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Abstract: The publication of this manual aims sharing and facilitating the study on snow leopard and its prey species among mid-level professionals interested in conducting fieldwork on their own. The manual is derived from the 1996 "Snow Leopard Survey and Conservation Handbook" written by Dr. Rodney Jackson and Dr. Don Hunter and published by International Snow Leopard Trust (ISLT) based in Seattle, Washington, USA. The first section introduces the topic, the second and third section deal with presence/ absence and abundance survey methods. The various survey-forms with instructions are given in the annexes.



# **Snow Leopard Manual**

**Field Study Techniques  
for the Kingdom of Nepal**



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# **Snow Leopard Manual**

**Field Study Techniques  
for the Kingdom of Nepal**



This report was compiled and prepared by Mr. Shyam Bajimaya, Department of National Parks and Wildlife Conservation for WWF Nepal Program with technical support from the International Snow Leopard Trust, Dr. Rodney Jackson, Snow Leopard Conservancy and Ms. Kirsten Froede.

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## Foreword

The snow leopard (*Uncia uncia*), the “Mountain Queen” is a legendary elusive mega-species across the widespread mountains of Central Asia for conserving the rich biodiversity. The snow leopard, a single species genus and an endangered cat at the apex of the food-chain, is considered an indicator of healthy mountain ecosystems. The snow leopard still remains a little studied animal throughout its range states. There is an urgent need of precise documentation on both its biology and its interaction with human activities. An understanding of the past and current trends of snow leopard and its prey number is vital for long-term conservation of its prey and its habitat.

On one hand, the pressure of human activities increasingly threatens protected areas, and on the other hand, protected area managers find it difficult to convince local people to protect an animal that may kill their valuable livestock. Therefore, the Eighth International Snow Leopard Symposium held in Pakistan in 1995, embraced collaborative efforts towards Snow Leopard and biodiversity conservation in Central Asia. Thus, cooperation of all conservation partners including local community is vital to securing the future of the snow leopard and its habitat.

In course of such efforts, a field workshop on snow leopard and its prey census techniques had been organized in Shey-Phoksundo National Park, Dolpa in 1999. Subsequently, a field survey of snow leopard and prey species was conducted in the park and its adjoining areas. The publication of this manual aims at sharing and facilitating the study on snow leopard and its prey species among mid-level professionals interested in conducting fieldwork on their own. The manual is

derived from the 1996 "Snow Leopard Survey and Conservation Handbook" written by Dr. Rodney Jackson and Dr. Don Hunter and published by International Snow Leopard Trust (ISLT) based in Seattle, Washington, USA. The first section introduces the topic, the second and third sections deal with presence/absence and abundance survey methods. The various survey-forms with instructions are given in the annexes.

At this moment, we would like to express deep appreciation to ISLT for providing technical assistance and WWF Nepal Program for supporting the initiative. We also like to mention that Shyam Bajimaya deserves particular credit for preparing the manual manuscript. We extend our sincere thanks to Dr. Rodney Jackson, former Conservation Director, ISLT for his technical and his substantive role in helping to develop and review the manuscript whose inputs have contributed to the comprehensiveness of the manual.

We hope that this manual will be of immense value to field practitioners and students alike for censusing snow leopard and its prey species. This will also help to catalyze the capacity building program of the concerned department to undertake field surveys in Nepal's National Parks and Protected Areas.

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# List of Acronyms

ACAP	Annapurna Conservation Area Project
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
DHR	Dhorpatan Hunting Reserve
DNPWC	Department of National Parks and Wildlife Conservation
GPS	Global Positioning System
HMG	His Majesty's Government of Nepal
ISLT	International Snow Leopard Trust
IUCN	The World Conservation Union
KCAP	Kanchenjunga Conservation Area Project
KMTNC	King Mahendra Trust for Nature Conservation
LNP	Langtang National Park
MBNP	Makalu Barun National Park
MCA	Manaslu Conservation Area
MFSC	Ministry of Forest and Soil Conservation
NMCP	Northern Mountains Conservation Project
PA	Protected Area
SLC	Snow Leopard Conservancy
SLIMS	Snow Leopard Information Management System
SNP	Sagarmatha National Park
SPNP	Shey Phoksundo National Park
TCM	Traditional Chinese Medicine
TMI	The Mountain Institute
WWF	World Wildlife Fund

# SECTION ONE

## The Snow Leopard

The snow leopard (*Uncia uncia*) is a charismatic flagship species, promoting mountain biodiversity conservation. This beautiful but endangered cat is a striking symbol of the world's highest places. It is also an environmental ambassador, encouraging the establishment of trans-boundary national parks or protected areas (PAs), and an indicator of a healthy mountain ecosystem.

It is a medium to large-sized cat—standing about 60 cm at the shoulder, with a body-tail length of 1.8 - 2.3 meters, and a tail almost a meter long.

Other features include:

- Short, broad skull with an elevated forehead
- Exquisite smoky-gray fur tinged with yellow and patterned with dark gray, open rosettes and black spots
- Males weigh 45-55 kg.; females weigh 35-40 kg
- Adult pugmarks are 9-11 cm. long and 7-9 cm. wide



*Snow Leopard*

## Distribution and Status

The snow leopard has a patchy distribution through the Central Asian mountain ranges—over an area of 2.5 - 3.0 million square kilometers.

It is usually found at elevations 3,000 - 5,400 m. in the Himalaya; 900 - 3,000 m. in Mongolia and Russia.

### Potential Habitat

Snow leopards are found along Nepal's northern border with the Tibet Autonomous Region, China, with the largest populations in Dolpo, Humla, Mugu, Manang, Mustang, and Myagdi Districts.

The snow leopard is associated with steep, broken mountainous habitat in the alpine and sub-alpine zones, where vegetation is sparse.

- Prefers mountain ridges, cliff edges, and well-defined drainage areas. These terrain features serve as day-time resting sites, common travel routes, and sites for social marking—including scrapes, scats (feces), and scent-sprays

Without rocky or broken cover, females with small cubs are far more vulnerable to predation from humans and wolves (the latter preferring smooth or rolling plains and uplands).

- Snow leopards avoid densely forested areas

### Status & Distribution of the Snow Leopard\*

Country	Potential Habitat (sq. km.)	Population Estimates <sup>1</sup>
Afghanistan	80,000	unknown
Bhutan	10,000	100
China <sup>2</sup>	400,000	2,000 - 2,500
India	95,000	500
Mongolia	130,000	1,000
Nepal	30,000	300 - 500
Pakistan	80,000	300
Russia	131,000	120
Kazakhstan <sup>3</sup>	71,000	100 - 120
Kyrgyzstan <sup>3</sup>	126,000	650
Tajikistan <sup>3</sup>	78,000	<200 - 300
Uzbekistan <sup>3</sup>	14,000	<50

#### Notes:

Data from Jackson and Hunter 1996

<sup>1</sup> All estimates are rough guesses; up-to-date status and distribution surveys are urgently needed

<sup>2</sup> 60% of total snow leopard range

<sup>3</sup> Central Asian Independent States (CIS) of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan contained most of the snow leopard population in the former USSR

## Home Range

Home range size is a function of prey species availability and abundance, and habitat quality.

It varies from 12 - 39 sq. km. in prime habitat, to over 1,000 sq. km. in marginal habitat in Mongolia, which has lower prey densities (McCarthy 2000).

In the prime habitat of the Langu Valley (of the Shey-Phoksundo National Park), the ranges of five radio-tagged snow leopards (3 males; 2 females) overlapped almost entirely. However, they used particular areas at different times.

- On average, individuals were separated by 1.9 to 3.2 km, supporting the species' solitary social structure

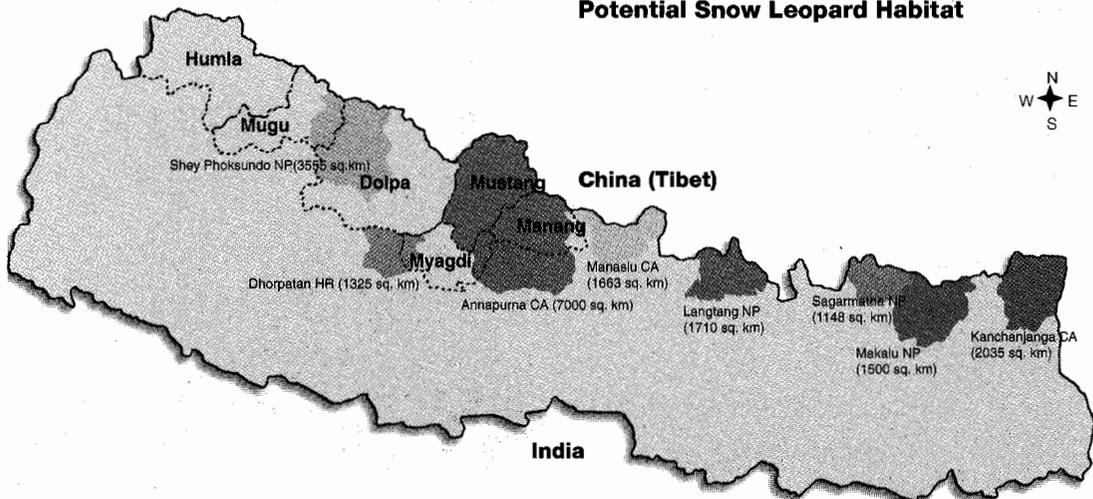
Analysis indicates that 42-60% of locations (an index of use) occur within only 14-23% of the total home area. Two males and two females shared a core use area—located at a major stream confluence—where topography, habitat, and prey abundance were very favorable. Overlapping core areas exhibited those habitat features preferred by the species, while non-core use areas exhibited relatively poorer habitat quality.

## Protected Area (PA) Coverage in Nepal

Snow leopards are thought to occur in about 120 PAs located across their entire range in Central Asia.

In Nepal, they reportedly occur in 8 PAs, but the actual number present in each PA is unknown.

## Potential Snow Leopard Habitat



At least 25-45% of the snow leopard's potential range falls within these PAs. The total area within the PAs is about 22,000 sq. km, including forested and other non-habitat areas. These areas are:

1. Annapurna Conservation Area (7,629 sq. km., including the 1,600 sq. km. Mustang addition)
2. Dhorpatan Hunting Reserve (1,325 sq. km.)
3. Kanchenjunga Conservation Area (2,035 sq. km.)
4. Langtang National Park (1,710 sq. km.)
5. Makalu-Barun National Park (1,500 sq. km.)
6. Manaslu Conservation Area (1,663 sq. km.)
7. Sagarmatha National Park (1,148 sq. km.)
8. Shey-Phoksundo National Park (3,555 sq. km.)

The largest snow leopard population is thought to exist in the Shey-Phoksundo National Park and the Annapurna Conservation Area.

Computer-based modeling suggests that these areas are the only ones that can support a minimally viable population of 100 or more (Jackson and Ahlborn 1994). Therefore, whenever possible adjacent parks should be linked by corridors.

### Population Density in Nepal

Nepal's population is roughly estimated at 300 - 500, but this figure must be confirmed by field surveys, using standardized methods like the Snow Leopard Information Management System (SLIMS), developed by the International Snow Leopard Trust.

Presently, Nepal's population density estimated at:

- 10 - 12 snow leopards per 100 sq. km. in the prime habitat of Langtu Valley of the Shey-Phoksundo National Park. This is the highest density reported to date throughout the snow leopard's range
- 4.8-6.7 snow leopards per 100 sq.km. in the Manang area of the Annapurna Conservation Area
- Probably less than 0.1-0.5 snow leopards per 100 sq.km. in most parts of Nepal



*Snow Leopard Cubs*

## Activity and Movements

Snow leopards are most active at dawn and dusk (*crepuscular* activity pattern). They are active through much of the day in areas with few people, but become nocturnal when their habitat is disturbed.

They often remain within a small area—a square kilometer or less—for an extended period, before shifting to another part of their home range.

For example, they usually move a kilometer or less in the Langu Valley, because of the extremely precipitous terrain. But they move up to seven kilometers (straight-line distance) in a single day; and further in less broken areas. In Mongolia, daily movements are much greater (McCarthy 2000).

Essentially nothing is known about its dispersal movements, which are critical to maintaining genetic interchange between separated populations.

## Breeding Habits

Snow leopards are sexually mature at 2-3 years.

- Mating occurs between January and mid-March, a period of intensified marking and vocalization
- Estrus lasts 2-12 days
- Gestation lasts 90-103 days

Cubs are born in late spring or early summer, usually in litters of 2-3. On rare occasions, there are litters of up to 7.

The first 4-6 weeks of a cub's life is spent restricted to an inaccessible and hidden den site. Mothers return from hunting forays frequently in the first 10 days of their cub's life for nursing. The cubs stay with their mother until they reach 18-22 months of age.

Adult siblings may remain together briefly, explaining the sightings of 3-5 similar sized animals seen together.

