damage (monetary losses to people, negative perceptions and retaliatory persecution)	-	C	0		
3.0. Developmental Activities					
3.1. Development – Roads & channels	-	0	0		-
3.2. Development – Outside labour	-	1	1	<i>a</i> 3	6
3.3. Development - Poaching	0	1	0		

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	H	TEL	NIA	
Threats	Area	Urgency	Intensity	Total
3.4. Livestock depredation and wildlife disturbance/depredation by feral dogs	0	0	0	0
4.0. Other Human Disturbances				
4.1. Plant Biomass extraction	-	0	0	1
4.2. Uncontrolled tourism	ŝ	2	1	9
5.0. Habitat Degradation				
5.1. Habitat degradation & loss of habitat (linked with most threats mentioned above)	2	1	2	5
6.0. Climate change				
7.0. Lack of awareness				

APPENDIX 5.2: DETAILS OF EACH PROPOSED SITE:

(Topographic and broad vegetation attributes of the areas are given in Table

5.2 & 5.3)

1. SHUATA NALA (13.1 SQ.KM):

Village: Lossar

Importance:

- 1.1. Important ibex and snow leopard area. Sighted over 15 ibex in this area during the field survey. Based on the habitat and key informant interviews we expect this region to support at least 50 ibex. This area was being grazed by gaddi grazers until two years ago so with gaddi grazing stopped, this area is likely to support better wild ungulate populations.
- 1.2. It is also an important mountaineering area. If tourism in encouraged in this area under the banner of wildlife this reserve can generate money for the village of Lossar, which can then be used for conservation and village welfare.

Threats:

- 1. Livestock grazing: There is small amount of grazing along the edges of the proposed area. Some of these surrounding pastures are overstocked (Livestock biomass >3,000 kq/ sq km).
- 2. Livestock depredation: The neighboring village of Lossar has intense problems due to livestock depredation by wild carnivore such as snow leopards and wolves and this problem should be addressed along with the creation of the core area. Villagers are now paying outsiders to herd their horses and yaks which were free ranging earlier. This has reduced livestock damage by carnivores.
- 3. Gaddi grazing: The proposed area was being used by gaddi grazers until two years ago and there is possibility that this area is again rented out to the gaddi if they are not gaining any incentives from conservation in this area.

Approach:

NCF is already engaging with this village. There is an agreement to lease the area for a modest sum of Rs 5,000 annually (since 2009) and support the wages of one reserve guard (selected & appointed by community). The villagers are thus not using the reserve nor are leasing it out to the gaddi herders.

2. PILLUNG OR GADDI AREA RESERVE (27.5 SQ.KM):

Village: Lossar and Kyomo

Importance:

- 1. Last remaining population of Himalayan marmots in Upper Spiti (south of the Parang-la)
- 2. Potentially good area for ibex, snow leopard and especially the Himalayan wolf. Currently the status of wildlife (except marmots) is very poor in this region (expected to be due to high grazing pressure by Gaddi sheep). But with right measures this is a very promising area.
- . Good connectivity with the Chandertal Wildlife Sanctuary towards west and Ladakh to the north.

Threats:

APPEND

- 1. High grazing pressure due to Gaddi grazing which is likely to increase as fewer areas are now given out for Gaddi grazing in the rest of Spiti.
- 2. About 130 sq. km of area east of Lossar village is being grazed by gaddi grazers during summer. All these pastures have high stocking density (livestock biomass > 3,000 kg/sq. km). The wildlife value of all these areas is very poor (field observation and key informant surveys). It is thus important to free some of these areas of grazing pressure to bring back the wild ungulates.
- 3. Wildlife has already declined considerably. The survey team did not see any ibex or their sign walking for *c*. 20 km in supposed good ibex habitat. There is an expectation of heavy conflict between gaddis and wolf in this region as many wolf signs were encountered. Villagers from Lossar also lose significant amount of their livestock to wild carnivores in this area, which may be due to low wild prey availability.
- 4. Although parts of three valleys (Pilung nala, Kabji nala and the Spiti coming from Kunzum) have been marked, the particular reserve area needs to be identified.

Approach:

- 1. This area is leased out to *c*. 8 groups of gaddi herders every year on an annual contract for a total sum of *c*. Rs. 42,000. Proper dialog with the villagers of Lossar and Kyomo can convince them that a wildlife area is a better use of the land than gaddi grazing (people here agree that gaddi's damage the pasture and bring in new livestock diseases). Part of this area can be converted as conservation area through incentive scheme to the village of Lossar and Kyomo.
- 2. Also these villages lose considerable livestock to wild carnivores in that area (proposed reserve area). People also accept that the decline in wild ungulate population could be responsible for it.
- 3. Together the above two arguments can convince the villagers of Lossar and Kyomo to lease out this area for wildlife conservation, especially in the context of incentives.

3. HANSA OR THUNA NALA (20.7 SQ.KM):

Village: Hansa

Importance:

- I Important ibex and snow leopard habitat. As many as sixty ibex have been sighted in this valley. Based on our field surveys and key informants we estimate at least 70 ibex in this valley together with the neighboring Takli nala.
- 2 Area is important as the watershed for most of Hansa's irrigation water. Negligible human disturbance except some labors that are based here during spring to repair the irrigation channels

Threats:

- 1. Livestock grazing: There is small amount of livestock grazing along the edge of the proposed area but even here, the stocking density is very low.
- 2. Influx of labour: Every spring/summer workers are employed to repair the irrigation channels emerging from this area and irrigating the fields of Hansa village.
- 3. Livestock depredation: There is small amount of livestock depredation in the village of Hansa by wolves. A solution to this problem should be the starting point for the creation of this reserve.
- 4. Gaddi: Similar to Kiato (Takli nala) this area could also be rented to gaddi grazing if the villagers don't gain any economic benefit from this reserve.

Approach:

The villagers of Hansa are looking for some economic use of this area. They are a little reluctant to give it to the gaddis because it damages the pastures. They are aware of the conservation programs in Kibber, Chichim and Lossar. They are willing to participate in similar projects. Thus it is a matter of proper dialog with the villagers. During the surveys people openly came up showing interest in the conservation programmes run by NCF in other parts of Spiti.

4. TAKLI NALA (35.5 SQ.KM):

Village: Kiato

Importance:

- 1. Important ibex, blue sheep and snow leopard habitat. Potential for about 70 ibex together with Hansa nala, along with 30 blue sheep that don't migrate to Hansa nala.
- 2. One of the few areas in India where ibex and blue sheep occur together
- 3. Negligible human disturbance

APPEND

Potential for tourism as this is also an alternate trek route to Ladakh and very close to the main road

Threats:

APPEND

Gaddi: In the past the villager of Kiato rented the proposed area to gaddi grazers and there is a possibility for this practice to get revived. They stopped this practice when they needed this area for their own livestock. In the recent past the average livestock holding in the village of Kiato has dropped and thus they don't require this area for their own livestock. The villagers are thus looking for some financial gain from this area. Other than this potential threat from gaddis, this area is a natural reserve.

Gaddi grazing was revived in 2009. The status of gaddi grazing as of 2010 is unknown.

Approach:

The situation in Takli is almost similar to that of Hansa above. Negotiations with community and suitable interventions to not lease areas to gaddis will be important.

5. GYUNDI NALA (124.4 SQ.KM):

Village: Hal Panchayat (Hal, Morang, Pangmo)

Importance:

- 1. Excellent ibex and snow leopard habitat with regular sightings of ibex by villagers. This is a very large area with very difficult access so is like a natural reserve.
- 2. We encountered signs of adult snow leopard with cubs in this area. Very low human disturbance in the interiors of this valley together with abundant prey could be the reason
- 3. Low human pressure. Interiors of this area have almost negligible human disturbance

Threats:

- 1. There is minimal grazing pressure in the outer regions of the proposed area (less than 350kg/sq km). This grazing pressure may not be detrimental to wildlife at such low stocking densities.
- 2. There are some gaddis who pass the valley in order to graze some of the upper areas of adjoining mountains, especially the ridge dividing the Chandra Valley from the Spiti catchment. This can grow into a serious threat if pressures increase in this valley for any reason.
- 3. There are two important irrigation channels coming from this area. Many workers are employed for the maintenance of these channels. These workers are thus based inside the proposed area throughout the duration of summer

Approach:

The interior areas are mostly free of human use and disturbance. Only part of the proposed area is being used by the villagers of Hal, Morang and Pangmo. Proper dialog and incentives with the villagers can potentially free up these low lying areas.

6. RATHANG NALA (92.1 SQ.KM):

Village: Rangrik Panchayat

Importance:

- 1. Good Ibex and snow leopard habitat. Ibex are sighted regularly in this area.
- 2. This area is also connected to the Pin Valley National Park, an excellent area for snow leopard and ibex.
- 3. Negligible grazing pressure.

Threats:

- Livestock grazing: There is small amount of livestock grazing along the edge of the proposed area. This may not be detrimental to wildlife directly as the stocking density is quite low (<1200 kg/sq km)
- 2. Influx of labour: Many workers enter the outer regions of the proposed area every day and this can potentially cause some disturbance.

Approach:

Dialog with the hydroelectric project department and villagers of Rangrik are important to have a joint understanding. Awareness and monitoring of labourers and their employers for not indulging in activities detrimental to wildlife will also be crucial.

7. QUELLING OR ULA NALA (65.4 SQ.KM):

Village: Quelling

Importance:

- 1. Excellent ibex and snow leopard habitat. The terrain seems ideal for both ibex and snow leopard. Regular sightings of Ibex by team and villagers. Signs of adult snow leopard with cubs
- 2. Excellent connectivity with Pin Valley National Park
- 3. Negligible grazing pressure

In spite of a small area this valley can potentially have more than 50 ibex.

Threats: The threats are not high at present, but could increase.

A project to build an irrigation channel to irrigate fields of Quelling village has been proposed in this area. The project itself may not be harmful to wildlife but the disturbance caused during the construction and later during maintenance needs to be minimized.

Approach:

The village of Quelling is one of the most progressive villages of the upper Spiti valley. At least one person per family has a government job. Land holding is also comparable to the rest of the upper Spiti valley. Livestock holding is very low thus there is negligible pressure on the Ula nala. The Nono, or the erstwhile royal family, is from this village who has been involved in many other community socio-economic development activities. Proper dialog with the villagers and the Nono explaining the importance of this valley for Ibex and snow leopard conservation is required to declare this area an important wildlife area. This village has serious problems of feral dogs so some program to control it is necessary in this area. Help with this threat can be an incentive for the reserve for the village of Quelling initially. Sensitization of the labor on this project and other such activities should be carried out before hand.

8. LANGZA RESERVE (19.1 SQ.KM):

Village: Langza

Importance:

- 1. Very strategically located in one of the most important bharal habitat (along with wolf and snow leopard) surrounded by areas of very high disturbance.
- 2. Good connectivity with the Kibber village reserve.
- 3. Because it is situated in prime bharal landscape this reserve can potentially support a bharal population of over 100 animals.
- 4. It is also very good wolf and snow leopard habitat
- 5. Conflict with wolf is intense in this area
- 6. Along with Kaza, Tabo and Kibber, Langza is among the most important tourism destinations. Some models of community based tourism are already being carried out in this landscape.

Additional to the above reason this reserve gains importance because of its location on the plateau. The plateau is the most important habitat of the blue sheep (Figure 2.5) and is also home to the largest number of livestock anywhere in the upper Spiti landscape (Figure 2.14). Focus on such areas should thus be of utmost priority. This reserve actually contributes towards reduction of pressure from important wildlife areas that are heavily exploited.