## Prey

The snow leopard's home range is most closely related to two of its most common large prey species:

- Blue sheep or bharal (*Pseudois nayaur*), of the Himalaya and Tibet
- Asiatic ibex (*Capra ibex sibirica*), of the Karakorum, Tien Shan, Mongolian, and Russian mountain ranges

It is an opportunistic predator, able to kill prey three times its weight (only adult yak or oxen are too large)—including horses and other livestock.

It also relies on small and supplementary prey like the marmot (*Marmota himalayana*), pika (*Ochotona* species), hares (*Lepus oiostolus*), Tibetan snowcock (*Tetraogallus tibetanus*) and Chukor partridge (*Alectoris chukor*).

Studies in Nepal suggest that:

- An adult snow leopard kills 20-30 adult blue sheep per year
- On average, it kills a large animal every 10-15 days or around twice monthly
- It remains on its kill for an average of 2.7 days, protecting it from vultures or ravens, and usually consuming all of the meat (unless disturbed by humans). Its chances of being killed by humans

increases if it stays at the kill site more than a few days

Snow leopards eat slowly—unlike wolves and wild dogs, which consume their prey quickly and leave within a short time.

In some areas, snow leopards consume notable amounts of woody material (*Myricaria germanica*), during February and March in the mating season. It is unknown why they do this.

In many areas, domestic animals far outnumber natural prey species so that reports of livestock depredation are not surprising. Depredation rates increase where livestock are poorly guarded. Scat analysis indicate that livestock constitutes 15-25% of the snow leopard's food supply, even within some national parks where wild prey is relatively abundant — presumably because domestic stock is less wary than the wild prey.



## Mortality

Snow leopards are thought to live 10-12 years in the wild, but this must be verified.

Snow leopards succumb to disease, inadequate nutrition, and abandonment. They may also suffer injuries from intraspecific fighting, especially between males seeking dominance of an area.

Their only natural predator appears to be the wolf.

The single most important source of mortality, however, is hunting or poaching by humans, including the removal of cubs from their natal dens.

Cub survival rates are low in areas with little prey or where humans remove cubs from dens and kill them. It has been noted that females with cubs frequently attack domestic stock, suggesting either that natural prey is scarce or that they are having difficulty securing their normal food.

*Check Rubbing by  
Snow Leopards*

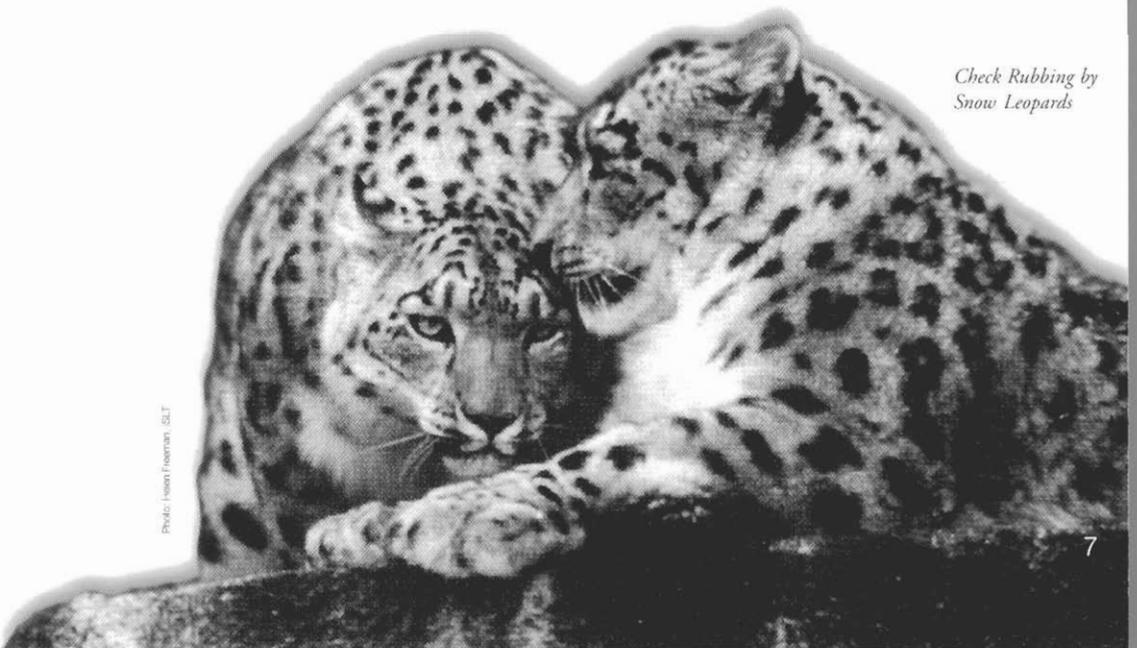


Photo: Susan Freeman, SLT

## Threats

Snow leopard populations are threatened by:

- **Poaching**—illegal hunting and selling of pelts, bones, and body parts for the fur trade and use in Traditional Chinese Medicine (TCM)
- **Loss of prey**—depletion of the natural prey base
- **Problem animals or depredators**—snow leopards that kill domestic livestock are killed by herders (retaliatory killing); this may include the removal of cubs from their natal dens
- **Loss of habitat**—habitat degradation and habitat fragmentation
- **Lack of awareness and support**—among villagers & herders—of the importance of protecting snow leopards and their prey base

### Poaching

Until recently, the killing of snow leopards for their valuable fur represented the single most important threat to the species:

- Hunters in Mugu District earned \$10-50 for a snow leopard pelt
- On the black market, a furrier may get a lot more money from selling a good quality coat, which may require 10-12 pelts

In Nepal, the fur trade is centered in Kathmandu, operating under the control of Kashmiri traders, and sold under-the-counter at tourist gift stores and hotels.

- In 1989, one investigator reported finding 12 snow leopard pelts with one five-star hotel offering a fur-coat for \$3,000
- In 1993, another survey found the number of fur shops had increased, despite an apparent decline in fur demand

As the supply of tiger bones declines, so Traditional Chinese Medicine (TCM) producers are turning to other large cats such as the clouded leopard and snow leopard, as well as fake substitutes made from cow bones. With many more affluent Asians demanding traditional aphrodisiacs and home remedies, the demand for the bones of wild cats far exceeds the supply. Therefore, the bone trade is rapidly replacing fur-trade as a primary threat to the species:

- Herders living along Nepal's northern border have been known to exchange snow leopard bones for domestic sheep breeding stock from Tibet
- Much of China's supply of snow leopard bones is thought to originate from the Tibetan Plateau and the surrounding Himalayan Range, as well as the mountains of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan
- The sale of bones offers poor mountain people an opportunity to generate substantial income, especially where enforcement is weak and the penalties insignificant

## FURTHER ACTION

- ✓ Conduct a rapid survey to determine the current pattern and extent of trade
- ✓ Increase anti-poaching surveillance patrols and strengthen law enforcement
- ✓ Improve anti-poaching techniques and trade route surveillance
- ✓ Conduct anti-poaching efforts similar to those used in tiger conservation
- ✓ Train and equip PA field personnel, so they can work in the cold climate and arduous terrain
- ✓ Develop local peoples' support for protecting snow leopards through energetic public awareness programs
- ✓ Improve CITES\* administration (as recommended by illegal-fur-trade investigators)
  - Create a special Kathmandu-based enforcement unit
  - Increase consumer awareness
  - Train customs officials in the detection of illegal wildlife products

\* Convention of International Trade in Endangered Species of Wild Fauna and Flora.

## **Loss of Prey**

Unless afforded an adequate and dependable supply of natural prey species, snow leopards will have to look elsewhere for food: this means killing and subsisting on domestic stock.

- Poaching of prey species reduces the amount of food available to snow leopards
- Livestock may compete with natural prey for forage and grazing space, leading to over-grazing and rangeland deterioration. As habitat quality declines, prey numbers decrease. As an opportunistic predator, the snow leopard often finds it easy to kill livestock which are being poorly guarded by their owners
- In many areas, especially along PA buffer zones, the amount of livestock far exceeds the number of wild ungulates (3-10 times or more in terms of biomass)
- Snow leopards become dependent upon livestock if their natural prey base is reduced or disrupted

## **FURTHER ACTION**

- Control poaching, both inside and outside of PAs
- Ensure that large prey species have sufficient summer and winter habitat, which should be mapped and designated on a park-by-park basis
- Conduct prey species status surveys using SLIMS\* methods and protocols
- Establish core areas for wildlife, where livestock use is precluded or significantly limited
- \* Snow Leopard Information Management System developed by the International Snow Leopard Trust

## **Retaliatory Killing and Conflict With Herders**

This is rapidly becoming the single most important conservation issue for large predators like the snow leopard. The number of domestic stock damage-complaints is increasing in most areas, along with increasing numbers of livestock and decreasing numbers of wild ungulates or herbivores.

Snow leopards that attack livestock, especially those implicated in repeated or multiple killings, usually end up being killed themselves, for angry herders will try to trap, poison, or shoot predators that cause unacceptable economic loss.

Snow leopards appear to attack livestock for four basic reasons:

1. Livestock are not well-guarded, especially during the daytime. At night, they may be housed in poorly constructed pens that a predator may easily enter
2. Livestock lack the natural anti-predator instincts found in the wild prey
3. The depredator is old, incapacitated or injured and thus not able to pursue its normal prey
4. There is not enough natural prey or habitat for it

All of these factors may interact to worsen the cycle of depredation and retribution. Furthermore, females bringing their cubs to a livestock kill may be reinforcing the taking of livestock as prey, by teaching their offspring what to hunt and eat.

In addition, during their first 6-8 weeks of life, cubs are completely immobile and restricted to their natal den, thus forcing the female to secure all food nearby. As wild prey animals become increasingly wary or leave the immediate area, she may be more likely to go after livestock. As they mature and become independent, snow leopards disperse from their natal areas, and may be forced to leave the confines of a PA, only to enter and attack livestock outside the park.

The snow leopards' tendency to remain at its kill site — and consume all available meat — only increases their vulnerability to human retribution. Such conflict with herders dates back over 9,000 years to the time when animals were first domesticated by humans. So why is it such a problem today? Before possessing modern firearms and traps, herders employed simple, but reasonably effective methods for minimizing loss of livestock by:

- Using shepherds to maintain close watch over their livestock and keep predators away

- Avoiding grazing their animals in predator-rich habitats
- Using skilled livestock-guarding dogs
- Keeping livestock in predator-proof night-time corrals
- Favored livestock breeds with well-developed anti-predator traits

Today, the situation has become more deadly for snow leopards because of:

- A decline in well-adapted traditional skills and knowledge for animal husbandry
- Less vigilant herders (animals are often left to graze unattended)
- Increased livestock numbers and the tendency to graze areas closer to cliffs or other prime snow leopard habitat
- Other animal husbandry changes (i.e., not favoring breeds with well-developed anti-predator traits.)
- Erosion in traditional religious beliefs such as the Buddhist sanction against the hunting or killing of wildlife

## FURTHER ACTION

- Construct predator-proof corrals and livestock pens such as those proposed under the program of the Snow Leopard Conservancy\*
- Educate and encourage livestock owners to better guard their animals
- Improve animal husbandry systems
- Provide veterinary care for animals injured in attacks
- Provide monetary compensation for livestock loss—under special circumstances such as multiple killing
- Develop policies and procedures (via DNPWC\*\*) for coping with habitual livestock depredators
- Educate herders on ways to improve animal husbandry practices

\* Jackson, R. August 2000. Snow Leopard Stewardship Program Concept: community-based research and action for protecting snow leopards in India, Nepal and Mongolia. Program Concept Paper. Snow Leopard Conservancy, Sonoma, California.  
[www.snowleopardconservancy.org](http://www.snowleopardconservancy.org)

\*\* Department of National Parks and Wildlife Conservation

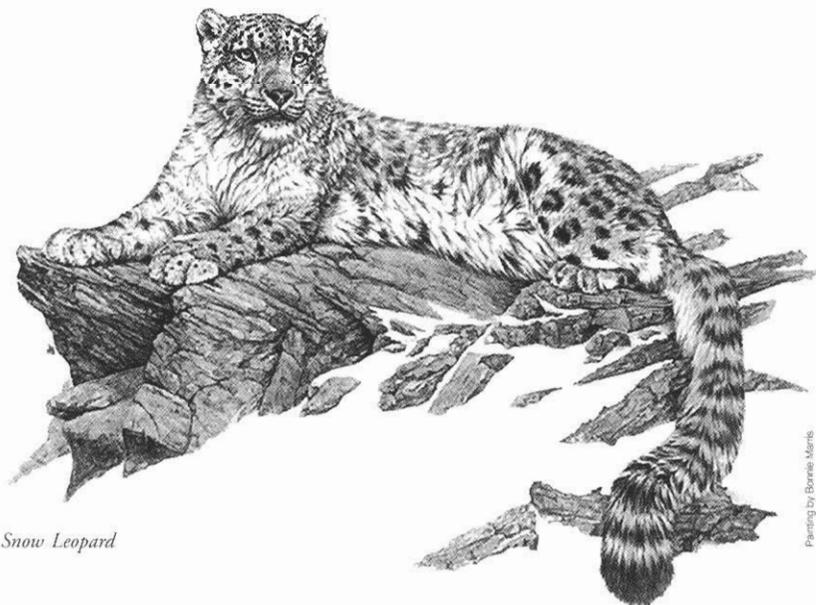
## Degradation, Loss, and Fragmentation of Habitat

Snow leopards often do not have adequate or suitable habitat; thus, they may wander outside the boundary of a PA onto the “herders’ pastures”

- Snow leopards are more likely to attack livestock along the edge of PAs, or along the corridors which link separated PAs
- Since PAs may harbor more snow leopards than they can support, those individuals without a home range of their own must disperse outward, thus increasing their chances of wandering onto pastures with fewer wild prey and having to kill domestic stock for a living

## FURTHER ACTION

- Increase the availability of core areas with PAs or along connecting corridors
- Use an ecosystem approach to better ensure sustainable utilization and biodiversity conservation
- Reduce grazing pressure in core habitat areas
- Remove herders and their livestock gradually from critical core areas



*Snow Leopard*

Painting by Bonnie Morris

Local people depend heavily upon animal husbandry for their livelihood, and may thus see no advantage to co-existing with snow leopards. Understandably, they are reluctant to support its conservation unless depredation losses are reduced, or they are compensated for any livestock killed by predators.