Threats:

- 1. Retaliatory killing of wolf was high. This practice has stopped but some times snow leopard and wolves face the retaliatory measures put in place against the feral dog.
- 2. Livestock grazing: The areas surrounding the proposed reserve are overstocked by livestock. There is some amount of grazing within the proposed reserve area.
- 3. Influx of labour: The irrigation channels supplying water to the fields of the Langza village originate from within this proposed area and thus some framework will be required for their conduct.
- 4. Dogs: The village of Langza is close to Kaza and is already severely affected by livestock depredation by feral dogs and attacks on bharal have also been reported in recent years.
- 5. Livestock depredation: As the areas around this reserve remain overstocked with livestock there is likely to be some amount of livestock depredation around this core area.

Approach:

The area requires conflict management and managing tourism to benefit local people.

One of the NGO's working on economic development and cultural conservation has launched tourism programs in this village (Ecosphere). One of their packages is called the "Wolf trail" (already launched and working), which is wildlife-based tourism where they take tourists trekking in the prime wolf area. Thus a reserve like the one proposed can help this form of tourism (both to attract tourists and to maximize the sighting chances). Many people of this village are involved in tourism related business. Increased tourism through creation of such a reserve will open up many more job opportunities for accommodation and nature interpretation. Thus proper dialog with the NGO's working here and the villagers together can help negotiate with the villagers to set aside this small piece of land for wildlife conservation.

9. DEMUL RESERVE (8.3 SQ.KM):

Village: Demul

Importance:

- a) A strategically located reserve area; provides connectivity between the Lingti valley and the proposed Langza village reserve and the existing Kibber reserve.
- b) Located on the plateau (important blue sheep, wolf and snow leopard habitat)
- c) The survey team sighted over 40 blue sheep in this area.

APPENDIX

Threats:

- Livestock grazing: This area is currently being used by the sheep-goats, herded from the village of Demul. The stocking density in this pasture is very low (lower than 800 kg/sq km). Although this stocking density is very low the livestock depredation in this area is very high as this area is also very important snow leopard habitat (key informants). Thus Livestock grazing is an issue to be discussed with the village council rather than a direct threat.
- Livestock depredation: Because the proposed area is being used by livestock the current level of livestock depredation by snow leopard in this region is relatively high (key informants). Creation of this area into core area is likely to reduce this conflict in the region at least in the short run.

Approach:

APPEND

- Livestock depredation by snow leopard is a serious issue in the village of Demul.
- The villagers are willing to participate if some solution is provided for the livestock depredation 2. problem. Detail dialog with the village is required. Such possibilities have already been discussed with the lambardar who seemed interested. Crop raiding by bharal is also an important issue in this village and it should also be incorporated in the conservation program for this village.
- NCF has already negotiated an insurance programme to help villagers address the livestock 3. depredation issue

10. LINGTI VALLEY (411.8 SQ.KM):

Village: Lalung

Importance:

- This is the largest chunk of good wildlife area in Spiti with minimal or negligible human disturbance.
- The survey team sighted more than 350 bharal within three days of survey in this region 2. (excluding repeated count). This is a very large area of over 250 sq km of pastureland and a total of 550 sq km of habitat below the altitude of 5200 meter.
- There is a single village of one house within this landscape. 3.
- The total livestock grazed in this landscape is about 74 yaks. Grazing pressure is thus 4. negligible.
- Almost no human disturbance. Bulk of the valley is rugged and involves numerous river crossings 5. to travel upstream; probably a reason for its remaining relatively pristine
- Great potential for tourism with spectacular landscapes, good wildlife sightings but will need 6. some infrastructure

Threats: The threats are not high at present, but could increase.

- Construction of road to connect the village of Kibri to Lalung (length c. 10 km)
 - It will disturb important blue sheep and snow leopard habitat a.
 - It will allow for people and their livestock to settle deeper inside the valley b.
 - Livestock pressure, tourism pressure and human disturbance may increase considerably C.
 - Influx of labor can be a very high threat if the road does come up d.
- Grazing by yak 2.
 - Livestock grazing within this proposed core area is not a threat but a concern that the a. manager should be aware of. The stocking density of livestock is extremely low (less than 350 kg/sq km). The livestock species grazing within the proposed area is the domestic yak, which we know competes little with the blue sheep (Mishra et al. 2004).
 - Current grazing pressure is less than four yak months grazing per sq km b.
 - It is therefore important to engage with the people of Lalung to maintain status quo. c.
 - Livestock intrusion in this area may lead to livestock depredation by snow leopard leading d. to conflicts especially as it is good snow leopard habitat.
- Ulshikpo is a forgotten village deep inside Lingti. People abandoned it many years ago but they 3. still have claim over that land; even today government spends money to repair the irrigation channels of Ulshikpo. This road will allow opportunities for recolonization of such places

Approach:

- 1. It is very important to engage with the people of Lalung and explain that the Kibri road may negatively affect the tourism potential. At the same time it is also important to promote Lingti as a wildlife tourism spot
- Training people to be nature guides and wildlife guides and helping generate tourism 2. infrastructure
- Engaging with the army for patrolling and their awareness 3.
- Lingti is a special case where grazing by yaks can be allowed because 4.
 - a. It's a large chunk of undisturbed rangeland and blue sheep densities are much higher than vak
 - Domestic yaks grazing here are very few (about 75) b.
 - Almost half of this area is anyways not accessible to yaks due to the difficult terrain c.
 - It is best to treat Lingti as one large landscape rather than further classifying it into smaller d. units with sections where yak can graze and places they cant
 - There is never been a case of yak depredation by snow leopard in this area (most likely due e. to high wild prey availability for snow leopard)

11. PANGMO PLATEAU (23.2 SQ.KM):

Village: Pangmo

Importance:

Regular sighting of ibex in this region Provides connectivity between Guindi (proposed) and Chichim reserves

Threats: The threats are not high at present, but could increase.

- Livestock grazing: The Pangmo village uses part of this proposed area for grazing their small livestock. This small section within and along the proposed area also has somewhat higher livestock stocking density (> 1,600kg/sq km). This is however expected to decline in the future with shifting focus on cash crops.
- 2. Crop damage: Crop damage is not a current problem but because of the increasing focus on agriculture in this village it is possible that this problem can emerge in the future. It is thus important for the manager to be aware of this potential future problem.

Approach:

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1. Engaging with the people of Pangmo to limit livestock stocking density and not use the designated area.

12. KEE AND RANGRIK (7.0 SQ.KM):

Village: Kee and Rangrik

Importance:

a. Important blue sheep area

b. This area is mainly grazed by the small livestock of Kee, which is on a decline

Threats:

- 1. Livestock grazing: The proposed area is still being grazed by small livestock from Kee and some large livestock from Rangrik.
- 2. Feral Dogs: The proposed site is very close to Kaza and the blue sheep population is likely to become more vulnerable the feral dogs in this site. Key informants from Kee told the survey team that they have seen feral dogs attack blue sheep in this area. Also the village of Kee already has the problem of livestock depredation by feral dogs.

Approach:

- 1. The village of Kee is already involved in some of the conservation programs, which should be used effectively to engage with this village.
- 2. The Kee gompa needs to be included in the discussions and actions

3. Part of the proposed area also belongs to Rangrik village. This pasture is currently under-used and thus the villagers can be convinced to keep it aside as a conservation area.

13. NAKSHUNG-SHEGO RESERVE (8.9 SQ.KM):

Village: Pangmo

Importance:

- 1. This clearly appears to be good blue sheep habitat as the survey team sighted over one hundred blue sheep in this area.
- 2. This area is being grazed by the livestock from four villages. But as this area is further away form all these villages it is expected to be the first to start showing a decline in grazing pressure.

Threats:

- 1. Livestock grazing: The proposed area is under moderate livestock grazing pressure (<1,200 kg/ sq km). Livestock grazing will have to be negotiated with the villages.
- 2. Feral Dogs: This proposed reserve is very close to Kaza and thus feral dogs could be a potential threat to the blue sheep population in this proposed core area.
- 3. Livestock depredation: Livestock depredation is currently existent as livestock graze this area but this can be mitigated once villagers are convinced to create into a grazing free zone.

Approach:

Engaging with the people from all stake holding villages. Feral dog management will be important.

14. CHICHIM RESERVE (4.3 SQ.KM):

Village: Chichim

Importance:

- a. One of the few areas of Spiti with both blue sheep and ibex. The population of ibex has shown a remarkable recovery in the reserve area (being maintained since 2004 by NCF).
- b. Pasture quality is very good. Over 62% area is covered by shrub dominated pasture and another 22% covered with sedge, grass and herb dominated pasture.
- b. This area is also located near a very important and highly livestock stocked region on the plateau.

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- Livestock grazing: The proposed area is currently not under livestock grazing pressure due to NCF's involvement with this village reserve. Livestock grazing will have to be negotiated with the villages during its renewal.
- 2. Livestock depredation: Livestock depredation is high in the surrounding area.

Approach:

Engaging with the people of Chichim village. This village is already involved in many of NCF's conservation programs. The tourism potential of the village vis-à-vis the Parang la trek and the Ladarcha grounds needs to be tapped effectively.

15. KIBBER RESERVE (17.4 SQ.KM):

Village: Kibber

Importance:

- a. This is an excellent blue sheep habitat. The survey team sighted over 100 blue sheep in this area. Regular monitoring by NCF shows 100 to 250 blue sheep in the area on an average, numbers that have increased from just about 40 six years ago. A small population of ibex is also often seen in the reserve area, which wasn't so before the reserve was established.
- b. This area is also located near an important but highly livestock stocked region on the plateau.

Threats:

- 1. Livestock grazing: The proposed area is currently not under livestock grazing pressure. Livestock grazing will have to be negotiated with the villages in 2010.
- 2. Livestock depredation: Livestock depredation is high in the surrounding areas.
- 3. Feral Dogs: Feral dogs have been reported from this region (NCF camera trapping).

Approach:

Engaging with the people of Kibber village. This village is already involved in many of NCF's conservation programs, which include conflict resolution and managing the grazing-free reserve. The reserve designation needs to move from monetary compensation to in-kind incentives.

APPENDIX 8.1: HIMALAYAN SNOW LEOPARD RESEARCH CENTRE SPITI

Background: The snow leopard (*Panthera uncia*) is a globally endangered species included under the Schedule I of the Indian Wildlife (Protection) Act 1972. Snow leopard habitat is unique in many ways and presents both conservation challenges and opportunities. The high altitude cold, arid landscapes that constitute snow leopard habitat cover an almost contiguous stretch from J&K till Arunachal Pradesh in the Himalaya, as also further north in Central Asia. While the snow leopard is distributed widely, it mostly occurs at very low densities throughout, often less than 1 individual per 100 km². People sharing their home with the snow leopard, mostly agro-pastoralists, also have pervasive use of the landscape for livestock grazing, fuel, fodder and other needs. The threats being faced by snow leopard varies across its range, but in India, competition with livestock, man-animal conflicts, developmental pressures and in some areas, hunting, are the primary threats. From a scientific perspective, it is amongst the most data deficient cats. The MoEF's recent initiative of using snow leopard as a flagship for conservation in this unique landscape, the Project Snow Leopard, aims to conserve the snow leopard and other wildlife in a scientifically robust and people sensitive manner, by facilitating scientific research and promoting welfare of local communities and seeking their co-operation in conservation.

A few research initiatives have recently been undertaken and have made valuable contributions, but remain either at a small scale or for a short window of time. There are numerous aspects of snow leopard's biology and ecology that remain little understood. Primary among these are its home range size, social organization, influence of livestock on its prey, causes of conflicts, and influences of rangeland dynamics. Studies done in the Himalaya have suggested home range sizes of 20 to 100 sq. km. Most of these estimates are considered to be inadequate as they represent a very small period of sampling due to monitoring under difficult terrain-climate conditions that include long durations when the leopard was untraceable. Recent studies by the Snow Leopard Trust in Mongolia and Pakistan using more advanced GPS collar technology have estimated home ranges over 1,400 to 1,600 sq. km and thus change the very perception of their range sizes and potential population estimates. The large people-snow leopard interface also means that there are higher chances of conflicts, the patterns and causes of which remain little understood. Another important point is that we do not have a good idea of snow leopard abundance from any area within its vast range, primarily because of its elusiveness and difficult terrain. More robust techniques such as the use of camera trapping and genetic markers are now presenting better opportunities.

The snow leopard is the state animal of Himachal Pradesh, and the state Forest Department's commitment to snow leopard conservation is evident in the active role it played, along with the Nature Conservation Foundation, in assisting MoEF to develop Project Snow Leopard. These two agencies have also been collaborating to generate sound scientific knowledge in the Spiti Valley, one of India's most important snow leopard landscapes.

Proposed Centre: Here, we propose the establishment of a globally unique, field-based snow leopard research and conservation facility in the Spiti Valley, and propose to undertake India's first

comprehensive and long-term radio-collaring project on snow leopards and their prey. The only other such facility in Asia is the one set up in Mongolia by the Snow Leopard Trust, together with other the Himalayan ones; one primary difference being that while the former is mostly between 1,000 and 2,500m, the latter are mostly above 3,200m.

As mentioned earlier, the Himachal Pradesh Forest Department (HPFD) and the Nature Conservation Foundation, Mysore (NCF) have been leading some of the efforts of both research and conservation in the snow leopard range in Spiti. The latter organization, which also partners with the Snow Leopard Trust, has over 30 peer-reviewed publications and technical reports focusing on the snow leopard or its prey/habitat along with model community based conservation programmes. The HPFD and NCF are also partnering to prepare a detailed landscape based and participatory Management Plan for the entire Spiti Wildlife Division.

It is desirable that a Himalayan Snow Leopard Research Centre be set up in Spiti to give a further boost to snow leopard research and conservation in the country with the broad goal of initiating and encouraging studies (short and long-term) pertaining to snow leopards.

Objectives:

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- 1. Set up a research and training centre for snow leopard conservation with necessary infrastructure for carrying out state-of-art research, which will include work space, laboratory, communication and accommodation
- 2. Conduct a comprehensive snow leopard radio-collaring project in India

The Centre is proposed at Kibber Village, which is the field base of NCF and a site of detailed research and conservation programmes led by NCF since 2001.

A detailed proposal for the telemetry study is enclosed as Appendix 8.2, which as said above, is proposed as the first major project of the new facility.

TABLE: BUDGET FOR SETTING UP THE 'HIMALAYAN SNOW LEOPARD **RESEARCH CENTRE, SPITI. (THIS IS ALSO INCLUDED IN THE MASTER BUDGET REQUEST BELOW (APPENDIX III))**

Detail	Year 1 (Rs.)	Year 2 (Rs.)	Year 3 (Rs.)	Year 4 (Rs.)	Year 5 (Rs.)
Buildings					
Office and accommodation	700,000	300,000	0	0	0
Equipment					
Laboratory	0	100,000	100,000	100,000	100,000
Camping	0	150,000	150,000	150,000	150,000
Binocular, GPS, Scope, etc	0	100,000	100,000	100,000	100,000

Detail	Year 1 (Rs.)	Year 2 (Rs.)	Year 3 (Rs.)	Year 4 (Rs.)	Year 5 (Rs.)
Solar Power backup	0	200,000	20,000	20,000	20,000
Staff (1 caretaker, 2 assistants)	168,000	168,000	240,000	240,000	240,000
Internet (satellite)	0	200,000	100,000	100,000	100,000
Maintenance	50,000	50,000	50,000	50,000	50,000
Miscellaneous	60,000	60,000	80,000	80,000	80,000
Understanding snow leopard ranging along a gradient of human use (<i>Pl. see separate</i> <i>proposal document</i>)*	3,248,800	1,650,800	1,110,800	810,000	812,000
Total	4,226,800	2,978,800	1,950,800	1,650,000	1,652,000

* For details see Appendix 8.2

APPENDIX

APPENDIX 8.2: UNDERSTANDING SNOW LEOPARD RANGING ALONG A HUMAN PRESSURE GRADIENT IN SPITI, HIMACHAL PRADESH

Implementing agencies:

The Wildlife Wing, Himachal Pradesh Forest Department

Nature Conservation Foundation, Mysore

Study Area:

Upper Spiti Landscape, Himachal Pradesh

Project Duration:

Four years

Total Budget:

Rs. Sixty two lakhs, twenty eight thousand, four hundred only (Rs. 62,28,400)

BACKGROUND

The Himalayan and Trans-Himalayan cold deserts are spread over c. 1,30,000 km² in India, 22% of which lies in the state of Himachal Pradesh (Anon. 2008, Rodgers et al. 2001). These high mountains and plateaus occur above the forested zone and have a unique biodiversity that includes large mammal species such as the snow leopard (Panthera uncia), brown bear (Ursus arctos), ibex (Capra sibirica), bharal (Pseudois nayaur), Tibetan argali (Ovis ammon hodgsoni), chiru (Pantholops hodgsonii), serow (Nemorhaedus sumatrensis), and musk deer (Moschus spp) (Das 1966), all of which are nationally and some even globally threatened (IUCN Red List http://www.iucnredlist.org/, 2008, Anon. 2002). These areas also provide numerous ecosystem services that are important for the dense human populations downstream and in the Indo-Gangetic plains. What is probably more unique is that most of this wildlife is not limited to the rather large existing Protected Area (PA) network in the region, but exists in the larger landscape, including very close to rural and semi-urban centers (Anon. 2008, Bhatnagar et al. 2003). On the other hand the sparsely populated landscape, where the human density is mostly below 1/km² (compared to about 300/km² national average), also has pervasive resource use such as livestock grazing, which extends into most of the existing PAs. The predominance of Buddhism in the region, which preaches non-violence, the relatively low human densities, and lack of interest so far in creating large developmental projects, have probably been crucial for human-wildlife coexistence.

Nationally, forest-dwelling flagship species such as the tiger (Panthera tigris) and the Asian elephant (Elephas maximus) have occupied and guided mainstream conservation in India so far (Rangarajan 2001, 2007). The 'one-size-fits-all' system of conservation that is developed from the forested ecosystems is to the detriment of the more diffused systems such as the Himalayan high altitudes (Bhatnagar 2009). Given the uniqueness of Himalayan and Trans-Himalayan high altitudes in terms of biodiversity value and human use, and to address the conservation needs in this largely neglected landscape, the Ministry of Environment & Forests (MoEF), Govt. of India (GOI) recently approved a program for landscape level conservation for the region using the snow leopard as a flagship species (Anon. 2008). This new program, whose formulation was catalyzed by the Nature Conservation Foundation, together with the Himalayan State Wildlife Departments, the Wildlife Institute of India, and the MoEF, is called Project Snow Leopard (Anon 2008). The Department of Forest Farming, and Conservation, Himachal Pradesh, played a critical role in enabling Project Snow Leopard. The first state workshop amongst all five states was conducted by the Department together with the Nature Conservation Foundation and the Snow Leopard Trust in Manali in mid 2005. The respective Chief Wildlife Wardens of the state then continued to actively work jointly with NCF to enable the national level program.

Project Snow Leopard recognizes the twin needs of community participation in conservation, and the important role of scientific research in informing conservation strategies. Conservation at these large spatial scales needs greater understanding of the influence of human pressure gradients on populations of wide ranging and endangered species such as the snow leopard and its prey. The present project aims to fill in gaps in our knowledge of the snow leopard, to enable better conservation planning and action. The project, proposed jointly by the Department of Forest Farming and Conservation, and the Nature Conservation Foundation, will be implemented in the Upper Spiti Landscape (upstream of Kaza), an important area for snow leopards.

APPENDIX

SNOW LEOPARD:

12 countries of South and Central Asia, namely Afghanistan, Bhutan, China, India, Kyrgyzstan, Kazakhstan, Nepal, Mongolia, Pakistan. Russia Taiikistan, U-L-1 Kazakhstan, Nepal, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan and possibly also Myanmar (Fox 1994; Nowell and Jackson 1996). The wild population is estimated at 4,500 to 7,500 individuals, spread across a range of c. 1.6 million km². In roughly 5% of the global range, India may possess **Z** 10% of the global population, most of which lies in the states of Jammu & Kashmir and Himachal Pradesh (Anon. 2008). Snow leopard is listed under the 'Schedule I' of the Indian Wildlife (Prote Act, 1972 and as 'endangered' under the 2008 IUCN Red Data List (http://www.iucnredlist.org Pradesh (Anon. 2008). Snow leopard is listed under the 'Schedule I' of the Indian Wildlife (Protection) (2008)). The 1975 enactment of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) prohibited all international commercial trade of Appendix 1 species, which includes the snow leopard. The snow leopard has been further designated as a 'concerted action' species under the Convention on Conservation of Migratory Species of Wild Animals (CMS), under which India is obliged to conserve and restore its habitat. As detailed above, recognizing the precarious nature of the species, the MoEF, GOI, along with the Himachal Pradesh Forest Department and other Himalayan state Governments of snow leopard range states, developed the Project Snow Leopard, a unique conservation strategy and action plan for the snow leopard, in a process that was catalyzed by the Nature Conservation Foundation, Mysore and the Snow Leopard Trust (Anon. 2008; PSL 2006). This plan recognizes the lack of research in the region as an important impediment to designing good conservation programmes, outlines the tremendous need for filling the gaps in information, and proposes to support focused research programmes to meet the need.

The snow leopard is a medium sized cat (females c. 35 kg, males c. 50 kg) with a shoulder height of c. 60 cm and head-body length of c. 2m (Hemmer 1972). Its smoky-grey pelage, patterned with dark grey, open rosettes and black spots helps in camouflage among bare rocks or patchy snow. It has a welldeveloped chest, short forelimbs with proportionately large paws, long hind limbs, and a noticeably long tail (c. 90% of its head and body length), giving it an amazing agility for negotiating steep terrain or narrow cliff ledges (Sunquist and Sunquist 2002). Adaptations for cold include an enlarged nasal cavity, long body hair with dense, woolly under-fur, and a thick tail that can be wrapped around the nose for added warmth while at rest. Mating occurs between January and mid-March, a period of intensified social marking and vocalization (Ahlborn and Jackson 1988). Other important aspects of snow leopard biology are given in Table 1.

Table 1: Some key aspects of snow leopard biology as obtained from the wild or from captivity.