Protection of snow leopards, their prey, and habitat is a direct function of how effective park management is. Unfortunately, park management and law enforcement is relatively weak, for the mountain parks tend to have few trained personnel with little equipment.

Field personnel must contend with difficult terrain and harsh winters, factors that severely hamper status and distribution surveys or surveillance patrols; as a consequence, there is a lack of baseline information on the snow leopards and their prey.

## FURTHER ACTION

- Increase local awareness provide education through:
  - posters and brochures using traditional images and contexts
  - radio and television
  - forums, such as workshops and slide-shows
- Prepare and distribute suitable materials for use in schools
- Improve teacher training in conservation
- Promote exchanges, study-tours, and workshops—which facilitate the exchange of ideas and information
- Improve park management
- Improve training, equipment, and incentives for field personnel
- Increase the number of field personnel trained in SLIMS methods



## **Actions Implemented in Nepal**

Eight PAs (four national parks, three conservation areas, and one hunting reserve) have been established to date within known or potential snow leopard habitat in Nepal. These total as much as 22,000 sq. km in extent (see page 3-4). In addition the snow leopard has been protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1973.

The snow leopard is fully protected under Nepal's National Park and Wildlife Conservation Act 2029 (1973), within

- The fourth amendment of the Act, which sets penalties for buying or selling a pelt at Rs. 50,000-100,000, or 5-15 years in prison, or both

Snow leopards were radio-collared in the wild for the first time in the Shey-Phoksundo National Park in 1982 and for the second time in the early 1990's in the Annapurna Conservation Area.

The first field-methods-training workshop was held in Shey-Phoksundo National Park, Dolpo in 1999, and a survey was conducted on snow leopards and their prey species in Shey-Phoksundo National Park, Dolpo in the same year. Following this, a workshop was held in Kathmandu and several publications prepared on the snow leopard, the Mountain Queen of the Himalaya.

# SECTION TWO

## Conducting a SLIMS Survey

Any successful wildlife survey requires good planning and organization. SLIMS, or the Snow Leopard Management System, developed by the International Snow Leopard Trust identifies the key steps to a successful survey as follows:

1. Identify the survey area or areas
2. Schedule and prepare for survey
3. Conduct the survey and gather baseline data
4. Analyze and interpret the survey data
5. Report the results of the survey and make recommendations for future action

This section is divided into 5 parts according to these steps, and describes how to determine the presence/absence and/or the relative abundance of snow leopards in a particular area. The next section (Section 3, page 39) describes how to survey the leopard's primary large prey species, namely blue sheep. These methods have been summarized from the Snow Leopard Survey and Conservation Manual published by the International Snow Leopard Trust to which the reader is referred for greater detail.



## Step 1: Identify the Survey Area and Sign Transect Locations

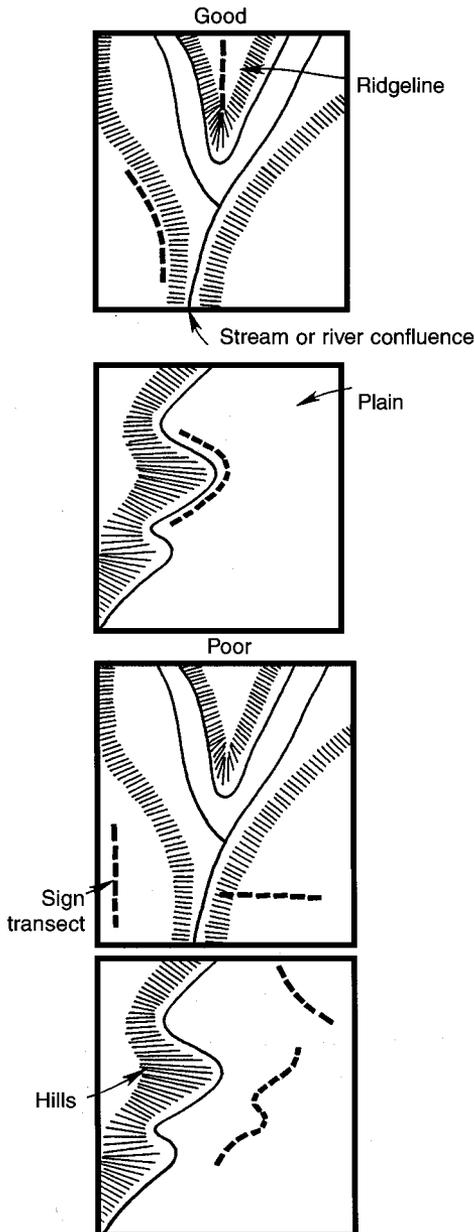
Based on current knowledge of snow leopard status and distribution, determine which areas are most important to survey first. Once you have identified the general area, you should gather the existing information and interview knowledgeable persons, including local residents, to help you determine which are the best places to visit for undertaking a search for the snow leopard, its sign and prey. When possible, target strategic areas such as core areas, high-density prey areas, and rugged mountain ranges, both within and outside of existing PAs. You should revisit areas if the existing survey information is outdated by five or more years.

Snow leopards usually occur in the areas that have:

- A well-defined mountain range (especially those with an abundance of steep, uneven and rocky slopes, cliffs, rocky outcrops, steep sided gorges or deeply-cut drainages and ravines)
- Elevations in excess of 3,000 m (i.e. in Nepal these are the areas with the lowest density of human habitation)
- Open shrub, grass, and herbaceous vegetation (as opposed to those with dense or closed-canopy forest)
- Less than 2,000 mm of precipitation per year
- Few human settlements that are relatively undisturbed
- Suitable prey, such as domestic or wild sheep, goats, deer, marmots, and game birds

Since a snow leopard marks to alert other individuals of its presence, it tends to leave its sign (scrapes, feces, and scent-sprays) in places most likely to be visited by other snow leopards. These are usually commonly shared travel routes located along obvious topographic features, also known as edges.

**Figure 1: Examples of Good and Poor Sign Transect Placement with Respect to Topography**



**Where to Place Transects or to Look for Snow Leopard Sign**

- Along the crest of well defined ridgelines
- Where permanent rivers or streams meet, especially if there is a well-defined ridgeline descending toward the confluence
- At the base or crest of a cliff, riverine bluff, or sharply defined escarpment
- On well defined mountain passes or the saddle area found along high ridgelines
- On prominent projection points of steep hillsides (known a promontories)
- Where the base of a mountain spur meets a valley or plain
- At the base of isolated, prominent rock boulders or outcroppings
- Along other well defined topographic edges, including human footpaths

**Where not to Look for Snow Leopard Sign**

- In the middle of a wide valley (i.e., absence of any features at which a snow leopard may leave its sign or mark)
- Along a featureless, wide and open hill slope (which different snow leopards would cross at different places)
- Along trails which are heavily used by livestock or people (any sign left here would be very short-lived!)

**Place transects along distinct landform edges**

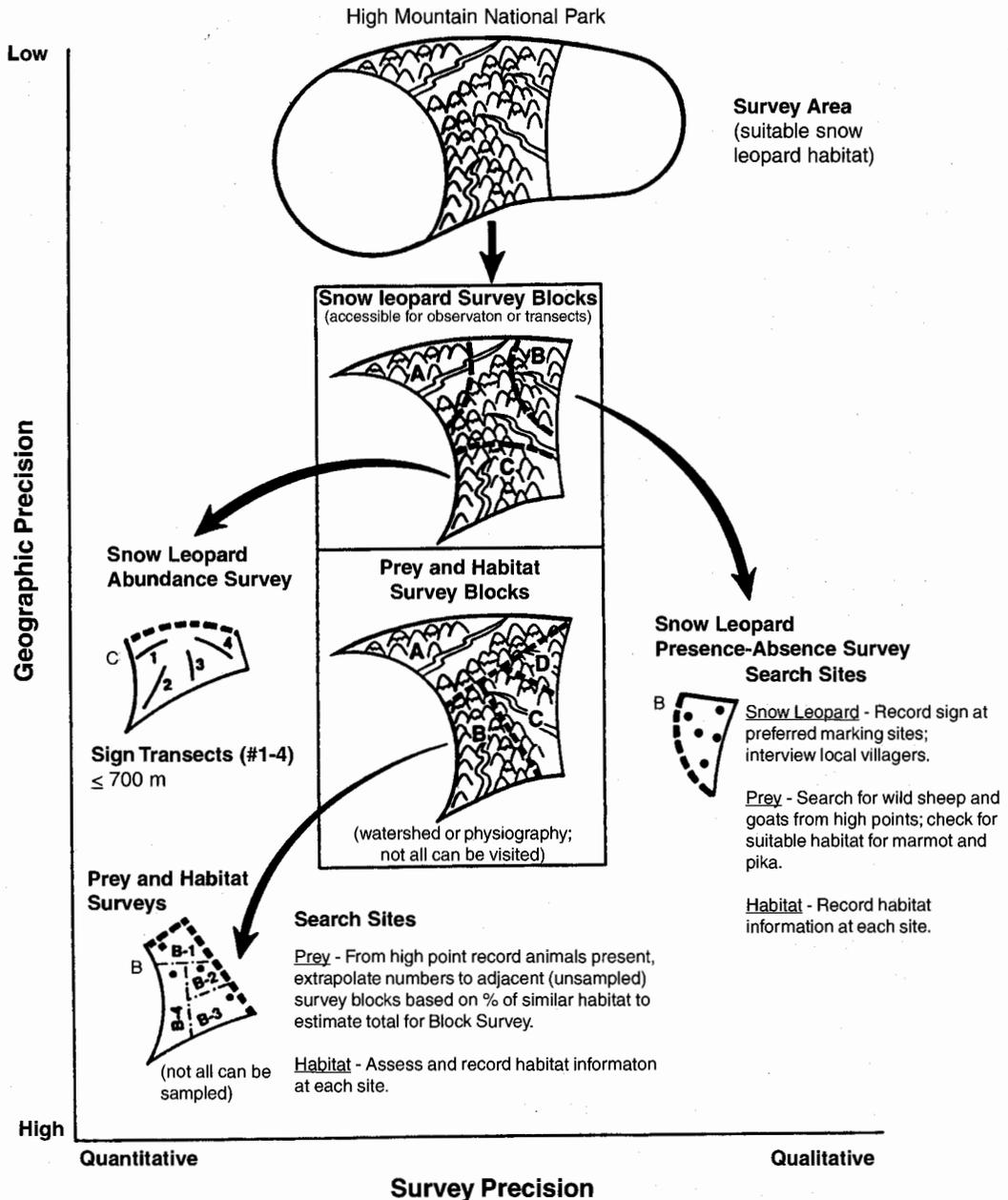
Source: ISLT Snow Leopard Survey & Conservation Handbook, 1996 Edition ISLT, Seattle

### **Divide the Survey Area into Manageable Units!**

First, outline the survey blocks and search sites you want to visit. Have your supervisor assist you in determining these areas. Figure 3-1 provides an overview of how the survey area should be broken up into smaller units to facilitate the field work:

- **Survey blocks** help organize the survey by ensuring a more systematic and objective assessment since it is impossible to visit or walk over all of the proposed **Survey Area**. Survey blocks are subsections within the survey area that you shall visit and sample for snow leopard sign and prey species sightings. A typical survey block may be 100 or more square kilometers in size and usually encompasses all or part of a particular stream or river drainage
- **Search sites** are specific areas within a particular survey block where you will actually look for snow leopard sign, place sign transects (see page 19) or conduct blue sheep herd counts (Section 3, page 41). They are small areas of about 5 km or less in length or width. The different search sites should be 5 to 25 km apart and include a variety of topographic or terrain conditions which are representative of the **survey area** at large
- Within your list of survey blocks and search sites include a range of habitat conditions if possible. But if your time is limited, and you have only been asked to determine presence/absence, visit sites with the best or “optimal” habitat (see “where to look for snow leopard sign” page 22)

Figure 2: Snow Leopard, Prey and Habitat Survey High Mountain National Park



Source: ISLT Snow Leopard Survey & Conservation Handbook, 1996 Edition ISLT, Seattle



## Step 2: Schedule and Prepare for the Survey

Proper preparation is key to a successful survey! It should be undertaken at the appropriate time of year and with the right equipment. You will need to learn the characteristics of the different signs left by the elusive snow leopard, and how to tell it apart from other species such as common leopard, lynx, wolf and fox.

Season	Sign Detectability Factors						
	1	2	3	4	5	6	7
Winter	*	-	+	*	+	-	-
Spring	+	*	*	+	*	*	+
Summer	-	+	-	-	-	-	+
Fall	-	-	-	*	-	+	*

**Key to symbols:**

- + optimal time
- \* acceptable time
- poor time

**Factors affecting sign detectability:**

- 1 = Intensity of marking activity
- 2 = Accumulation of signs
- 3 = Amount of human disturbance
- 4 = Amount of weather disturbance
- 5 = Suitability of tracking medium
- 6 = Access and travel conditions
- 7 = Availability of "relic" signs

### When to Look for Snow Leopard Sign

The best time of year to conduct a snow leopard survey is late winter or early spring (January through April), when snow leopards are mating and marking their home ranges most intensely. If you conduct a survey in mid-summer, when the weather is warmer, you risk having most signs destroyed by herds of livestock which have been taken to the higher elevations for grazing.

### Scheduling your Survey

There are many factors affecting the accuracy of your survey, including the season. Table 3, below reviews the major factors to consider when scheduling your snow leopard survey (Jackson and Hunter 1996). You will note that spring is the optimal time for finding snow leopard sign.

### Know the Different Kinds of Sign Made by Snow Leopard

Snow leopards leave 5 different kinds of sign (pugmarks or tracks, scrapes, feces or scats, scent-sprays and claw-rakes), described and illustrated below:

#### Scrapes

Scraping is the most common marking activity and among the most long-lived of signs, especially if made in gravelly areas not disturbed by livestock. While snow leopards scrape through the year, far more scrapes are made during the period January through March, which is the mating season.

Scrapes are made when a leopard scuffs the ground with its hind feet, leaving a characteristic shape. Urine may be deposited on some scrape piles, giving them an acrid or sweet odor. Scrapes are made singly or in clusters but tend to be deposited in clumps of 2-10 or more (known as scrape clumps). Scrape sites that have been repeatedly reused are called relic sites (i.e., animals have marked these over successive generations). The more visible a scrape, the more likely it is to be re-marked

again. Scrapes are visible at all seasons and last for a long time (even up to a year!).

Since the common leopard also scrape, you need to learn how to tell its scrape from that made by a snow leopard. However, common leopards usually live at lower elevations than snow leopards. The table on the next page describes several ways to tell the difference between snow leopard and common leopard scrapes.



*Snow Leopard Scrape*

Photo: Rodney Jackson



**Table: Distinguishing Between Snow Leopard and Common Leopard Scrapes**

Characteristic	Snow leopard	Common leopard
Scrape orientation to trail	Any orientation to trail, on or beside the trail	Parallel to trail, beside trail
Scrape orientation in a scrape group or cluster	Cluster circular as a "tight group" of scrapes	Cluster linear as long "string" of scrapes
Scraping behavior	Rescraping of same scrape or scrape cluster	Rescraping uncommon
	Relic scrape sites exist	Relic scrape sites do not exist sculpted
Scrape clusters appear	Scrape clusters are not sculpted	Scrape clusters are sculpted
Visual attributes	Large soil pile behind scrape depression	Small soil pile behind scrape depression
	Infrequent toe/claw indentations	Frequent toe/claw indentations
	Pugmark infrequently present at front of scrape depression	Pugmark frequently present at front of scrape depression
	Appear to be carefully made	Appear to be hastily made
	Broader, shorter, heart shaped	Longer, narrower, linear shape
	Deeper depression	Shallow depression

Source: Snow Leopard Survey and Conservation Handbook, 1996 Edition. ISLT, Seattle

### Scent Spraying

Snow leopards spray-mark the faces of upright or overhanging boulders and cliff bases; some sites are periodically revisited and re-sprayed. Freshly sprayed rock faces are best identified by the strong odor of the scent, along with a dark staining on many but not all surfaces. The top of the spray

mark is located 70 to 85 cm above the ground, with the average rock face being about 1.5 m high and about 2.0 m wide. Hair found on sprayed rock faces indicates where a snow leopard has cheek-rubbed in its own scent.

### Feces

Feces or scats are also long-lived, especially in areas with little rain and minimal insect activity. Feces may be deposited solitarily or in clumps. Typically, they are left on a scrape pile or within a meter of a scrape, but may be deposited along on or next to a trail. Relic sites tend to contain more feces than non-relic sites or those used less frequently.

### Claw Marks

Although claw mark impressions are rarely detected as part of the pugmark (because snow leopards walk with their claws retracted), you may occasionally see clawmark impressions on a tree trunk or rock face where the cat has scratched or raked its claws.



Photo: Rooney Jackson

*Snow Leopard Scat*

### Pugmarks

Also known as “spoor,” pugmarks or tracks are the imprint of the paws left on soft ground. The distinguishing characteristics of the snow leopard’s pugmarks are:

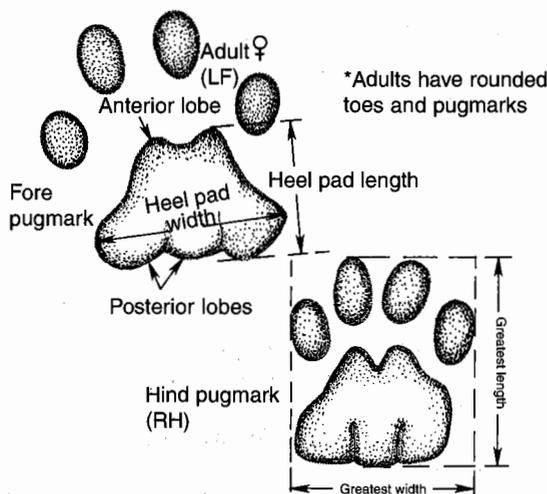
- Front pugmarks are distinctly larger than the rear ones
- Overall shape of the forepaw is round or as wide as it is long
- Hindpaws are more rectangular in shape
- Each heel-pad has two anterior lobes and three posterior lobes (see picture)

Tracks left by a wolf (about the same size as a snow leopard pugmark) or another canid

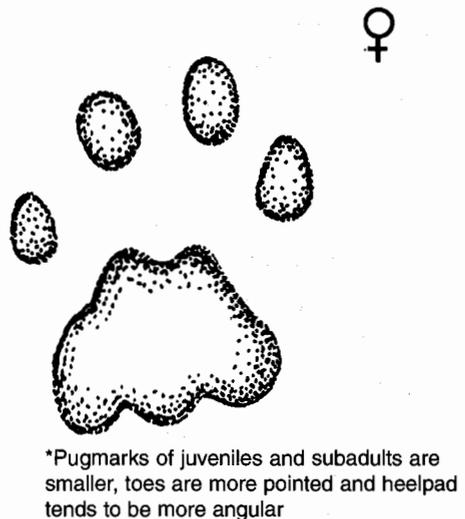
(smaller in size) has a triangular heel-pad with a single anterior lobe.

As noted, marking is intense during mating season, and may be at its height when more than one female inhabitant of an area is in heat. For more information on marking behavior in wild snow leopards, see Ahlborn and Jackson 1988. Marks may be more than four times as abundant in areas where different snow leopards’ home ranges overlap. Core areas are marked more than non-core areas, suggesting that marking plays an important role in spacing individuals (Jackson and Ahlborn 1989; Jackson and Hunter 1996).

**Figure 3: Measuring a Snow Leopard Track**



**Figure 4: Fore Pugmark 6 Month Old**



Source: ISLT Snow Leopard Survey & Conservation Handbook, 1996 Edition ISLT, Seattle

## Other Tasks Prior to Departing for the Field:

### Know the Survey Area

- Access route and trail conditions, seasonal weather pattern and livestock herd movement and grazing practices
- Snow leopard and prey species natural history, habitat conditions, conservation status and issues, and land-use/human inhabitant activities and practices

### Be Prepared to Interact with the Local People

- The cooperation of local residents is vital to a successful survey: more importantly, they are the best stewards for ensuring conservation of snow leopards, their prey and habitat
- Therefore, if possible, arrange for a local person to join the survey team to help guide you, translate and to facilitate contact with local herders

### Know the Subject

- Familiarize yourself with the proposed work program, including all questionnaires and data forms which have to be completed
- Know how to recognize snow leopard sign and distinguish it from other wildlife species
- Have the local Nepali and other language names for the various species that may inhabit the area

### Bring the Right Equipment!

- Topographic and other maps of the survey area (scale 1:50,000 or 1:100,000 preferable)
- Himalayan wildlife pictures (fauna, vegetation)
- Field notebook
- Appropriate questionnaire and data forms
- Pencils, pens & eraser
- Binoculars
- Warm clothing and good walking shoes
- Rain or foul-weather gear
- Camping gear
- ✓ Food and cooking gear if staying away from villages

- Take pictures of wildlife known or expected to occur in the area to show to local people and to test the reliability of their observations
- Review the current snow leopard literature and learn as much as you can about snow leopard and prey species natural history and ecology

### Optional Items:

- 35 mm camera and film (any kind)
- Plastic bags and/or cups for collecting scats and other items
- Altimeter and magnetic sighting compass
- Tally counter
- Tape measure and pugmark tracer
- ✓ Plaster of Paris (to make casts of tracks)
- ✓ Cassette tape recorder



## Step 3: Conduct the Field Survey

Your next steps will depend on which type of survey you wish to conduct. The SLIMS protocol includes the following surveys:

### Presence/Absence Survey

- Wide-ranging investigation to determine the presence or absence of snow leopard and target prey species in a particular area
- Verifies use of specific areas by snow leopards
- Identifies habitat types present
- Makes a preliminary assessment of conservation and protection needs
- Helps to determine which areas and species could be potentially be impacted by development or factors like fire and livestock grazing

### Abundance Survey

- Conducted to estimate the number or relative abundance of snow leopard and/or prey species within a particular area
- Provides detailed information on snow leopard, its prey and habitat
- Expensive, intensive, and time-consuming to undertake, and thus can only be

conducted in a few places (thus it is critical to select survey areas carefully and through a prioritization procedure)

### Food-Habits and Human Conflicts Assessment

- Provides information on the food habits of snow leopards
- Assesses extent of livestock depredation in a particular area

This chapter, Step 3, is broken into three sections. The first, beginning on page 29, explains how to conduct a presence/absence survey; the second, beginning on page 32, explains how to conduct an abundance survey. Prey Species censusing is described in Section Three (Page 41)

#### Use the right form!

The Appendix contains blank forms used for each of these surveys. Be sure to select the correct one, photocopy it at 135% and to fill each out carefully. You may execute a perfect survey, but if you do not record observations correctly, your efforts would have been wasted. Throughout this section, you will see boxes like this one with tips on filling out your forms. When you return to the office after completing your survey, duplicate your completed forms as insurance against accidental loss and store them for future reference.

## **A. Conducting a Presence/Absence Survey**

The main objectives of this survey are to:

- Determine the presence or absence of the snow leopard or its prey in a particular area
- Summarize the status of each species of interest, and prepare or update its range map
- Identify major habitat types and any management or conservation concerns

Generally, presence/absence information can be gathered in one of two ways:

- By contacting and speaking with wildlife experts familiar with the area
- By interviewing local people who are knowledgeable about the wildlife of a particular area and whose observations can be trusted
- By conducted a short site visit (i.e., visit the area and record each species you observe, including such sign as tracks or pugmarks, droppings, and carcass or bone remains)

Presence/absence surveys rely heavily on local knowledge. Thus, it is important that you know how to interview local villagers in ways that solicits reliable information. You will then visit a field area in the field to search for snow leopard and prey species in order to verify the information provided by the local people.

### **On Interviewing Villagers**

- Visit different settlements so you can interview more persons and households in the time available
- Concentrate on the most knowledgeable or well-informed residents first. Herders are generally better informed about wildlife because they spend much time in the field away from the village

There are two equally important components to a successful interview survey: Collecting the useful information, which means asking the right kind of questions, and accurately recording and interpreting the answers provided.