	In Captivity	In the Wild
Age at sexual maturity:	2-3 years	_
Age at last reproduction:	15 years	-
Estrus:	2-12 days (Rieger 1984) Estrus cycle: 15-39 days (Freeman 1975)	-
Gestation:	98-104 days (Jones 1977, Freeman 1975)	-

	1	19-11-11-11-11-11-11-11-11-11-11-11-11-1
Longevity:	up to 21 years (Blomqvist and Sten 1982, Wharton and Freeman 1988)	-
Reproductive season:	early Jan to mid-Mar; most births occur in May-Jun (Freeman 1975, 1977, Blomqvist and Sten 1982)	Early Jan to mid-Mar, a time when vocalizations can most commonly be heard (Jackson and Ahlborn 1988)
Litter size: 1-5	Usually 2-3, exceptionally up to Blomqvist and Sten 1982, What	seven(Heptner and Sludskii 1972, rton and Freeman 1988)
Age at dispersal:	NA	18-22 months; sibling groups may remain together briefly upon independence (Jackson and Ahlborn 1989)

Snow leopards prefer steep, rugged terrain that is broken by cliffs, rocky outcrops, ridges and gullies (Jackson and Ahlborn 1989, Sunquist and Sunquist 2002). However, in Mongolia and Tibet they also use relatively flat or rolling terrain provided there is sufficient hiding and stalking cover (Schaller 1998, McCarthy 2000). Home range sizes are not clearly understood but the four studies that have taken place on the species place it from as low as 12 to 40 km² in productive habitats in Nepal (Jackson and Ahlborn 1989) to more than 500 km² in Mongolia with its rolling terrain and lower ungulate density (McCarthy et al. 2005). However, even in the productive landscapes, home ranges may be higher, as the estimates there have been based on ground-based VHF tracking, rather than GPS satellite telemetry. Coarse density estimates range from c. 0.1 to 10 individuals per 100 km², but these are insufficient for generating a reliable range-wide population estimate. Even though the species is known to be territorial, the telemetry studies so far reveal largely overlapping male and female home ranges, which may constitute areas of prime resources in terms of topography, habitat and prey base (Jackson and Ahlborn 1989, Fox & Chundawat 1988). They are solitary and typically crepuscular animals and usually follow mountain ridges, cliff edges, and well-defined drainages as their common travel routes and sites for the deposition of sign, including scrapes, scat and rock scent (Ahlborn and Jackson 1988). In precipitous habitat, radio-collared leopards moved an average of c. 1 km daily (straight-line distances), with up to 7 km on a few occasions, (Jackson and Ahlborn 1989); whereas in Mongolia their daily movements were considerably more (averaging 12 km), with one female covering 28 km within a single day (McCarthy et al. 2005), which may be a consequence of variation in prey availability. season and state of the animal. Snow leopard distribution coincides closely with that of its principal prey, the bharal or blue sheep and the Asiatic ibex, ungulates with mean body weights of 55 kg and 76 kg respectively (Mishra et al. 2002). These caprids may contribute up to 66% of the cat's diet, with livestock providing as much as 15 to 60% in places (Schaller et al 1988; Oli et al. 1993; Chundawat and Rawat 1994; Jackson 1996; Bagchi and Mishra 2006). Other prey items (approximately 12-25% of diet) may seasonally consist of marmot (Marmota spp), pika (Ochotona spp.), hares (Lepus spp.), small rodents, and game birds. Annual prey requirements are estimated at 20 to 30 adult bharal, with radio tracking studies indicating a large kill every 10 to 15 days (Jackson and Ahlborn 1984; Jackson 1996).

THREATS:

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APPENDIX

Pastoralists and agro-pastoralists, for whom livestock husbandry is the mainstay for their sustenance, co-inhabit the entire range of the snow leopard in Spiti. The human population in the region is *c*. 11,000 and is speedily increasing and so is the livestock population, which is currently *c*. 23,000 (http://hplahaulspiti.nic.in/, February 2009). The dependence of the people and developmental activities pose pressures on the wildlife of the region as explained below.

Overstocking and competition with livestock: Snow leopard habitat in Spiti is often overstocked with livestock, compromising animal production itself (Mishra *et al.* 2001). The resultant competition for forage, along with human disturbance, is often cited as the cause for prey population declines or even local extinction of wildlife in the Trans Himalayan region (Namgail *et al.* 2007, Bhatnagar *et al.* 2006, Bagchi *et al.* 2004; Mishra *et al.* 2004, Raghavan 2003, Mishra *et al.* 2002;). As livestock numbers increase, wild prey populations tend to drop, as reported in Spiti where bharal density was 63 % lower (2.6 bharal per km²) in a rangeland supporting 30% more livestock than an otherwise comparable area sustaining 7.1 bharal per km² (Mishra *et al.* 2004). Declining prey populations are a serious threat to snow leopard, which often intensifies livestock depredation rates, leading to increased herder retribution.

People-Wildlife Conflicts: Livestock depredation rates may vary widely from 1 to 20% of livestock holding in Ladakh and Spiti in Western Himalaya (Namgail et al. 2007, Jayapal 2001, Bhatnagar et al. 1999, Mishra 1997, NCF unpubl. data). Events of surplus killing when a snow leopard enters a corral and up to 50 or more of the confined sheep and goats are killed in a single instance often result in serious economic loss to the affected household and increased animosity towards conservation in general (Jackson and Wangchuk 2001). In the Hemis National Park, Ladakh, such events (14% of all incidents) accounted for 38% of all livestock lost (Bhatnagar et al. 1999) and probably led to most retribution against snow leopards (Spearing 2002). Conflicts thus cause monetary loss to the dependent community, often to the tune of half their per capita income, animosity towards conservation and actual loss of snow leopards to retributive killing (Namgail et al. 2007, Bhatnagar et al. 1999, Mishra et al. 1997). Research has also detected vulnerable pastures, seasons, livestock type, as per their age-sex, which can affect depredation patterns in an area (Bagchi and Mishra 2006, Bhatnagar et al. 1999). Livestock have been bred with selection for economically important traits, with little or no attention to their anti-predatory abilities. Livestock may often constitute over 90% of the prey biomass in an area thus increasing chances of an encounter with predators. They further occur in relatively greater predictability compared to wild prey. As alluded to above, exclusion of wild prey from an area due to overstocking by livestock may further push snow leopards to increase their dependency on livestock.

A study in Spiti demonstrates that in a high livestock density area the proportion of livestock in snow leopard diet was higher (Bagchi and Mishra 2006). It has also been observed in places that the herding practices, whether it is the quality of corrals or of accompanying herders/herding, has deteriorated. The corrals may be placed in vulnerable sites (near cliffs), may not be sufficiently predator proofed, and there may be few or very young or very old herders with the animals (Bhatnagar *et al.* 1999, Namgail *et al.* 2007). All these factors probably make livestock more vulnerable to depredation, but understanding these also can help manage conflicts better.

Although the attributed livestock losses to wild predators often tend to be higher than actual carnivore-caused mortality, it is the perceived level of depredation that determines people's negative

attitudes and subsequent reaction towards wild predators (Mishra 1997). A study in Spiti shows that even in culturally similar areas, negative attitudes may have a strong economic basis: thus, communities with more access to alternative income (Kibber WLS) displayed greater tolerance toward snow leopards, despite losing on average 1.1 livestock per family annually. A nearby community (Pin Valley NP) heavily dependent upon animal husbandry, however, held more negative feelings despite losing fewer livestock (0.6 animals per household; Bagchi and Mishra 2006). A recent trend towards increased crop damage by bharal is also reported in some places in the upper Spiti landscape (NCF, unpubl. data), and may need closer attention in the near future.

Developmental pressures: A large portion of the snow leopard's range in India falls along politically sensitive international borders. The growing population and the pressures due to national security are increasingly leading to a spurt in development projects in the region. These include roads, infrastructure, including some mega projects. In some areas there is a feeling that better access into good wildlife areas can increase poaching pressures. In the Spiti region however, poaching is not perceived to be a serious threat. In other instances well intentioned developmental projects such as roads and pasture development can lead to habitat loss (Anon 2007).

CONSERVATION SCENARIO AND NEEDS

Spiti has two wildlife protected areas (PA) -Pin Valley National Park and Kibber Wildlife Sanctuary that cover c. 10% of the c. 12,000 km² landscape. As explained above, the Spiti region as also the entire snow leopard range in the country has low to moderate densities of wildlife, including that of the snow leopard, dispersed widely in the landscape and not restricted to these PAs. Over 60% of the snow leopards in the Indian range may occur outside the PA network (Anon. 2008). Thus the need to manage the threats outlined above is not restricted to the PAs but has application in the entire landscape. The Project Snow Leopard suggests an alternative to large PAs that relies on a mosaic of small community supported reserves that help in prey recovery, and judicious use of the larger intervening landscape (Anon 2008). Experiments in Spiti have shown that such reserves can be established through incentive based programmes (Mishra et al. 2003 a, b) and that they can lead to a significant increase in prey populations and subsequent high use by snow leopards (Mishra, C., unpubl. data, 2008). The PSL also cautions that such recovery of wildlife populations may lead to an increase in conflicts and thus needs to be coupled with conflict management in the larger landscape. It has been suggested that some of the ideal habitats of snow leopard may show high spatial overlap in use between individuals, but with temporal separation (Jackson and Ahlborn 1989, Chundawat 1992). The reserves proposed under the PSL thus should form such 'cores' as the prey population increases.

Important questions of snow leopard conservation relate to good estimates of its population, area needed for each animal (as per its age-sex), determinants of range quality in terms of prey availability, topography and disturbance, and their ability to movement across human and natural barriers. There is also a pressing need to understand conflicts and the role of individual snow leopards in it.

OBJECTIVES

Given the above questions the project is proposed with the following objectives:

1. To study the distribution, seasonal movement, and ranging patterns of the snow leopard - the

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- 2. Estimating the population size of now leopard in the upper Spiti Landscape
- 3. To model the most important snow leopard areas in Spiti based on the findings from the first objective
- 4. To understand the mechanism of snow leopard-people conflicts, especially the ecology of 'habitual livestock depredators', if any
- 5. To train and set up a monitoring program for snow leopards to be implemented jointly by trained wildlife staff and local community representatives
- 6. Determine the primary threats and conservation needs for the snow leopard

STUDY AREA

LOCATION AND TOPOGRAPHY

The study area is part of the upper Spiti Catchment (31° 57' 57" to 32° 44' 19" N latitude and 77° 37' 06" to 78° 29' 09" longitude), located in the Lahaul and Spiti district of Himachal Pradesh (Figure 1). Spiti is a sub-division of the district with the head-quarters located at Kaza. Spiti is situated in the rain shadow of the Pir Panjal range and is classified under the Trans-Himalayan Zone 1 according to biogeographic classification by Rodgers and Panwar (1988). The region experiences extreme cold, semi-arid to arid conditions, has low plant productivity and a plant growth season of about two and a half months from mid-June to August.

The Spiti River originates in the NW of the catchment, and the River flows roughly SE to join the Satluj River at Khab. The region is flanked by the Kinnaur district to the east, Tibet to the north and east, Ladakh (J&K) to the NW, Lahul to the west and Kullu district to the south. The placement of Spiti in between two major branches of the Greater Himalaya, the Pir Panjal in the south and the Zanskar in the north probably isolates it from influences from both regions and may also cause a certain amount of endemism (Sharma *et al.* 2003). Most of the region is very rugged, but a small plateau from Kibber to Lingti Valley is more rolling.

CLIMATE AND SEASONS

Annually, the temperatures vary more than 60 C, between a maximum of c. 30 C in summer and a minimum of c. -40 C in winter. The daily minimum temperature remains sub-zero for over half the year (October to May) and even the daily maximum temperature drops below zero in January and February. These variations result in a marked seasonality. The area experiences severe winters with heavy snow from November/December to March/April. The total snow precipitation at places exceeds three meters. Spring is characterized by patchy snow melt and sprouting between April and May/June. The vegetation pulse coincides with peak summer beginning from July till September. This season also has a large number of cloudy days with occasional rain and snow and temperatures varying between a minimum of 4°C and a maximum of 30°C. With the onset of autumn there is a steady decline in daily temperatures. Dry conditions and senescence of most plants continue till heavy snowfall begins in November/December.

GEOLOGY AND SOILS

The geology of Spiti is interesting owing to the almost complete sequence of exposed sediments from the Pre-cambrian era to the Cretaceous period (Wadia 1966). The area is characterized by sharp changes in a combination of quartzite, shales, limestones and conglomerates. Most of the area is rich in fossils, mainly brachiopods, trilobites, ammonites, bivalves and also certain corals and algae, indicating its Tethyan past. The high altitude desert soils are predominantly sandy and shallow, derived mainly by mechanical 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).

FLORA

Puri *et al.* (1989) classed the area as 'Dry Alpine Steppe' while Schweinfurth (1957) as 'Artemisia Steppe and Meadows'. It is characterised by sporadic patches of trees (Juniperus macropoda, Salix spp. and Betula utilis, now mainly confined to inaccessible areas or those protected by religion) and sparse scrub, meadows and grasslands. Prominent shrubs are Rosa spp., Lonicera spp., Caragana gerardiana, Ephedra gerardiana, Eurotia ceratoides, Artemisia spp.; herbs are Lindelofia spp., Cicer microphyllum, and Cousinia spp., and grasses such as Festuca spp., Oryzopsis spp. and Poa spp. The cliffs and steep rocky slopes have rare Juniperus spp., Rosa spp. and Ribes orientale. Moist tracts in the valley bottoms have patches of Salix daphnoides, S. flabellaris, Myricaria elegans, and Hippophae tibetana. Most Ephedra and Rosa scrub and meadows occur in the lower to middle slopes. Middle to higher slopes have Caragana-Lonicera scrub and patches of usually dense meadows dominated by herbs such as Lindelofia stylosa, Potentilla atrosanguinea and grasses like Festuca spp., Oryzopsis spp. and Stipa spp.

FAUNA

The large mammalian fauna is less diverse in this region compared to other Trans-Himalayan areas as reported by Chundawat (1992) and Mallon (1991). Large wild mammals recorded from the area are ibex, bharal, snow leopard and wolf. Besides, smaller carnivores such as red fox, stone marten (*Martes foina*), Himalayan weasel (*Mustela sibirica*) and pale weasel (*Mustela altaica*) with a variety of rodents and mouse hare (*Ocotona* spp.) also exist (Mishra 2001, Bhatnagar 1993).

Golden eagle (*Aquila chrysaetos*), lammergeier (*Gypaetus barbatus*), Himalayan griffon (*Gyps himalayensis*), Himalayan snow cock (*Tetraogallus himalayensis*) and chukar partridge (*Alectoris chukar*) are among the important bird species in the area (Manjrekar 1997).

PEOPLE AND THEIR DEPENDENCE

All indigenous people of the area follow Tibetan Buddhism. There are *c*. 50 villages in Spiti. Of these, most villages barring some like Sagnam, Kibber, Losar, Chichim, Rangrik, have fewer than 60

households. The human population of Spiti is approximately 12,000 with a human population density of c. 1/km². There is varying level of dependence on the local resources for fuel, fodder, pastures and donkeys, sheep and goats. Dzomo, sheep and goats are often accompanied by herdsmen to prevent crop damage and protect from wild carnivore predation and crosses. farming. People own yak, cows, yak-cow hybrids [locally called dzo (male), dzomo (female)], horses, crop damage and protect from wild carnivore predation and are grazed close to the villages or seasonal settlements (*dogries*) during the day. Young (<4 years), and pregnant horses are grazed at definite sites far from settlements and are herded into pens during nights by herdsmen, whereas yak, dzos and older PEN horses are directed into definite areas to be left unattended to graze. Between mid-December and the first major snow fall usually later that month, the livestock is herded back to the villages by the dogri dwellers. Cultivation is confined to very small areas owing to limited availability of arable land, limited primarily by availability of irrigation water and deep soil areas and is thus confined to alluvial fans and plateaus. People cultivate barley (Hordeum vulgare), peas (Pisum sativum) and potatoes (Solanum tuberosum). Green peas have recently gained considerable importance as a cash crop. Some households have seasonal settlements, locally known as dogries located away from their villages where they tend cattle, collect fodder and fuel and cultivate crops between April and October. Between June and December people collect fuel (shrubs and cattle dung) and fodder.

Coinciding with the vegetation pulse, in late June, groups of migratory herdsmen from the Simla, Kullu and Kinnaur districts may arrive, some covering a distance of over 200 km, with a total of over 10,000 sheep and goats. These groups have either traditional rights over pastures or have lease agreements with the local communities and spread out into the upper catchments of some of the valleys till mid-August. According to local sources, their sheep and goat population is increasing remarkably each year.

Human pressures are likely to have created hindrances or barriers in movement of wild animals that can affect conservation goals.

METHODS

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INDIRECT METHODS FOR IDENTIFYING HIGH-USE AREAS

Snow leopards have a tendency of using distinct landform edges for leaving territorial markings and while traversing a landscape (Ahlborn and Jackson 1988). Monitoring these signs over short transects to obtain the encounter rate of signs was suggested as a means for calculating snow leopard abundance (Jackson and Hunter 1996), but recent studies point out to serious limitations of these simple techniques alone for monitoring snow leopard (Jackson et al. 2006, Sharma et al. 2006a, b). The knowledge about the plausible snow leopard routes however does allow reasonable prediction of their movements. Using this knowledge has helped some earlier studies on using remotely placed cameras with better trapping success compared with other large cats (Jackson et al. 2006, NCF unpubl. data). After identification of high use sites, camera traps will be placed along them to identify and monitor individuals using the sites. The data will be collected to conform to the modifications in the above method suggested recently (Chundawat and Sharma, 2008; Sharma et. al. 2009; Suryavanshi, unpublished data) so that it can be used to also estimate the site occupancy (McKenzie et. al. 2006) of snow leopard and its prey.

Radio collaring snow leopards will involve the physical capture of the animals using Aldrich leg-snares (Jackson et al. 1990, Chundawat 1992, McCarthy 2000). Each snare will be equipped with a VHF trap transmitter for enabling constant monitoring. With the help of a qualified veterinarian at least six snow leopards will thus be captured and fitted with radio collars. These snares are relatively safe, and have been very effective in capture of snow leopards. Box traps are difficult to use in the harsh terrain of the snow leopard habitat, and the cat rarely enters box traps, even when they are baited. Voluntary services and advice of the senior staff of the Snow Leopard Trust, including Dr. Tom M. McCarthy, who has safely captured and handled the highest number of snow leopards by any individual ever in the wild, will be available to this project. Snow leopards will be immobilized with a mixture of of Ketamine (3 mg/kg) and Medetomidine (0.08 mg/kg). Atipamizole (0.4 mg/kg) will be used as the reversal drug. Immobilized animals will be monitored and clinically examined. Possible side effects of the immobilization including respiratory depression, aspiration of vomitus/saliva, and thermoregulatory dysfunction will be constantly monitored. To prevent aspiration of saliva or vomitus, the immobilized animal will be kept in lateral recumbency with the mouth and head low relative to the body. An eye gel (Viscotears®) will be applied to the cornea to prevent drying and an umbrella will be used to shade the eyes from direct sunlight, whereas a padding will be kept under its head to prevent dust from getting into the eyes. Cats will be weighed, measured, and a passive integrated transponder (PIT) will be implanted under the skin near the shoulder. The cats will also be inspected for parasites, wounds, and signs of recent lactation. All capture and handling protocols employed will be state of the art, informed by past and ongoing snow leopard projects of the Snow Leopard Trust across Central Asia.

RADIO-COLLAR SELECTION

The Very High Frequency (VHF) collars require ground monitoring and earlier studies have shown the serious limitations of using these in the snow leopard range, which results in very poor data (Chundawat 1992, Jackson 1996). More advanced techniques using the Global Positioning Systems (GPS) technology integrated into the VHF collars have however yielded much more reliable and consistent results (McCarthy et al. 2005). Collared snow leopards will thus be monitored using a combination of traditional VHF receivers, satellite assisted downloads, and mobile laptop computers following standard radio-tracking study protocols (e.g., Jackson, 1996; Mech and Barber 2002; Miquelle et al. 1999; Snow Leopard Trust, unpublished data). Near-real time locations accurate to within 15-30 meters will allow study animals to be unobtrusively observed and monitored in order to document feeding patterns. This technique also has some limitations and newer options are becoming increasingly available. Below we provide a brief overview of the options.

SATELLITE TELEMETRY – A BRIEF REVIEW:

In India, several Argos based GPS collars have been used on Tigers by the Wildlife Institute of India but have mostly been unsuccessful and only the VHF transmitters are working reliably on these collars (Q.N. Qureshi, pers. comm.). Failures can be due to the uplink cycle mismatch with the animals' locations, and breaking of the antennas. The Snow Leopard Trust has used GPS-Argos collars on snow leopards in Pakistan and found the GPS units useful, although the Argos satellite data uplinks have

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APPENDIX

been overridden by radio noise at the Argos dedicated frequency in the whole Central/South East Asian region. This problem is even worse in Mongolia, so a non-Argos data retrieval system is now being tested by the Trust. The new generation GPS collars use Satellite phone technology to transmit and record data apart from the conventional on-board recording and VHF transmission. Other technologies include use of GPRS (mobile phone signals), UHF (Ultra high Frequency) or recovery of dropped collars to obtain data manually. While the GPRS technology has limitations in most remote areas due to sporadic mobile connectivity, UHF fails at receiving data for any distance which is more than 1.5 km when installed on an animal. The risks of relying completely on dropped collars are those of losing them if the VHF beacon stops functioning or if the collars are too far to be tracked through radio receivers and antenna.

Snow Leopard Trust has been using NorthStarTM C-Cell GPS collars with Globalstar Satellite phone transmitters in Mongolia for the past one year. The GPS collars have a VHF transmitter, a Satellite phone transmitter, a remote drop-off mechanism, and on-board recorder to store all GPS locations. The collars communicate with the satellites every 7 hours and upload the last location on the website. With a life of approximately 1 to 1 ¹/₂ years, the collars are made of strong synthetic material capable of surviving hard conditions and treatment.

The collars have so far been very successful in South Gobi province, Mongolia with more than 85% successful uplinks. The cost is over \$4,000 for each collar. Once installed on the animal, a monthly subscription is paid to download the data on the website. The website where this data is downloaded is password protected, and data from individual collars can be downloaded as excel files, or be directly seen on Google Earth. The collars weigh about 500 grams, which is within the 'permissible' limit of 2% of the animal's weight.

While the NorthStar collars have performed exceedingly well on snow leopards in Mongolia, and have an option of solar charging too; there seems to be some problem in using them in India. The Globalstar Satellite network coverage excludes most of India from its core range. However in North and North East India, there seems to be something that is called 'fringe coverage', with an expected communication success of 80-90%. However, as per the recent information obtained from Globalstar, there are plans to increase their coverage to whole of India by early 2010. It is crucial that before using these collars on snow leopards, we should test them in the field for the success rate and efficiency as was done recently in Mongolia before installing the collars on snow leopards. In case the results are not satisfactory, other options exist in the form of makes that offer Iridium satellite phone technology. Vectronic AerospaceTM and LotekTM are the two companies that manufacture GPS collars with Iridium communication technology. The price and download costs from these collars needs to be obtained for appropriate comparison before ordering them.

FIELD MONITORING AND RADIO-TRACKING

After the capture and collaring, the snow leopards will be closely monitored using both, the on-ground VHF option as also the satellite based option. The locations will continuously be plotted on a suitable GIS map. In case reliable internet access in not possible in the field, constant communication will be maintained between field researchers and the headquarters to provide satellite data to the field personnel.

A detailed spatial database of the entire region will be developed that will include layers on topography, vegetation, wild and domestic prey species, and disturbance gradients and managed in Arc Info and Manifold softwares.

ANALYSIS

Home range and movements: The seasonal home ranges of snow leopards will be calculated using the minimum convex polygon and adaptive kernel methods (Worton 1989, Dixon & Chapman 1980) on Arc Info[™]. The 55% 'core' adaptive kernel polygons will identify the high use areas for each individual. Appropriate analysis such as C-scores will be used to calculate spatial overlap between seasonal ranges (core and overall) of different individuals (Stone & Roberts, 1990). Daily movements will be calculated based on straight line distance between subsequent locations.