### **Asking Questions**

Properly structured interviews can provide invaluable information on livestock depredation losses and ownership patterns, along with background information on livelihoods and animal husbandry that are pertinent to identifying the best conservation actions. Note that conducting formal interviews and completing lengthy questionnaires can be very time-consuming. Follow these guidelines to make your interviews as effective as possible:

- Be very clear on what questions you wanted answered and why: then design the questionnaire accordingly
- Set a convenient time and place with the interviewee for the interview
- Conduct the interview in a quiet and comfortable place
- Be courteous, friendly, and relaxed, and let people know the purpose of your visit
- Keep your questions as short, simple, and clear as possible
- Clarify any unclear points
- Use the exact same questions, tone of view and procedures for all participants interviewed
- Ask some questions to gauge the knowledge, accuracy, and reliability of each interviewee
- Treat people and their answers with respect

- Thank your interviewees courteously for their valuable time and information
- Make sure that you or someone from your department reports the results of the survey back to the community in question

### **Recording the Answers**

- Use the respondent's own words
- Take note of all aspects of the answers, including emotions such as anger, embarrassment or evasiveness
- Try to obtain information from other sources for verification (a process which is known as triangulation)

### **Rapid Site Visit**

A rapid site visit allows you to verify information from formal or informal interviews.

Compile and rank the list of areas reported by locals to contain snow leopards, and visit the ones that are most easily reached and which represent the type of terrain found across the Survey Area (See Step 1, Page 18). Then visit each in turn to look for snow leopard sign.

When you find such sign, record it on Form No. 1 (Snow Leopard Presence-absence Survey, see Annex one page 49 for a sample form). Use the coding system provided.

### **Recording Data**

If there are many observers in the survey party, review the survey form together to ensure everyone understands the survey terms, units, codes, and methodology.

When recording your data, be sure to include:

- General description of habitat types present in survey area
- Black and white or color photos/slides of survey area when possible
- Map of the survey sites and where signs are observed

### **Use the right form!**

Follow the instructions on the back of each form. Be sure to include the major threats, such as poaching and its magnitude, livestock use, and other human activities, if any, in **Threats and Conservation Issues**.

Use the **Comments Section** to include any other important observations. Use the **Other Wildlife Present in the Area** section to record information on prey species observations



## B. Conducting An Abundance Survey

This type of survey is intended to provide a rough estimate of how many snow leopards may live in a particular area. Since snow leopards are very rarely seen and virtually impossible to count directly, abundance is measured in terms of the number of sign (tracks, scrapes, scented-rock etc) left along a transect of known length.

Extensive sampling is needed to establish the relative number or relative density (number per unit area—such as 100 square kilometers) of snow leopards in a particular area. The method is probably most useful when sign densities are compared on a relative basis between areas or from one year to another (the rule of running transects at “the same place — same time of year — same method” each time).

Define the survey area and locate transects as described in Step 1, Page 18.

### Bring Extra Equipment

An abundance survey is more detailed than a presence/absence survey, so bring along additional equipment to that listed on page 27:

- Topographic Map (preferably at 1:50,000 or 1:100,000 scale)
- GPS (Global Positioning Device) for recording transect and sign locations
- Tally counter for measuring the length of the transect
- ✓ Tape measure for measuring the size of pugmarks, scrapes and scats
- ✓ Map of standard ecotypes or vegetation communities
- Cassette recorder (optional)

### Remember:

- Use a 1:50,000 or 1:100,000 topographic map to define your survey area and delineate survey blocks
- Examine the contour lines and locate suitable ridgelines, cliff bases and riverine bluffs along which to place the sign transects (See Page 19 of this Manual and refer to Jackson and Hunter 1996 for further information)

### **Placing Sign Transects**

Once you have your survey area and blocks identified, you can begin placing your transects. Keep these points in mind as you define your transects:

- Include a range of terrain or habitat conditions within the sample of search areas where sign transects will be run (i.e., by including both highly suitable and less suitable habitat, you will get a more accurate estimate of the relative abundance of snow leopards for the survey area as a whole)
- Place transects along routes that snow leopards would be expected to visit and mark (see sketches on Page 19)
- Separate each transect by a distance of at least 1-3 km
- Place the transects evenly throughout the survey area
- Note the location of each transect on a topographic map in order to facilitate repeat visits in the future
- When re-surveying each transect, be sure you do so at the same time every year, so that you can use sign frequency to generally compare snow leopard numbers and activity from year to year. Consult a qualified biologist for interpretation of your data

- Over the years, continue to expand the number of representative areas that you are sampling annually

### **Shorter and More are Better!**

Conduct many short transects, 15-40, 250-700 m in length, rather than a few transects that are 2 or more kilometers in length.

Short transects require less time, if they have been well sited, and minimize variability within the data set.

### **How to Run a Transect**

- Sample the transects systematically using the same methods
- Number and permanently mark the beginning and end of each transect. Record its location using a GPS or by marking it accurately on a topographic map
- Go to the beginning of the transect and walk slowly along it, searching for snow leopard sign within a 5 m wide strip on either side of your line of travel
- Whenever you encounter sign, record the pertinent information on Form No 2 (Snow Leopard Sign Transect – Abundance Surveys)
- Allocate a unique consecutive number to each site

### Measuring Your Transect

With the transect starting point set at zero meters, walk along its full length. Using a tally counter, take even sized paces that measure 1 meter, and record the number of paces or meters as you walk along looking carefully for signs. All distances are cumulative. Use this method to measure the length and the distance between each site and its individual sign items.

### Survey Tips

- Be consistent: always set the ground rules (methods) for the count before you begin, to ensure everyone collects data in the same way
- Ensure the transect runs across a relatively homogeneous habitat (try not to mix different types of terrain in the same transect)
- Mark each transect on a map, indicating the dates and areas sampled
- Report sign numbers accurately; do not inflate numbers
- Use your observational skills

### Don't Name it Unless You Know It!

It can be difficult to distinguish snow leopard signs from those of other animals. Record the actual species only if you are fairly certain of identity of the animal that left the sign. Otherwise, use a more general

### Use the Right Form!

- Use SLIMS Form No. 2 (Snow Leopard Sign Transect) to record details of each sign
- Use the codes described in Annex One
- Put the transect number, its total length, and its elevation at its beginning and end points, at the head of the form
- Use a separate form for each transect
- If more than one page is required for a transect, record the total number of pages used for that particular transect on each page (for example: page 1 of 4, page 2 of 4, page 3 of 4, and page 4 of 4)
- Each time you find a carnivore's sign, record the site number and distance along the transect (m) in Columns 1, 2 and 3
- Record species leaving sign in columns 4, the elevation (meters), aspect and slope steepness in columns 5 through 7
- Columns 8, 9, 10 and 11 are used to report the type of rangeland utilization, habitat or vegetation type, landform ruggedness class and the type of topographic feature (see page 52 for details)
- The type of feature at which the mark is left appears in column 12, while columns 14-17 are used to note the type of sign, its relative age, substrate type and size or measurement. Column 13 is used to note which the site is a relic one or not
- List each sign on a separate line, to avoid confusion
- Use the codes given
- *Source:* Snow Leopard Survey and Conservation Handbook, 1996, ISLT.

classification, such as cat or dog. It is not a problem if you cannot determine the identity of a particular animal that left sign – it's far better to err on the side of caution.

#### **Recording Data**

- Number each transect and date your observations clearly so others can easily differentiate between transects and surveys conducted in different places or years
- Allocate a unique consecutive number to each sign site and record the cumulative distance along the transect to that point in meters
- Assign groups of scrapes and scats the same site number if they are located less than 5 m apart
- Number all signs within a site consecutively, using the site number as a prefix (e.g. 1-1, 1-2, 1-3 if there are three items of sign)
- Prepare a map, indicating sites surveyed and sign transect locations

#### **Also Note:**

- Habitat types within the surveyed area (e.g. barren, grassland, shrubland, woodland, or forest)
- Number of snow leopards observed each day for each search site
- Number of days each search site was sampled and how many hours each person spent at that site
- Total number of individuals conducting the survey (all blocks combined)



## Step 4: Analyze Data

After you have completed your survey (presence/absence or abundance) and recorded your data, the next step is to analyze and interpret the data. Data analyses use survey block summaries to draw conclusions on:

- Presence/absence or relative abundance of snow leopards
- Major threats faced by wildlife in the area surveyed
- Priorities for management and conservation

How you analyze your data depends on what type of survey that you conducted.

### **Presence/Absence Survey**

Simply state what evidence you found to confirm that snow leopards were present in the survey area and where they are known or thought to occur. Your analysis is a personal, qualitative judgment supported by the physical evidence found in your survey or the information provided by local people.

The presence of snow leopard sign is a good indication that a snow leopard has been there, note that the lack of any sign does NOT necessarily mean snow leopards do not occur in the area – rather that you failed to find any in the time allocated and places visited. Consider all information you collected before you make a judgment. Prey species, habitat, and local interview data may point to the presence of snow leopards even though you did not find any signs during the survey.

### Abundance Survey

Use your survey data to describe the status, relative abundance, and distribution of snow leopards within the area surveyed.

Analyze your data according to:

- total length of transects surveyed
- minimum and maximum transect length
- mean transect length
- the number of scrapes and feces per km
- mean and total number of sites per transect:
  - with scrapes only
  - with feces only
  - with scrapes and feces
  - density of sites with more than one scrape present per kilometer of transect

Classify the sign frequency within each block to the following relative density classes:

- High- more than 20 items per kilometer
- Medium- 5-20 items per kilometer
- Low- less than 5 items per kilometer

### Food Habits Survey

Describe the amount of each food item found in the sample as:

- A percent of the total contents in the sample
- Frequency of occurrence (% of total scats in which the item was found)

Note any other pertinent information.

Consult a lab technician for analysis of the scat and hair samples. He or she will be able to identify the prey from hair scale patterns in the samples (Oli et al 1993).

Interviews of herders help establish how many and what type of livestock are killed by snow leopards and other predators, as well as where and when the losses occurred (location, month, guarding pattern at time of loss, etc). It is important that you attempt to establish the number lost to other types of mortality, such as disease, accidents and severe weather (since predators may not be the major cause of loss). Your report should also include your own observations on the underlying root causes of livestock depredation.



## **Step 5: Report Results and Make Recommendations**

Compile and submit your report as soon as possible after returning from the field. Your observations can contribute to snow leopard conservation only if they are made available to the protected-area authorities in a timely manner.

Include major threats and management recommendations in your report. Consult with park managers and knowledgeable persons to assess existing or potential threats and to make reliable recommendations for the long-term conservation of the species.

Submit copies of your complete report to the department or the local ISLT node (PO Box: 7660, Baluwatar, Kathmandu, Nepal). Be sure to include all the details of your study, such as maps and photos, as well as with whom, when, where and how you conducted the survey. And don't neglect to include photographs to give the reader a better idea of conditions in the area surveyed.

## SECTION THREE

### Surveying Blue Sheep

Blue sheep (*Pseudois nayaur*) or bharal are one of the snow leopard's primary food sources in Nepal, and the Himalayan-Tibetan region. A single snow leopard requires an estimated population of 150 - 230 blue sheep to survive (possibly less in areas where other prey is readily available). Prey density and predator-prey ratios help set limits when estimating the number of snow leopards a particular area might support.

Therefore, surveying blue sheep helps us with snow leopard conservation in two ways:

- We can use blue sheep status as a measure of the potential of an area to support snow leopards
- Understanding blue sheep population and structure allows us to manage them more effectively, thereby conserving a vital element in the snow leopard's long-term survival



Photo: Rodney Jackson

Blue Sheep



By ensuring a good prey population, we can help to keep livestock depredation (and subsequent people-wildlife conflict) at a minimum

When surveying blue sheep, you essentially follow the same steps as you did while surveying snow leopard:

1. Identify survey areas and delineate census blocks
2. Schedule and prepare for the survey
3. Conduct the survey and gather data
4. Analyze and interpret survey data
5. Report the survey results and make recommendations for future action

Review pages 27–31 of this manual for details on defining your survey areas and preparing for the survey.

Plan to execute your survey early in the morning or late in the afternoon. These are the times when blue sheep are most likely to be active and feeding. Do not go to the field at midday, as blue sheep rest then, and are difficult to spot when they are resting (especially if rocks and uneven terrain break the area).

### Where to Look for Blue Sheep

- Between the elevations of about 3,400m and 5,200m
- On smooth, or moderately broken, open slopes, Caragana scrubland, open grasslands and summer pastures
- Usually Within 200-400 meters of escape or cover

You will need the same equipment as that used in the snow leopard survey. See page 27 for a complete list.

SLIMS includes two different ways to survey blue sheep:

- Rapid site visit to record or verify presence/absence (after interviewing herders)
- Fixed point counts for more reliable, systematic and quantitative information for particular areas

Estimating blue sheep population size requires rigorous field counts that must be undertaken by appropriately trained persons and following standardized scientifically valid procedures.