Habitat selection: The habitat attributes of the 'cores' and the home ranges will be analyzed using the compositional analysis approach (Aebischer et al. 1993) to come up with the important variables and hierarchy of selection. Simultaneously, multivariate tools will be used to explore habitat selection patterns of the snow leopard. Resource selection functions (RSF) will be generated based on data from individual snow leopards and will be used to model ideal snow leopard areas in the larger landscape (Manly et. al. 2002).

Population of snow leopards will be assessed through an integration of the ongoing study based on mark recapture techniques using camera trapping and genetic tools as also the home range estimates from this study. Results obtained from camera trapping studies will also be compared with occupancy data (MacKenzie 2006) collected along side to establish the relationship between the two in order to monitor the populations over time as recommended by Chundawat and Sharma (2008).

Field staff of the Forest Department will be involved in all important aspects of the project, and trained in these aspects of capture and monitoring. Members of the local community, particularly youth, will also be involved in the implementation and monitoring of this project.

EXPECTED OUTCOMES

- Reliable and accurate information on ranging and movements of snow leopards, especially 0 with respect to different disturbance gradients.
- Model of snow leopard distribution in Spiti and other parts of the state with a stratification of 0 areas based on habitat quality.
- Better population estimates for the landscape, Spiti, the state and maybe the Western 0 Himalaya based on clearer understanding of snow leopard densities across different topographic and human disturbance gradients.
- Role of disturbance in affecting snow leopard habitat use. 0

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SPITI, HIMACHAL PRADESH (This is also included in the Research Centre Budget above (Appendix I) and the Master Budget **GRADIENT IN** A HUMAN PRESSURE UNDERSTANDING SNOW LEOPARD RANGING ALONG Request below (Appendix III)) **[able:**

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Sr. No.	Detail	Year 1 (Rs.)	Year 2 (Rs.)	Year 3 (Rs.)	Year 4 (Rs.)	Year 5 (Rs.)	Total Amount (Rs.)
-	Salaries and Wages						
	Stipend for researcher (2)	288,000	360,000	432,000	432,000	432,000	1,944,000
	Wages for Field assistants (4)	192,000	192,000	240,000	120,000	0	744,000
	Daily wages	10,800	10,800	10,800	0	0	32,400
2	Equipment & data						
	Telemetry equipment	2,000,000	0	0	0	0	2,000,000
	Camping	150,000	0	0	0	0	150,000
	Field equipment	100,000	50,000	0	0	0	150,000
	Fuelwood, etc	50,000	530,000	30,000	10,000	0	620,000
	Computers (2)	60,000	60,000	0	0	0	120,000
	Satellite location data (c.Rs.4000pm for 4yrs)	48,000	48,000	48,000	48,000	0	192,000
ŝ	Travel						
	Long distance travel	100,000	100,000	100,000	50,000	50,000	400,000
	Local travel & vehicle hiring	150,000	150,000	150,000	50,000	0	500,000
4	Training workshop (2)	0	50,000	0	0	100,000	150,000
5	Consumables	50,000	50,000	50,000	50,000	50,000	250,000
9	Reporting and printing	20,000	20,000	20,000	20,000	150,000	230,000
\sim	Miscl.	30,000	30,000	30,000	30,000	30,000	150,000
		3,248,800	1,650,800	1,110,800	810,000	812,000	7,632,400

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• Study Team from Wildlife Wing, HPFD and NCF A suitable team from the Wildlife Wing, HPFD.

From NCF-SLT the following will be involved in a primary role. Other scientists and researchers will be involved based on need. Suitable research scholars will be hired for the project.

Charudutt Mishra, PhD, Director, Science & Conservation, SLT and Senior Scientist, NCF. Has initiated some seminal studies on high altitude ecology, conflict management and conservation. Authored over 50 peer reviewed scientific papers, conference presentations and technical reports. Yash Veer Bhatnagar, PhD. Director, India Program, SLT and Senior Scientist, NCF. Has about 20 years of research and conservation experience in Spiti and other parts of the Indian Himalaya. Authored over 30 peer reviewed scientific papers, conference presentations and technical reports. Both, Dr Mishra and Dr Bhatnagar are involved from conception to implementation in formulating the innovative conservation program for the high altitudes, the Project Snow Leopard, along with the state governments of the five Himalayan states and the Ministry of Environment & Forests, GOI.

APPENDIX 9.1: THE CHAPTER 7 OF THE PSL DOCUMENT (ANON 2009) STATING THE ADMINISTRATIVE STRUCTURE OF THE PROJECT SNOW LEOPARD.



Himalaya tahy (Hemitragus jemlahicus

National-level: At the MoEF, a national steering committee with representation of MoEF officials, Governmental and Non-governmental research institutions, and the Forest Departments of Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh, will co-ordinate the Project Snow Leopard. This committee may invite qualified scientists specializing in human ecology/ sociology/ tribal affairs to be a part of the steering committee. The steering committee will be responsible for general direction setting, overseeing, funds generation and disbursement, and facilitating periodic monitoring and evaluation of the Project Snow Leopard. The steering committee will also ensure transparency and periodic information dissemination pertaining to the programme at a national level. The steering committee will also administer a small grants programme aimed at enabling the direct participation of community based organizations, NGOs, and research and conservation institutions in effecting research and conservation initiatives and capacity enhancement particularly at the local community-level.

PPEN

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Bara shigri glacier, Labul, HP

The Nature Conservation Foundation and the Wildlife Institute of India will respectively be the primary non-governmental and governmental institutions providing constant technical support and advice to the national steering committee and the states. At the initiation of the Programme, they will jointly work to develop guidelines and frameworks for landscape-level, knowledge-based and participatory management planning as outlined in section 5 & 6 above.

State-level: At the state-level, the Chief Wildlife Warden will set up a State Snow Leopard Conservation Society for this purpose, including senior forest officers managing snow leopard landscapes, other relevant governmental departments such as tourism and animal husbandry, the army and paramilitary forces, representatives of NGOs active at the state-level, and community-based organizations. The Society may also seek the advice, support, participation and assistance of reputed individuals and institutions that it believes can provide scientific and technical expertise. The Society, chaired by the Chief Wildlife Warden, and represented by diverse stakeholders such as other government departments and community based organizations, scientists and conservationists, will provide greater focus and thrust to the programme, as well as enable the states to raise additional funds for wildlife conservation in the snow leopard landscapes. This Society will be the primary body responsible for implementation of the Project Snow Leopard at the state-level. It will send consolidated proposals and annual budgets and obtain funds from the national steering committee and provide it to the landscape-level management committees (see below). The Society will also be responsible for ensuring transparency and information sharing regarding the programme at the state-level, as well as get periodic financial and work audits by appropriate and reputed research

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bodies or committees. Once in five years, the Society will facilitate a work audit by the national steering committee or any other body designated by the latter for this purpose.

Each State Snow Leopard Conservation Society will designate landscape-level implementation committees with representation of serving officers (CF/DCF level) from the various wings of the Forest Departments, other appropriate governmental departments including the relevant senior officials of District Administration, locally active NGOs, a representative of tourism operators, community-based organizations and the member secretary of each of the local village-level committees nominated by the Village councils/ Gram Sabhas (that are important stakeholders at the landscape-unit level; see below). The committee will be headed by a senior officer of the Forest Department (CF/DCF). It is recognized that the role of local NGOs, and communitybased organizations including religious bodies is extremely important for effecting project activities, and these must be given adequate representation in the landscape-level committees. These committees will assist in the development of integrated landscape-level management plans based on the landscape-level management planning guidelines mentioned above. The committees will be responsible for implementation of landscape-level conservation activities, mobilizing and capacity enhancement of village/ landscape unit-level bodies (see later) and in formally organizing them in case they are traditional and informal village management bodies, selection and training of community-protection forces, and for overseeing, facilitating and monitoring the conservation activities and management programmes at the community/ village/ landscape unit-level. Where the landscape is large and jurisdictionally divided between different wings of the Forest Department, more than one implementation committee may be designated. These committees will also serve as the link between village/landscape unit-level bodies and the State Snow Leopard Conservation Society. The committees will collate and submit annual work and financial reports to the Society, as well as provide annual work proposals and budget estimates.



Rhododendron setosum in alpine tracts of Sikkim

Rheum nobile in northern Sikkin.

APPENDIX





It is recognized that over most of the snow leopard landscape within India, the local communities have a near pervasive presence and are amongst the most important conservation stakeholders. It is also recognized that considerable village and land use administration and decisionmaking in this landscape is the responsibility of traditional and democratic, albeit informal, village councils. In all areas where local human communities have a presence, traditional rights or resource use access, these hitherto informal village councils or the Gram Sabha becomes one of the primary

Lizard in western Kashmir

institutions, alongside the Forest Department, for planning and implementation of the Project Snow Leopard at the landscape unit level. The Village Councils/Gram Sabhas, together with the Forest Department, will constitute village-level management and implementation bodies, to be called Village Wildlife Conservation Committees, for implementation of the Project Snow Leopard activities. Facilitating the capacity development of these village-level committees, including assistance in formally organizing them, training in accounting and book-keeping etc. will be the responsibility of the landscape-level committees. One front-line Forest Department staff will be represented in these village committees. The Village Council/ Gram Sabha may choose to either take on the responsibilities of the committee itself, or designate any existing village-based institution (such as youth clubs) for this purpose. One member from each family in the village will have the option of becoming a member of such a body, which will also ensure the equitable representation of existing classes and gender. Where the village size is very small (< 10 families), the Village Council/Gram Sabha may, together with the Forest Department, decide to have a combined Village Wildlife Conservation Committee with one or more neighbouring villages. On the other hand, if the quality and area of wildlife habitat within the resource use catchment of the village is relatively high, independent village committees may be desirable even in small- sized villages. The Village Council/ Gram Sabha will designate either a Panchayat member or any other collectively chosen suitable person from the village as a member secretary of this body.

All landscape unit-level wildlife conservation and community-based management initiatives will be undertaken and implemented by the Village Wildlife Conservation Committees and their capacity enhancement will be one of the primary responsibilities of the larger landscape-level committee. The committees will participate integrally in developing landscape unit-level management microplans. The work of the Village Wildlife Conservation Committee will include but need not be restricted to community-based management of human-wildlife conflicts, incentive and alternate income generation programmes, setting up of small 'core' areas on traditionally used rangelands



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with community participation (see section 5), participation in monitoring programmes for wildlife habitats, populations and human socio-economy, and nomination of suitable members for community protection forces. It is recognized that a different approach will be needed in the case of nomadic pastoralism, as well as in the few areas where high altitude landscapes are habitation free but people in the lower altitude villages use the higher altitude landscape for certain kinds of natural resource extraction.

PSL Body	Constituents
National	
Project Snow Leopard National Steering Committee	MoEF officials, Governmental and Non-governmental research institutions, and the Forest/Wildlife Departments of five Himalayan states. Qualified scientists specializing in human ecology/ sociology/ tribal affairs to be a part of the steering committee. (For the first 5 years this the PSL drafting committee will serve as the steering committee)
State	
State Snow Leopard Conservation Society	Chaired by the Chief Wildlife Warden, including senior forest officers managing snow leopard landscapes, other relevant governmental departments such as tourism and animal husbandry, the army and paramilitary forces, representatives of NGOs active at the state-level, and community-based organizations. The Society may also seek the advice, support, participation and assistance of reputed individuals and institutions that it believes can provide scientific and technical expertise
Landscape	
Landscape-Level Implementation Committees	Field officers (CF/DCF level) from the appropriate wings of the Forest Departments, other appropriate governmental departments including the relevant senior officials of District Administration, locally active NGOs, a representative of tourism operators, community-based organizations and the member secretary of each of the local village-level committees nominated by the Village councils/ Gram Sabhas. Local leaders may be special invitees for the meetings as seen appropriate
Village /Village Cluster	Participante and the second seco
Village Wildlife Conservation Committee	Traditional Village Councils/Gram Sabhas, frontline Forest Department staff representative

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Project Snow Leopard will be treated at par with other flagship species programmes of the country



APPENDIX 9.2 (A): (AUTHORITATIVE ENGLISH TEXT OF THIS DEPARTMENT NOTIFICATION NO. FTS-II (B)-15-10/87 DATED 23.8.2001 AS REQUIRED UNDER CLAUSE (3) OF ARTICLE 348 OF THE CONSTITUTION OF INDIA)

Notification

No. Fts. II (B) 15- 10/87

Dated 23.08.2001

In exercise of the powers conferred under Sections 80 read with section 81 of the Indian Forest Act, 1927 (Act No. XVI of 1927), the Governor of Himachal Pradesh is pleased to make the following regulations, namely:

- 1. Short title, application and commencement
 - (1) These regulations may be called the Himachal Pradesh Participatory Forest Management Regulations, 2001.
 - (2) They shall apply to such Government forests and such Government lands including the common land, which shall be selected jointly for Participatory Forest management by the Society and the Department.
 - (3) They shall come into force from the date of publication in Rajpatra, Himachal Pradesh.
- 2. Definitions In these rules, unless there is anything repugnant in the subject or context,
 - (a) "Act" means The Indian Forest Act, 1927, (Act No.16 of 1927) as amended in its application to Himachal Pradesh;
 - (b) "Conflict Resolution Group" means a group consisting of a representative of the concerned Gram Panchayat, a representative of the local non-government organizations or local community based organizations and the concerned Assistant Conservator of Forests;
 - (c) "common land", "family", "Gram Panchayat", "Panch", "Pradhan",
 "Village" and "Ward" shall have the meanings respectively assigned to them in the Himachal Pradesh Panchayati Raj Act, 1994 (Act No.4 of 1994);
 - (d) "Department" means the Himachal Pradesh Forest Department.
 - (e) **"Divisional Forest Officer**" means the forest officer in-charge of a territorial or wildlife forest division of the Department ;
 - (f) **"Executive Committee**" means executive body of the Society;
 - (g) "Forest Officer" means a Forest Officer as defined under sub-section (2)

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- (h) "General House", means General House of the Society;
- (i) "Government" means Government of Himachal Pradesh;
- (j) "Grazier group" means a group of persons, whether resident members or migratory graziers, who are dependent on the grazing resource in the selected area for meeting their livelihood needs;
- (k) "Micro-plan" means a holistic forest management and development plan of the area selected for participatory management;
- (l) **"participatory forest management"** means management of Government forest and Government land including common land managed jointly by the Society and by the Department;
- (m) "selected area" means any Government forest and Government land including common land selected under regulation 3 of these Regulations;
- (n) "self help group" means any organized group of persons, who collectively by mutual help are able to enhance their economic status through resource based activities;
- (0) **"site specific plan"** means a sub component of the micro-plan which is a technically appropriate plan for the site;
- (p) "Society" means village forest development society registered under section 3 of the Societies Registration Act, 1860 (Act No.21 of 1860) for participatory forest management;
- (q) **"sustainable forest management"** means management which is economically viable, environmentally benign and socially beneficial, and which balances present and future needs; and
- (r) **"user group"** means a group of persons dependent upon a common natural resource for sustaining its livelihood need

3. Intent of Participatory Forest Management

- (1) On an application made to the Divisional Forest Officer signed by at least 50 percent of the voters of a Gram Panchayat Ward, any Government forest and Government land including common land may be brought under participatory forest management. The land so identified shall be known as selected areas.
- (2) In accordance with the wider objectives and plans of Government for sustainable forest management, the selected area shall be managed jointly by the Society and the

Department on the terms and conditions of an agreement to be entered between the Society and the Department.

4. Village Forest Development Society

- (1) There shall be a Society for a Gram Panchayat Ward. However, where the Ward is not compact and the hamlets within it do not have common forests, common grazing lands, common rights and concessions, more than one Society may be formed for each cluster of hamlets. The Society shall be registered under section 3 of the Societies' Registration Act, 1860 (Act No.21 of 1860).
- (2) All voters of a Gram Panchayat Ward shall be entitled to be enrolled as members of the Society.

Constitution of Executive Committee of the Society. The Executive Committee shall consist of -

	(a) President		- to be elected by General House;
(b)	Vice President	-	to be elected by General House;
(c)	Four Members	-	to be elected by General House;

(d) Treasurer - to be nominated by the elected members from amongst the members of the Society;

(e) Joint Secretary (wo	man)	-do-	
(f) Ward Panch	-	ex-officio member;	
(g) President	-	Mahila Mandal -do-	
(h) Representative	-	Local women group -do-	

(i) Three Members - to be co-opted from the village level committees constituted by other departments of the Government, societies registered under the Societies Registration Act, 1860, (Act No.21 of 1860); user groups, self help group and grazier group;

(j) Member-Secretary - to be elected by the General House.

Provided that at least 7 members of the Executive Committee shall be amongst the women. Joint Secretary shall assist the Member-Secretary.

6. Term of office of members of the Executive Committee. Elected members of the Executive Committee shall hold office for a period of two years from the date of assumption of office.

7. **Powers of the Executive Committee.-** Elected members of the Executive Committee shall hold office for a period of two years from the date of assumption of office.

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- Usufruct Sharing .- The Society shall be entitled to the following benefits, namely:-
 - (g) to collect the yield such as fallen twigs, branches, loppings, grass, fruits, flowers, seeds, leaf fodder and non timber forests products free of cost;
- (h) to the sale proceeds of all intermediate harvest, subject to protection of forest and plantations for at least 3 years from the date of agreement;
- to organize and promote vocational activities related to forest produce and land; and other activities such as promotion of self help groups which may provide direct benefits, including micro-lending to women. None of the activities so promoted shall affect the legal status of the forest land;
- (j) recorded rights over the forest shall not be affected by these benefits;
- (k) the Government shall charge no royalty on the forest produce within the selected area;
- (l) after 5 years, the Society may expand the area, on the basis of a fresh agreement deed, by inclusion of adjoining or nearby areas;
- (m) after 20 years from the date of agreement and, based on the principles of sustained forest management, 75 percent of the net sale proceeds from the selected area shall be put into the account of Society and the remaining 25 percent of the net sale proceeds shall go to the concerned Gram Panchayat; and
- (n) to utilize at least 40 percent of the sale proceeds on forest regeneration activities including soil and water conservation.

Provided that for the purpose of usufruct sharing family shall be one unit.

9. Funds Funds shall be generated by the Society through contributions by members and sale of usufructs under these regulations. All funds, including those received from the Government, Gram Panchayats and non-government sources, shall be utilized through the micro-planning process.

10. Maintenance of accounts. The sum received by the Society shall be deposited in the name of the concerned Society in a nationalized bank or scheduled bank or co-operative bank or post office and the account shall be operated under the signatures of the President, Treasurer and Member-Secretary of the Society.

11. Grant-In-Aid. The department shall release Grant-In- Aid to the Society under the Grant-In-Aid Rules subject to the availability of funds and satisfactory performance of functions by the Society.

12. Settlement of dispute. In case of any dispute in relation to usufruct sharing in the Society, the Deputy Ranger concerned of the Department, shall take steps to reconcile the dispute. In case the dispute is not resolved, the Deputy Ranger shall refer the dispute, along with his report to the Ranger Officer concerned of the Department. The Range Officer, after hearing the parties, shall resolve the dispute within 30 days from the date of receipt of report of the Deputy Ranger.

13. Appeal. An appeal shall lie from the decision of the Range Officer the Conflict Resolution Group to be filed within 30 days from the date of decision, who shall decide the same within 60 days from the date of filing of appeal, after affording an opportunity of being heard to the parties. The decision of the Conflict Resolution Group shall be final and binding on the parties. The Conflict Resolution Group shall send a copy of the decision to the Society and the Divisional Forest Officer concerned free of cost.

14. Preparation of micro-plans:

(1) A micro-plan shall be prepared for the holistic forest management and development of the selected area, by the Society. The Department shall help the Society in preparation of the micro-plan. A micro-plan shall be operative for a period of five years from the date of its approval by the Divisional Forest Officer and may be revised after three years. The micro-plan shall be passed in the general house with at least 60 percent majority of the members present.

(2) The Divisional Forest Officer may approve whole or part of the micro-plan.

15. Powers of the Government.- Notwithstanding anything contained in these regulations, the Government shall have the powers to issue directions to the Society on participatory forest management processes, micro-planning, co-ordination, monitoring, grant-in-aid and implementation mechanisms.

By order

FC- cum-Secretary (Forests) to the

Government of Himachal Pradesh

Endst. No. As above

Dated, Shimla-2, the 23.8.2001.

Copy is forwarded to the following for favour of information and necessary action.

- 1. The Secretary, Government of India, Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi-3.
- 2. The FC-cum-Secretary (Finance-Reg.) to the Government of Himachal Pradesh Shimla-2, with 3 spare copies.
- 3. The Pr.Chief Conservator of Forests, H.P. Shimla-1, with 20 spare copies.
- 4. The Addl. PCCF, HP Shimla-1.

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APPEND

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- The Accountant General (Audit), HP Shimla-3 with 5 spare copies.
- 6. All CCFs in Himachal Pradesh.
 - The Conservator of Forests, Planning, HP Shimla-1.
 - The Controller (P and S), HP Govt. Press, Shimla-5, for publication in the Rajpatra.
 - The Asstt. Controller (FandA), O/o PCCF, HP, Shimla-1.
 - Guard File.

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Addl. Secretary (Forests) to the Government of Himachal Pradesh

APPENDIX 9.2 (B): NOTIFICATION: THE GOVERNOR, HP IS PLEASED TO PROMULGATE THE FOLLOWING RULES REGULATING PAYMENT OF GRANT-IN-AID TO THE VILLAGE FOREST DEVELOPMENT SOCIETIES UNDER THE PARTICIPATORY FOREST MANAGEMENT (PFM) SCHEMES OPERATIVE IN HIMACHAL PRADESH.

RULES

1.	Short Title and Extent	(i)	These Rules may be called "Rules Regulating the Grant-in-Aid to the Village Forest Development Societies under the PFM schemes in Himachal Pradesh.	
		(ii)	These Rules shall come into force immediately.	
2.	Definitions		In these Rules, unless there is any thing repugnant in the subject or context:	
			'Department' means the Himachal Pradesh Forest Department.	
			'Govt.' means the Government of Himachal Pradesh.	
			'Revenue' means the revenue administered by Himachal Pradesh Govt.	
			'Secretary' means the secretary to the Govt. of Himachal Pradesh in the Himachal Pradesh Forest Department.	
			'Conservator' means the Conservator of Forests of the Circle concerned.	
			'DFO' means the Divisional Forest Officer of the Division concerned.	
			'PFM' means Participatory Forest Management.	
			'Society' means Village Forest Development Society.	
3.	Purpose of the Grant-in- Aid		The purpose of Grant -in-aid is for the furtherance of objectives of PFM and its implementation through the Societies. The assistance in the shape of Grant -in-Aid would be meant for expenditure on plantation and pasture improvement, soil and water conservation, income generation activities, maintenance, fencing, protection etc., subject to the availability of funds, and based on such norms, and for such other purposes, as may be decided by the Govt. from time to time. All Grant- in-Aid disbursal will be guided by transparent norms, framed in advance, to govern not merely the unit of cost of different activities, but to also specify maximum costing for amounts for different activities and individual Societies would be entitled to.	