## Conducting a Rapid Site Visit

The rapid site visit survey for blue sheep allows you to report on the general status and distribution of the animal. When conducting a rapid site visit, follow the same procedures as those for surveying snow leopards.

Follow these guidelines to improve your chances of sighting blue sheep and obtaining good data:

- Find a high point from which to search for and locate animals
- Use powerful binoculars or a spotting scope mounted on a steady tripod
- Position yourself close enough to the animals so that you can see some detail through your viewing device – such as horn size – but not so close as to disturb them
- Locate as many individuals or groups as possible
- Keep track of the amount of time spent search

## When to Look for Blue Sheep

Blue sheep counts are best conducted at two times of year:

- Late June through August, after lambing. You can acquire birth rate (number of lambs per 100 adult females) and yearling survival rate (number of lambs entering the yearling age class) data at this time. Females leave the herds when lambing, so it is easier to make these counts after they and their 7-10 day old lambs have rejoined the herd
- Late November through February, during the blue sheep's rutting period. At this time, animals gather in large groups as the males vie for the attention of females. The ratio of males to females and the percentage of males in each age class provide critical information on population structure, recruitment and mortality. For instance, herds with a high female-to-male ratio may indicate poaching, as poacher's seek-out males as trophies

### Conducting a Fixed Point Count

The main objectives of fixed-point counts are to:

- Count or census herds and to use this information for estimating population size within the area surveyed
- Characterize blue sheep habitat
- Record factors that may affect blue sheep behavior or population size, including interaction with livestock and seasonal use of pastures

Identify your survey areas in the same manner described on pages 32 for a snow leopard abundance survey.

### Collecting the Information

Climb onto high ridgelines and look downward or across into the adjacent valley. Blue sheep can blend very well into the background and be exceptionally hard to see, especially if the ground has a similar color to the sheep. Keep the sun behind your back to make it easier to spot animals – obviously most easily seen when they are moving or standing and feeding.

Blue sheep have a highly developed sense of smell and good sight. If they detect you first, they could leave the area before you have counted them. Therefore, approach your observation site from downwind and view the sample area from a distance, so that you don't disturb the animals.

To make the counting process easier:

- Mount your spotting scope on a secure tripod out of the wind
- Use the wide-angle lens of the spotting scope (22X) to locate herds and the high power zoom (40-60X) to identify each individuals' age and gender

As you observe the blue sheep, take note of the age of each individual. You can identify the age of animals over 1 year or so based on the size of the horns (see table on next page). Classifying the sheep by

**Form No. 1. Snow leopard presence-absence survey.**

Observer Name: \_\_\_\_\_ Date: \_\_\_\_\_

Survey Block No./Name: \_\_\_\_\_ Elevation (m/ft/masl): \_\_\_\_\_

Latitude/Longitude: \_\_\_\_\_ MAP \_\_\_\_\_ GPS \_\_\_\_\_

Administrative District: \_\_\_\_\_

Biogeographic Zone/Unit: \_\_\_\_\_

Sites & Configuration: \_\_\_\_\_

1. Summary of snow leopard sign observed in this survey block.

Column 1 Search site number	Column 2 Type and amount of sign	Column 3 Search effort (min/units)	Column 4 Dominant landscape

Threats to snow leopard: \_\_\_\_\_

Comments (attach location map): \_\_\_\_\_

**Snow leopard signs:**  
 PUO = pugmark; SC = scrape; FE = feces or faeces; IS = irrigation; RC = rock sweat spray  
 Age of sign: OLD = old or very old sign (> 1 month); FRS = fresh or very fresh sign (1 day to 1 month)

**Dominant landscape:**  
 FLA = plain; GRCL = gently rolling; BRCL = steeply rolling; BTES = broken terrain; WVAL = wide valley;  
 NVAL = narrow valley; OGRB = gorge; OTH = other (describe)

**Presence information:**  
 OBS = confirmed by sighting made by observer(s); R = reported presence by local people; B = presence based on sign pellets, tracks, or other sign seen by observer

age from one year to the next allows you to analyze the changing number of lambs or yearlings per adult female and changes in the male-to-female ratio and male class size over time.

### Bring the Right Equipment!

In addition to a spotting scope or powerful pair of binoculars, bring the same equipment for this survey as you would for a snow leopard abundance survey. See page 27 for a complete list.

### Identifying a Blue Sheep's Age and Sex

There are readily visible differences between males and females and different age groups. The table indicates differences between each sex and age class (adapted from Schaller 1977).

Newborn	Male	Female
<b>Yearling</b>	Small, grayish, wooly tuft of hair on crown After 8 months of age, male appears larger and has short horns	Smaller than males; shorter, thinner horns; may still have wooly crown
<b>(1-2 yrs.)</b>	2/3 as large as an adult female; no dark flank stripe; horns less than 15 cm; may still have wooly crown	N/A
<b>Class One</b>	Same size as adult female; lacks flank stripe; has longer, larger horns than female (25 cm); horns point up	N/A
<b>(~ 2.5 yrs.)</b>	Same size or larger than adult female; faint flank stripe; horns (35 cm) flare up and out	N/A
<b>Class Two (~ 3.5 yrs.)</b>	Definite flank stripe; dark chest; horns bulkier, do not extend backward	N/A
<b>Class Three (~ 4.5 yrs.)</b>	Bulky, black chest & neck, foreleg stripe; thick horns (45 cm) that sweep out and back	N/A
<b>Class Four (~5.5 – 7.5 yrs)</b>	Fully grown; massive horns (50 cm+)	
<b>Class Five Adult Female</b>	~ 87 cm at shoulder; weighs ~39 kg; horns < 20 cm, spindly, knobby; no black chest, no dark flank stripe; wooly crown may be present	

### Recording Data

Complete Form No 3 (Prey Species Survey), noting the following information:

- Where possible, categorize each animal seen by its sex and age class. This will help you determine if you are seeing the same group from one day to the next. As noted above, this classification also provides important information on population structure and dynamics.
- Label the position of each sighting on a topographic map with a unique consecutive number.
- Record the time first sighted and date as well as other relevant observations, such as habitat and behavior, using the codes and definitions on the back of the form:

**Item 1:** species

**Items 2, 3 and 4:** Number in group, distance to group and sex/age composition

**Item 5 and 6:** Time spent searched and size of area searched

*Optional items:*

**Item 7 – 9:** rangeland use, habitat type, and land surface ruggedness class

**Items 10-13:** Position on slope, slope steepness and dominant aspect

**Items 14:** Distances to nearest escape cover, cliff, livestock and settlement

### Survey Tips

- Search each site at least two or three times before moving to the next search site
- Record the total amount of time spent searching for animals in each search site – spend 30 minutes to 2 hours at each site looking
- Select another vantage point if large parts of a search site are hidden from view
- Make your observations from two or three observation points to ensure adequate coverage
- Consider any bias that may occur in your census

For additional information on habitat assessment, see Chapter 5 and 6 in Jackson and Hunter 1996 Snow Leopard Survey and Conservation Handbook.

### Also Note:

- How far the groups are apart from one another
- Details that show the differences in sex/age composition between herds seen in the same search block
- Direction in which each group seems to be moving with respect to other groups, and whether any herds join or break into sub-groups
- Any uncommon individuals, such as those with a missing or misshapen horn

## Analyze Data

Based on your data, estimate the blue sheep population size in your survey area. This requires that you have an accurate estimate of actual area searched for blue sheep, the number seen in each census block, and the total area (in square kilometers) searched. Be cautious in extrapolating numbers to the survey area as a whole, since it is often difficult to judge how representative the area counted actually are. Review your data carefully, look for sources of bias (e.g., days with very different weather conditions or other factors affecting herd detectability), and try not to over or under estimate the population size. Note how the number of animals present usually varies quite widely from one day to the next.

Keep your raw-data in the appendix of your report so that others can see how you derived your population estimates.

Annex IV

SLIMS FORM 3a: Prey Species Survey\*

Observer: \_\_\_\_\_ Date(s)/month: \_\_\_\_\_

Location: \_\_\_\_\_ Survey Block No: \_\_\_\_\_

District/VDC: \_\_\_\_\_ Panch no: \_\_\_\_\_

Starting, ending dates: \_\_\_\_\_ Number days sampled: \_\_\_\_\_

Census Item	Search site	Search site	Search site	Census Item	Search site	Search site	Search site
	Herd no.	Herd no.	Herd no.		Herd no.	Herd no.	Herd no.
1. Prey Species				6. Forest Area Searched			
2. Total no. in group				7. Habitat type			
3. Distance to group				8. Insect surface roughness			
4. Sex and age composition				9. Position on slope			
5. Unfit				10. Elevation			
Adult females				11. Slope			
Adults				12. Aspect			
Young Rams				13. Distance to cliff			
M. Data Base				Other Escape Cover			
Grapple Item				Track			
5. Search time (hours:minutes)				Search time			

\* COMMENTS (enter relevant observations)

### Use the Right Form!

#### Include:

- Number of animals observed and activity at first sighting
- Observation distance in meters at first sighting (i.e. straight-line distance between observer and animal)
- Sex and age composition
- Habitat information: land-use, habitat type, vegetation type, landform type, topographic features present and distance to escape or cover

## Report Results

When creating your report, list each area surveyed, indicating the minimum number of individuals judged to be present in each block along with:

- Number of herds seen
- Herd size(s) and mean or average herd size for each block
- Mean number of individuals in each age class (with minimum and maximum number)
- Average, minimum, and maximum number of herds and animals (all blocks combined)
- Number of days each search site was sampled and number of hours each surveyor spent daily at each site

This data will allow a qualified biologist to construct a life-table that:

- Describes a mortality pattern
- Assesses population age structure and trends
- Estimates the average blue sheep density for each habitat

See a standard text such Bookhout 1994 for details.

Send copies of your report and blue sheep counts by census block, search site, and day (Form No. 3) to:

- The park in which you conducted your survey
- The Department of National Parks and Wildlife Conservation
- The SLIMS node (WWF, PO Box: 7660, Baluwatar, Kathmandu, Nepal and ISLT, 4649 Sunnyside Avenue N., Suite 325 Seattle, Washington 98103 USA, e-mail: [islt3@snowleopard.org](mailto:islt3@snowleopard.org))

Your detailed information will be entered into the SLIMS database for others to reference.

### Food Habits Analysis

It is extremely difficult to directly observe the food habits of a predator such as the snow leopard, and it is just as difficult to locate their kills in the mountainous terrain. Thus, the best way of determining what snow leopards are eating is to collect their scats and identify the remains contained within each dropping. Obviously what has to collect the scat before it decays too much. One has to be certain that it was deposited by a snow leopard in the first place. Food habits studies are time-consuming, and require that you have a good reference collection of hairs and small rodent bones along with the appropriate equipment. Direct observations (e.g., examination of remains of known or suspected snow leopard kills) and interviews must supplement food habits information with local herders (e.g., to estimate the number of livestock killed or scavenged by snow leopards in a particular area). These studies are needed to establish how important livestock are as a source of food.

This study's main objectives are to:

- Learn which foods are being utilized by snow leopards from different areas
- Learn how, when, and where those foods were obtained

### Bring the Right Equipment!

- Hand lens
- Graduated cylinders for measuring sample volumes
- Sieves of several screen sizes
- Forceps dissecting needles
- Pans or trays of various sizes
- Metal scoops for picking up scat samples
- Tamping rod for crushing scat samples
- Dissecting scope and high magnifying microscope for examining cross-sections of hair
- Small envelopes, paper bags, plastic bags, shell vials, screw-top glass bottles, or fruit jars for collecting samples

### Collecting the Information

During your field work, collect likely snow leopard scats, dry and store them in sealed plastic bags and label them with the:

- Name of carnivore leaving the scat (as indicated by tracks, other sign etc)
- Date and place of collection
- Sex of animal leaving (rarely possible)
- Collector's name and contact address

You can identify scats by size, color, associated signs, and location. Collect hair and bone samples from known or suspected prey species when the opportunity arises, for use as cross-references (Oli et al. 1993).