4. 5.	Mode of Payment		The amount of Grant-in-Aid shall be sanctioned and released <u>quarterly</u> by the DFO, keeping in view both, the norms and, within these, the requirement of the society, as well as available funds, on receipt of a written request for the Society, indicating the purpose for which it is required. Normally a self-contained proposal containing the demand for the whole year shall be furnished by the Society by 30 th April every year for scrutiny of the DFO, prior to sanction. The sanction of the Grant -in-Aid shall be subject to following
	Sanction of Grant -in-Aid		conditions:
			That the DFO shall have right to check the accounts of the Society, to satisfy himself that the Grant-in -Aid has been spent for the purpose for which it has been sanctioned. In case it is found that the Grant-in-Aid has been mis-utilised, it will be open to the DFO to recover the aid from the Society, and to stop further payment.
			The assets acquired wholly or substantially out of Govt. grants would not, without the prior sanction of the Govt., be disposed of, encumbered or utilized for purposes other than those for which grants are sanctioned. The Society shall maintain a register in the form (as in Annexure-A) in respect of the permanent and semi-permanent assets acquired wholly or mainly out of Govt. grant. This register should be maintained by the Society separately in respect of each sanctioning authority to whom a copy thereof will be furnished annually for permanent record. The assets would be taken to means all immovable and movable property of capital nature where the value exceeds Rs. 1000/- Library books and articles of furniture will not, however, be included in it.
6. Maintenance of (i) and Accounts Submission of Utilisation Certificates		(i)	The Society shall maintain its accounts and records, and the same will be open to inspection by the nominee(s) so deputed by the Government.

		(ii)	An un-audited utilization certificate will be furnished
			by the Society in respect of Grant-in-Aid released to the Society during a particular year by 15 th April of next year, as per form in Annexure-B, to the sanctioning authority, who will furnish the same to the Accountant General HP. The account in respect of the Grant-in-Aid released to the Society for PFM activities during a particular year, under various PFM schemes, will be furnished by the DFO to the Accountant General (Audit) HP by the end of September of the next/ following year of sanction of Grant-in-Aid. The PFM account of the Society will be audited by a qualified Accountant, or any other agency approved by the Government, before December next, in order to ensure proper utilization of the amount of the Grant-in- Aid released by the department to the Society. Thereafter the Society will submit one copy of the audited utilization certificate in respect of each project activity to the DFO. The quarterly installment in respect of the Grant -in-Aid for a particular year will be released by the DFO on the basis of un- audited utilization certificate furniched by the Society
7.	Miscellaneous		In order to ascertain the utilization of funds
			released to Societies by DFOs under various microplan activities, the Conservators shall furnish a half-yearly report on a prescribed format to the CCF-PFM.
8.	Head of Account		The expenditure on account of payment of Grant-in-
			Aid is to be charged under Head 2406 Forestry and Wild Life (Plan)- 01 Forestry - 800 Other Expenditure-06-SOON and 06-SOOS- under those schemes as may be included under PFM.

By order

FC-cum-Secretary (Forests)

to the Govt. of Himachal Pradesh.

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APPENDIX

APPENDIX 9.1(C) GOVERNMENT OF HIMACHAL PRADESH DEPARTMENT OF FOREST

File No FFE-C (9).1/2001

Dated 23.8.2001

NOTIFICATION

PPEN

1.

The Governor of Himachal Pradesh is pleased to promulgate the following scheme for sustainable management of forest resources in the State in collaboration with the local communities, namely:

- This scheme shall be called Sanjhi Van Yojna Scheme, 2001.
- 2. It shall come into force with immediate effect.

3. The existing Sanjhi Van Yojna Scheme, 1998, the Parisharam Hamara Van Hamara Scheme, 2000 and the Apna Van, Apna Dhan Scheme, which was to be launched during the year 2001 shall stand clubbed with the Sanjhi Van Yojna Scheme, 2001.

- 1. **Objectives:** The present scheme shall have the following objectives:
- Involvement of grass root level institutions such as gram panchayats, mahila mandals, yuvak mandals, ex-servicemen's bodies, schools, Village Forest Development Societies (VFDSs), User groups, other Community Based Organisations (CBOs) and NGOs in sustainable management of forest resources;
- (11) Grant of 100 % income from plantations to the VFDSs and Panchayats;
- (111) Grant of total usufruct rights to the VFDSs;
- (11) Regeneration of degraded forest areas and conservation and sustainable use of better forests through community involvement.
- (ϖ) Involvement of local communities in the choice of species to be planted under the scheme;
- (σι) Creation and enhancement of social, physical and financial capital of the participating communities for poverty reduction;
- $(\varpi \mathfrak{u})$ Special emphasis on involvement of women in the scheme;
- ($\varpi u \iota$) Address problem of rural unemployment by utilising degraded forest land for large scale plantations;
- (ιξ) Establish linkage between Food for Work Programme and the present scheme by making payments in the shape of food grains under the scheme;

- (ξ) Increasing productivity of the Forest areas by improvement of nursery stock and adoption of mixed plantations.
- (ξι) Training of forest staff, VFDS members and CBOs / NGOs for facilitating and strengthening community participation.
- (ξιι) Gradually empower local communities and local level institutions to become more pro-active in sustainable forest management.
- (ξιιι) To help VFDSs achieve financial viability and sustainability by introducing proper mix of short and long duration cropping patterns as a short and long term objective to ensure their continued participation in the scheme.

2. Strategy

- 1. Recognise that participatory processes are critical to Sustainable Forest Management in HP.
- 2. Recognise that to institutionalise participation, strengthening of local institutions like the Panchayat, Forest Development Societies, User groups etc., *and* the forest department is essential.
- 3. Recognise the link between rural poverty reduction and the sustained and increasing availability of forest resources and access to them for the rural communities particularly the poor, to target pockets of poverty in the state.
- 4. Recognise that the role of the HPFD, as the main facilitating agency for PFM, will need to be complemented by a regular, equitable participatory system through which stakeholders on their own meet, debate strategic issues, consider optimal solutions and form partnerships. In strengthening the latter, the engagement of Non Governmental Organisations (NGOs) and Community Bases Organisations (CBOs) would be encouraged.
- 5. Recognise that Gender issues form a thematic concern in PFM. Thus a gender sensitive approach will need to be adopted within the HPFD and amongst the organised community groups involved with PFM.

3. Implementation

The scheme shall be governed by the PFM Rules, 2001 promulgated vide Notification No. Fts. II(B)15.10.87 dated 23.08.2001.

4. Coverage

- (1) To begin with the existing 364 VFDSs and 153 VFDCs formed earlier under the Sanjhi Van Yojna and the Himachal Pradesh Forestry Project in Kullu and Mandi shall be brought under the umbrella of this scheme;
- (\mathfrak{u}) The scheme shall be extended to other areas subsequently.

(111) In tribal areas of the state the scheme shall be implemented from the current financial year i.e. 2001-02.

Process Approach

Since Participatory Forest Management entails a process approach, the Sanjhi Van Yojna scheme shall not be target driven. For the long-term success and the sustainability of the village level institutions, it is important that proper and adequate methods of community organisation and management are followed. Thus, normally in the first year where the scheme is introduced, major emphasis will be on the systematic and sequential formation of VFDSs, training of staff, CBOs and community members. Towards the end of the first year, a well documented but simple and understandable micro-plan needs to be ready for approval and implementation during the next year. The procedure for approval of micro-plans as laid out in the PFM processes has to be strictly followed. The forest department may also begin creation / extension of nurseries in the first year so that plants are ready in the second year.

6. Funding

- (1) The funding under Sanjhi Van Yojna scheme to the VFDSs for works to be carried out by them shall be made in the form of Grant-in-Aid (GIA) to the concerned society by the Divisional Forest Officer (DFO) concerned.
- (11) The Grant-in-Aid will be governed and regulated as per the GIA Rules notified vide Notification No. FFE-B-(G)9-6/99 dated 31.05.2000.
- (111) The GIA will be deposited in the bank account of the VFDS and unspent funds shall be allowed to roll over to the next financial year.

7. Contribution by the VFDSs

On the pattern of *Vikas Mein Jan Sahyog* policy of the Government, each VFDS shall be required to make a cash contribution of 15 % of the annual outlay under the approved micro-plan. This contribution can be made in instalments during the year provided each instalment will be 15 % of the GIA being released to the VFDS at one time. In the case of plantation work this contribution can be in the form of *shramdan* and deducted from the wage bill for the plantation work.

8. Maintenance

The maintenance of physical assets created shall be the responsibility of the VFDS concerned. For plantations, however, the forest department shall continue to supply planting material to the VFDS on demand, free of cost for three years including the year of plantation. Thereafter, for any more supply of plants price will be charged from the VFDS.

9. Income Generation Activities

 In order to enhance the economic stake of rural communities in the conservation and sustainable utilisation of forest resources as well as to create means of income for the VFDS and its members, forestry related income generation activities be promoted under Sanjhi Van Yojna scheme. Such activities may include water harvesting and its use for irrigation / drinking purposes. *In situ* or *Ex situ* growing of medicinal plants of high economic value within the selected areas or even on private lands. Value addition to medicinal raw drugs through simple semi- processing etc., and training in these. Introduction of improved grasses and development of village pastures. High-density fuelwood / fodder plantations. These examples are illustrative only and suitable income generation activities can be adopted as per the local conditions.

(u) The income generation activities, however, may commence only in the second or third year of the micro-plan. The proportion of funds earmarked to support income generation activities shall be as enumerated in the subsequent paragraphs.

10. Input Sharing Arrangement

- (1) The HPFD shall encourage social fencing by the VFDS as a matter of policy. Wherever necessity of physical fencing arises it will be done by using local materials like bushes etc. In order to encourage social fencing, funds that are normally spent on fencing, including cost of materials, will be made over to the VFDSs. The VFDS's shall then be free to use this money for protection of the plantations as they deem fit.
- (11) Tools, implements and other material required for carrying out activities under the approved micro-plans will be arranged by the VFDS.

11. Usufruct Sharing

- (1) 100 % of forest produce including NTFPs and all intermediate harvest from the closed area(s) shall go to the VFDS.
- (11) 75 % of the final harvest will go to the VFDS and 25 % to the Panchayat. However, out of its share of 75 % from the final harvest, 40 % shall be earmarked to regeneration / conservation activities within the closed area(s) of that VFDS.

12. Norms for allocation of budget

The statement of annual plan of operations under various micro plans will be submitted by the DFOs to their respective Conservators, who will scrutinize these APOs vis-à-vis Micro plans submitted to them and will allot the budget accordingly. Component wise allocations will be made as per the ratio proportions given in the following table.

However, in the first and second year of the execution of the scheme, emphasis shall have to be placed on the initial processes of establishing nurseries, preparation of the micro-plans, soil and moisture conservation measures, workshops, and training. This will help achieve sustainability. Accordingly in the first two years of the scheme, the budget allocation will be at variance from the norms given in the table below:

Table showing norms for allocation of budget

	S No	ACTIVITY		PROPORTION OF BUDGET
X	1	Lump sum	Preparation of MP	Rs. 5000/- for each MP
DI	2	Micro plan activities. 80%	Plantation incl. grasses, NTFPs	60%
LEN		(of this 15 % is to be contributed by the VFDS)	Soil and Water conservation	15%
			Income Generation Activities	25%
	3	Departmental Expenditure 20%	Establishment of Nursery	50%
A			Trainings	20%
			Workshops	10%
			Monitoring	10%
			Contingencies	10%

By Order

(Avay Shukla)

FC – cum – Secy. (Forests) to the

Govt. of Himachal Pradesh

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