Samples are collected, stored in a dry place and analyzed in a laboratory (see Bookhout 1994)



## Annex One

### SLIMS FORM 1. Snow Leopard & Prey Species Presence-Absence Survey International Snow Leopard Trust

Observer Name: \_\_\_\_\_ Date: \_\_\_\_\_

Survey Block No./Name: \_\_\_\_\_ Elevation (min/max): \_\_\_\_\_

Latitude/Longitude: \_\_\_\_\_ Map \_\_\_\_\_ GPS \_\_\_\_\_

Administrative District: \_\_\_\_\_

Biogeographic Zone/Unit: \_\_\_\_\_

Size & Configuration: \_\_\_\_\_

#### 1. Summary of Snow Leopard Sign Observed in this Survey Block

Form No: \_\_\_\_\_

Column 1 Search Site Number	Column 2 Type and Amount of Sign	Column 3 Search Effort (km <sup>2</sup> )/Time	Column 4 Dominant Landscape

Threats to Snow Leopard: \_\_\_\_\_

Comments (attach location map): \_\_\_\_\_

Snow leopard sign: PUG=pugmarks; SC=scrape; FE=scat or feces; UR=urination; RC=rock scent spray  
Age of sign: OLD=old or very old sign (> 1 month); FRE=fresh or very fresh sign (1 day to 1 month)

Dominant landscape: PLA=plain; GROL=gently rolling; SROL=steeply rolling; BTER=broken terrain; WVAL=wide valley;  
NVAL=narrow valley; GORG=gorge; OTH=other (describe)

Prey species information: OBS=confirmed by sighting made by observer(s); R=reported present by local people; S=presence based on sign (pellets, tracks, or other sign) seen by observer.

SLIMS Form 1 (Page 2)

2. Summary of Prey Species and Their Sign Observed

Column 1 Prey Species	Column 2 Type and Amount of Sign	Column 3 Relative Abundance	Column 4 Major Threats

See instructions in Snow Leopard & Prey Species Questionnaire for prey species abundance categories

Comments: \_\_\_\_\_

3. Summary of habitat assessment for this survey block.

Vegetation types present: \_\_\_\_\_

Habitat types present: \_\_\_\_\_

Major disturbances: \_\_\_\_\_

Key natural resources harvested: \_\_\_\_\_

Local attitudes to wildlife: \_\_\_\_\_

RECOMMENDATIONS: Is an abundance survey required? Yes \_\_\_\_\_ No \_\_\_\_\_

4. Summary of Management Issues.

Protection/management of snow leopard: \_\_\_\_\_

Protection/management of prey (name species): \_\_\_\_\_

Protection/management of rare wildlife (name): \_\_\_\_\_

Other recommendations: \_\_\_\_\_



**Codes to SLIMS Form 2. Snow Leopard Sign Transect - Abundance Survey  
International Snow Leopard Trust**

Col. No	Item	Code	Description
1.	Site number		Number sites consecutively
2.	Observation number		Number each item of sign at a site consecutively
3.	Distance along transect		Cumulative distance along transect in meters
4.	Species code:		Sign left by:
	<i>Uncia uncia</i>	SLP	snow leopard.
	<i>Panthera pardus</i>	LEO	common leopard.
	<i>Lynx lynx</i>	LYN	lynx.
	Other felid	FEL	another cat species (specify if possible).
	<i>Canis lupus</i>	WOF	wolf.
	<i>Vulpus vulpes &amp; ferrilata</i>	FOX	fox.
	<i>Cuon alpinus</i>	WDD	wild dog or dhole.
	<i>Canis domesticus</i>	DOG	domestic dog.
	Other canid	CAN	another dog species (specify if possible).
	Other species	OTH	another predator (specify if possible).
	Not known	UNK	Unknown species
5.	Elevation B Take from altimeter (in meters)		
6.	Aspect of site B (degrees)		Record the direction of the site containing the sign
7.	Slope B Take from clinometer (degrees)		Record the direction the dominant slope faces
8.	Rangeland Use:		
	None	NON	Area receives no human use
	Seasonal grazing	SGR	Area grazed seasonally by livestock
	YearRound grazing	YRG	Area grazed throughout the year by livestock
	Other	OTH	Other type of landUse (describe)
9.	Habitat type:		
	Barren	BAR	Less than 10% of the ground has vegetation cover
	Grassland	GRA	Dominant vegetation is grassland
	Shrubland	SHR	Dominant vegetation consists of shrubs
	Woodland	WOO	Dominated by open trees and savanna
	Forest	FOR	Tree cover exceeds 30%
	Other	OTH	Other habitat type such as field (describe).
	Vegetation type (in Bcountry)		Use standard classification developed by recognized Country expert & provide codes to SLIMS node.
10.	Landform or land-surface ruggedness:		
	Cliff	CLF	Terrain at site is very precipitous (slope more than 50°).
	Broken	BR	Terrain is broken by cliffs, rocky outcrops, ravines, and gullies.
	Very broken	VBR	Terrain heavily broken by cliffs, rocky outcrops, ravines, and gullies.
	Rolling	ROL	Terrain has a relatively smooth land surface (e.g., rolling hills or alluvial fan).
	Flat	FLA	Terrain forms a level surface (e.g., plain).
11.	Dominant topographic feature (local feature which best describes the site):		
	Cliff	CLF	Terrain at site is very precipitous (slope more than 50°).
	Ridgeline	RID	Narrow crest of land sloping down on either side
	HillSlope	HIL	Side or slope of a hill.
	Valley floor	VAL	Valley floor or adjacent slope.
	Basin or bowl	BOW	BowlBlike depression.
	Saddle	SAD	Well-defined low spot along a ridgeline
	Pass	PAS	Well-defined mountain pass
	Stream bed	STR	Site with seasonal or permanent water flowing drainage through it.
	Boulder field	BOU	Outcropping of large boulders.
	Talus or scree slope	TAL	Accumulation of rocks and pebbles at base of a steep slope.
	Rockfall or landslide	ROC	The mass of rocks at the base of a cliff.
	Bluff	BLU	Steep slope bordering a stream or river.
	Terrace	TER	Level raised area bordering a stream or river.
	Glacier	GLA	Permanent icefield.
12.	Feature marked (feature at which sign is directed):		
	Cliff (base or crest)	CLIF (1)	Steep rock face.
	Boulder	BOUL (2)	Large rock.
	Promontory	PROM (3)	Peak of land that juts out over a hillside, offering a good view of the land below.
	Knoll	KNOL (4)	Hillock or rounded protuberance on a hillside or ridgeline.
	Pass	PASS (5)	A narrow passage across a mountain top.
	Bush or tree	BUSH (6)	Only obvious feature present is a large bush or tree.
	Grass	GRAS (7)	Most obvious feature is a tuft of grass.

None	NONE (8)	No obvious feature is present.
Saddle	SAD (9)	Saddle (a low spot along a ridgeline).

Numbers represent alternative coding to minimize possible confusion with other environmental parameters

13. Type of Site (with respect to use by snow leopards):

<b>Scrape Site</b>		
NonBrellic	0	Usually only one scrape is present at the site or all the scrapes (and feces) are about the same age. No evidence of repeated use.
Relic	1	Usually there are numerous (3B10) scrapes present of various ages. Due to remarking, some or most scrapes have a sculptured appearance. Feces of many different ages may also be present.

14. Type of sign present at site:

Scrape	SC	Scrape made by a snow leopard or other felid.
Scratch (canid only)	SR	Scratch made by a canid.
Feces (scat)	FE	Scat or dropping.
Urine	UR	Urination mark.
Scent spray	RC	Scent mark.
Claw rake	CL	Claw mark made on a tree trunk or rock face and left by a felid
Pugmark	PU	Footprint impression or track

15. Sign age or visibility (by type of sign present):

<b>Scrape</b>		
Very old	0	Extensive weathering and disintegration, scrape features poorly defined, often with vegetation growth in the depression and on the pile (age = at least 3 to 6 months).
Old	1	Moderate weathering and disintegration, with the scrape showing a rounded form, occasionally with vegetation in the depression or on the pile (age = several months or more).
Fresh	2	Slight weathering. Scrape has a wellBdefined form with Asharp@ edges, is easily recognizable, and has no new vegetation growing in the scrape depression or pile (age = 1 to 4 weeks).
Very fresh	3	Little or no weathering has occurred, so that the scrape has a very sharp and Aclean@ form, is very easily recognizable, and has no vegetation in its depression or pile. Sand or gravelly material may cover some vegetation, causing it to Ablend-down@. Other ephemeral sign such as tracks or urine may be observed, while scats deposited at the same time are obviously still fresh or very fresh (age = less than 1 week).
<b>Pugmark</b>		
Old	0	Pugmark is very poorly defined, with an obviously Aweathered@ appearance (more than 2 weeks old).
Fresh	1	Pugmark has sharply defined edges and shape (several days, but less than one week old).
Very fresh	2	Pugmark is very fresh, showing fine surface details and having a very sharp edge (made less than 24 hours previously).
<b>Feces</b>		
Old	0	Scat is mottled and cracked, with a hard, dull surface and dry interior (several weeks to several months of age).
Fresh	1	Scat is odoriferous and Afresh-looking@, with a glossy, sheen inside (more than 2 days but less than 10 days of age).
Very fresh	2	Scat is still wet outside and moist inside (no older than 2 days).
<b>Scent-sprayed Rocks</b>		
None	0	No detectable odor (more than 3 months old).
Slight	1	Odor is just detectable.
Moderate	2	Odor is readily detectable.
Strong	3	Odor is unmistakable.
Very strong	4	Odor is very strong (can be detected from 25 cm or more away; less than several weeks old).
<b>Claw or Tree Rake (living tree only)</b>		
Very old	0	Bark has fully covered the claw scars, completely healing the wound.
Old	1	Claw scars on bark present but the scar has clearly started to heal.
Fresh	2	Claw marks still very evident and sap may still be exuding from the wound, with other sign such as mud on the bark or pugmarks nearby.

16. Substrate type:

Rock	1	Ground surface consists largely of rock.
Sandy soil	2	Sandy appearance with particles having a diameter of less than 2 mm.
Gravelly soil	3	Mixture of small pebbles (particle diameter more than 2 mm) and soil.
Fine or silty soil	4	Soil consists of fine or very fine particles (clay, silt, and dust).
Snow	5	Snow dominates.
Vegetation	6	Vegetation dominates.

17. Sign measurement (centimeters) See Figures

**DEFINITIONS & CODES for SLIMS FORM No. 3**  
International Snow Leopard Trust

Column number	Item	Code	Description
	<i>Search Site</i>		<i>Each sub-block or section of a census block should have its own name or number. Record location using a GPS (specify if decimal degrees or seconds &amp; minutes)</i>
	<i>Herd number</i>		<i>Number each ungulate herd seen consecutively</i>
<b>1. Prey Species:</b>			
	<i>Equus hemionus kiang</i>	<i>EQHEKI</i>	<i>Kiang</i>
	<i>Ovis ammon hodgsoni</i>	<i>OVAMHO</i>	<i>Tibetan argali</i>
	<i>Pseudois nayaur</i>	<i>PSNA</i>	<i>Blue sheep</i>
	<i>Hemitragus jemlihicus</i>	<i>HEJE</i>	<i>Himalayan tahr</i>
	<i>Naemorhedus goral</i>	<i>NEGO</i>	<i>Goral</i>
	<i>Capricornis sumatraensis</i>	<i>CASU</i>	<i>Himalayan serow</i>
	<i>Procapra picticaudata</i>	<i>PRPI</i>	<i>Tibetan gazelle</i>
	<i>Moschus chrysogaster</i>	<i>MOCH</i>	<i>Himalayan musk deer</i>
	<b>2. Total number in group</b>		<i>Count and record</i>
	<b>3. Distance (m) to group</b>		<i>Record distance from you to centre of the herd</i>
	<b>4. Sex and age composition</b>		<i>Record for each category/class. See separate handout for a description of the sex and age classes used for describing blue sheep</i>
	<b>5. Search time</b>		<i>Record total time spent looking or searching (in hours and minutes)</i>
	<b>6. Percent area searched</b>		<i>Estimate percent of survey block visible from observation point and which can be searched (in square kilometers or dimension)</i>
<b>OPTIONAL ITEMS:</b>			
	<b>7. Rangeland use:</b>		
	<i>None</i>	<i>NON</i>	<i>Area receives no human use</i>
	<i>Seasonal grazing</i>	<i>SGR</i>	<i>Area grazed seasonally by livestock</i>
	<i>Year-round grazing</i>	<i>YRG</i>	<i>Area grazed throughout the year by livestock</i>
	<i>Other</i>	<i>OTH</i>	<i>Other type of landuse (describe)</i>
	<b>8. Habitat type:</b>		
	<i>Barren</i>	<i>BAR</i>	<i>Less than 10% of the ground has vegetation cover</i>
	<i>Grassland</i>	<i>GRA</i>	<i>Dominant vegetation is grassland</i>
	<i>Shrubland</i>	<i>SHR</i>	<i>Dominant vegetation consists of shrubs</i>
	<i>Woodland</i>	<i>WOO</i>	<i>Dominated by open trees and savanna</i>
	<i>Forest</i>	<i>FOR</i>	<i>Tree cover exceeds 30%</i>
	<i>Other</i>	<i>OTH</i>	<i>Other habitat type such as field (describe)</i>
	<i>Vegetation Type</i>		<i>Use categories designated by your Department and sends to SLIMS HQ</i>
	<b>9. Land-surface Ruggedness:</b>		
	<i>Cliff</i>	<i>CLF</i>	<i>Terrain at site is very precipitous (slope more than 50)</i>
	<i>Very broken</i>	<i>VBR</i>	<i>Terrain heavily broken by cliffs, rocky outcrops, ravines, and gullies</i>
	<i>Broken</i>	<i>BR</i>	<i>Terrain broken by irregular slopes, rocky outcrops, and gullies</i>

**DEFINITIONS & CODES for SLIMS FORM No. 3**  
**International Snow Leopard Trust**

Column number	Item	Code	Description
	<i>Search Site</i>		<i>Each sub-block or section of a census block should have its own name or number. Record location using a GPS (specify if decimal degrees or seconds &amp; minutes)</i>
	<i>Herd number</i>		<i>Number each ungulate herd seen consecutively</i>
1.	Prey Species:		
	<i>Equus hemionus kiang</i>	<i>EQHEKI</i>	<i>Kiang</i>
	<i>Ovis ammon hodgsoni</i>	<i>OVAMHO</i>	<i>Tibetan argali</i>
	<i>Pseudois nayaur</i>	<i>PSNA</i>	<i>Blue sheep</i>
	<i>Hemitragus jemilhicus</i>	<i>HEJE</i>	<i>Himalayan tahr</i>
	<i>Naemorhedus goral</i>	<i>NEGO</i>	<i>Goral</i>
	<i>Capricornis sumatraensis</i>	<i>CASU</i>	<i>Himalayan serow</i>
	<i>Procapra picticaudata</i>	<i>PRPI</i>	<i>Tibetan gazelle</i>
	<i>Moschus chrysogaster</i>	<i>MOCH</i>	<i>Himalayan musk deer</i>
2.	Total number in group		<i>Count and record</i>
3.	Distance (m) to group		<i>Record distance from you to centre of the herd</i>
4.	Sex and age composition		<i>Record for each category/class. See separate handout for a description of the sex and age classes used for describing blue sheep</i>
5.	Search time		<i>Record total time spent looking or searching (in hours and minutes)</i>
6.	Percent area searched		<i>Estimate percent of survey block visible from observation point and which can be searched (in square kilometers or dimension)</i>
	<b>OPTIONAL ITEMS:</b>		
7.	Rangeland use:		
	<i>None</i>	<i>NON</i>	<i>Area receives no human use</i>
	<i>Seasonal grazing</i>	<i>SGR</i>	<i>Area grazed seasonally by livestock</i>
	<i>Year-round grazing</i>	<i>YRG</i>	<i>Area grazed throughout the year by livestock</i>
	<i>Other</i>	<i>OTH</i>	<i>Other type of landuse (describe)</i>
8.	Habitat type:		
	<i>Barren</i>	<i>BAR</i>	<i>Less than 10% of the ground has vegetation cover</i>
	<i>Grassland</i>	<i>GRA</i>	<i>Dominant vegetation is grassland</i>
	<i>Shrubland</i>	<i>SHR</i>	<i>Dominant vegetation consists of shrubs</i>
	<i>Woodland</i>	<i>WOO</i>	<i>Dominated by open trees and savanna</i>
	<i>Forest</i>	<i>FOR</i>	<i>Tree cover exceeds 30%</i>
	<i>Other</i>	<i>OTH</i>	<i>Other habitat type such as field (describe)</i>
	<i>Vegetation Type</i>		<i>Use categories designated by your Department and sends to SLIMS HQ</i>
9.	Land-surface Ruggedness:		
	<i>Cliff</i>	<i>CLF</i>	<i>Terrain at site is very precipitous (slope more than 50)</i>
	<i>Very broken</i>	<i>VBR</i>	<i>Terrain heavily broken by cliffs, rocky outcrops, ravines, and gullies</i>
	<i>Broken</i>	<i>BR</i>	<i>Terrain broken by irregular slopes, rocky outcrops, and gullies</i>

Rolling	ROL	Terrain has a relatively smooth land surface (e.g., rolling hills or alluvial fan)
Flat	FLA	Terrain forms a level surface (e.g., plain)

## 10. Position on slope (divide mountain slope in front of you into equal thirds and classify as one of the following):

Upper third	U	Animal located in upper portion of slope, near ridgeline
Middle third	M	Animal located in middle portion of slope
Lower third	L	Animal located near bottom of slope, or in the valley

11. Elevation *In meters, record from an altimeter or reliable topographic map*12. Slope *In degrees, record using a clinometer*13. Aspect *In degrees, from a compass*14. Distance to selected features *Estimate the distance to the nearest selected feature*

All distances are assumed to be in meters unless otherwise specified.

Cliff CLF Nearest Cliff

Nearest OTHER escape cover (indicate which best describes this feature closest to the herd):

GUL	Gully
RID	Ridgeline
TAL	Talus, scree
ROC	Rockfall or landslide
BLU	Riverine bluff
BOU	Boulder field

Livestock Indicate livestock type and approximate number in nearest livestock herd

GOAT	Goat
SHEP	Sheep
YAK	Yak and yak cross-breeds
HOR	Horse
CAT	Cattle (pure-bred only)

Indicate distance to nearest humans, including type (permanent village; summer village; goth)

SET	Permanent settlement or village
HER	Herders camp (goth)
SVIL	Summer village



## Annex Two

### Livestock Depredation Report Data Form

Name of Person(s) interviewed: \_\_\_\_\_

Name of Village: \_\_\_\_\_

VDC and Ward: \_\_\_\_\_ Date: \_\_\_\_\_

Name of Interviewer or person gathering information: \_\_\_\_\_

Household Name & Voters Number: \_\_\_\_\_

Number in Household: Adult male \_\_\_\_\_ Adult female \_\_\_\_\_ Children \_\_\_\_\_

Primary Source(s) of livelihood: \_\_\_\_\_

#### 1. Livestock Ownership and Trend:

##### (a) Current Livestock Holdings:

Type	Total Number	Adult male	Adult female	Juvenile
Yak/ Dzo (hybrid)				
Cattle				
Buffalo				
Sheep				
Goats				
Horse				
Other				

(b) Has your herd increased or decreased from last year or is it about the same size? Please indicate what your herd size was last year, preferably by the kind of livestock:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#### 2. Livestock Husbandry: Please describe your annual husbandry cycle -

(a) Do you use separate pastures during the winter and summer? \_\_\_Yes \_\_\_ No. Please indicate the number, approximate size, and location (name) and the distance (hours walk) of each major pasture from your home village in the following table:

Pasture Name*	Months used	Approx. Size	Distance (hours)	Type of Livestock using pasture

\* If possible, indicate where these are on the map provided.

(b) Do you share use of this pasture with other villages and/or outside herders? Yes\_\_ No\_\_

If yes, describe who and explain how pasture use is allocated among authorized users:

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(c) Are you able to obtain enough summer and winter forage for your animals? Have supplies become more or less available in recent years? Please explain: \_\_\_\_\_

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(d) Which persons (men, women or children) are responsible for looking after the animals in your household, and how this is accomplished (explain day-time and seasonal herding patterns)?

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(e) Has your income from livestock herding increased or decreased in recent years? If there is a change, please explain: \_\_\_\_\_

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3. Sources of Mortality:

Type of Mortality	Ranking (1-5)	Comments
Lack of forage		
Winter snow		
Disease		
Accident		
Predation		
Other (describe)		

(b) Enter the number of animals lost last year to each type of mortality. If possible, record the number of adults and young separately:

Source of Mortality	Number lost by kind of livestock					
	Yak/hybrid	Cattle	Buffalo	Sheep/Goats	Horse	Other
Lack of forage						
Winter snow/cold						
Disease						
Accident						
Predation						
Other (specify)						

(c) Describe what actions you take to minimize losses to each mortality source:

Mortality Source	Precaution or Action(s) taken
Lack of forage	
Winter snow/cold	
Disease	
Accident	
Predation	
Other (specify)	

## SNOW LEOPARD AND PREY SPECIES SURVEY

### *Explanation of Methods and Form:*

*Purpose:* The purpose of this form is to (1) Identify and map the distribution and status (numbers or relative abundance) of the snow leopard (*Uncia uncia*) and its major ungulate prey species such as blue sheep or bharal (*Pseudois nayaur*), Himalayan tahr (*Hemitragus jemilihacus*), nayen (*Ovis ammon*), musk deer (*Moschus spp.*); and goral (*Naemorhedus goral*); and (2) Gather information on threats to these species and local attitudes or feelings toward wildlife and its conservation, including an initial assessment of livestock depredation by wild predators.

This information is needed to help the Department and others to protect this endangered species and its prey, and to determine which areas are most subject to livestock depredation..

*Methods:* Visit each village, and as many herder camps as possible within the park and its immediate vicinity or buffer zone. Identify which persons are most knowledgeable about the area's wildlife and then ask them as many of the questions listed in the questionnaire as possible. Complete a single form for each person that you interview. On your return to headquarters, please report the results to your supervisor and send in the completed forms to the Snow Leopard Project Coordinator in Kathmandu. Please be sure to:

- (1) Record latitude and longitude of the locality surveyed and site(s) referred to during your interview;
- (2) Mark the location of villages and areas covered or surveyed on a map of the particular protected area and its immediate surroundings. Try to draw lines around the perimeter or edges of the areas described during village interviews, so that the DNPWC cartographer and/or responsible department person can measure their size and enter them into a computer-based GIS (Geographical Information System);
- (3) Prey relative abundance is ranked in general categories according to following sighting criteria: Abundant = species is seen often or very often; Common = species seen regularly; Uncommon = species not seen regularly; Rare = species is rarely or very rarely seen or its sign encountered. For shy animals, base relative abundance on the amount of sign (tracks and/or pellets) encountered;
- (4) Rate the reliability of each person interviewed on a scale of 0-3: where 3 = information appears to be very accurate, for the person is clearly very knowledgeable about the kinds and habits of wildlife present; 2 = knowledge is about average, with the person not being able to accurately describe or identify all of the species mentioned; and 1 = person unable to accurately describe or identify 2 or more species; and 0 = person's knowledge and statements are very questionable and what they say is highly doubtful;
- (5) Measure the greatest width and length of any pugmarks you are shown or which you find in the area, as well as the distance between strides (See SLIMS Conservation Handbook for details);
- (6) Collect snow leopard and other predator droppings so that they can be examined for their content and the animal's diet. Air-dry quickly, then place each dropping in its own plastic bag and include a label indicating the predator species (indicate if known or suspected), collector's name, date collected and place name where collected.
- (7) Any pelts or remains of snow leopard found should be turned over to your supervisor for proper scientific cataloging and storage, along with relevant information on when and where it came from.

**Snow Leopard & Prey Species Survey Questionnaire**  
for interviewing local residents on presence/absence and status of snow leopard and their prey  
in Nepal

Name of Interviewer: \_\_\_\_\_ Rank: \_\_\_\_\_ Post: \_\_\_\_\_

Informant's Name (Household Head): \_\_\_\_\_ Date: \_\_\_\_\_

Occupation and Social Status:  
\_\_\_\_\_

Village Name: \_\_\_\_\_ VDC: \_\_\_\_\_ Ward: \_\_\_\_\_

Total Village Population (number persons/households): \_\_\_\_\_ Elevation  
(m): \_\_\_\_\_

Name of Park: \_\_\_\_\_ Sector: \_\_\_\_\_

**Snow Leopard Sightings and Status**

Do you know if snow leopard occur here or in nearby areas? Yes\_\_\_ No\_\_\_

If so, Where? (list name of place(s) where seen): \_\_\_\_\_

When was one last seen? Month\_\_\_\_\_ Year\_\_\_\_\_

By Whom? List person's name and village: \_\_\_\_\_

How far from village (km)? \_\_\_\_\_ Indicate kind of evidence found with tick below:

Pugmark:\_\_\_\_\_ Scrape:\_\_\_\_\_ Feces:\_\_\_\_\_ Sighting:\_\_\_\_\_ At livestock kill: \_\_\_\_\_

Indicate size of sign (pugmark, scrape, feces): \_\_\_\_\_

Describe the place where the sign was found (e.g. trail, base of cliff, stream-bed, ridge, woodland, rocky area, other): \_\_\_\_\_

What habitat type? (forest, pasture, rock, shrubland): \_\_\_\_\_

If a sighting, how many snow leopards were seen in the group and what was their age class (indicate number below)?

Male:\_\_\_\_\_ Female:\_\_\_\_\_ Young:\_\_\_\_\_ Unknown Age: \_\_\_\_\_

Describe distinctive physical features: \_\_\_\_\_

How big was it (indicate height at shoulder)? \_\_\_\_\_

How many snow leopard do you think use this area? \_\_\_\_\_

Do you see their sign: \_\_\_ very often \_\_\_ commonly \_\_\_ uncommonly or \_\_\_ rarely?

During which months are they or their sign seen? (list each month & circle the month when most are seen):  
\_\_\_\_\_  
\_\_\_\_\_

How long do they remain in the area (days, weeks, or months)?

: \_\_\_\_\_

Are they here all year or seasonally? All Year: \_\_\_\_\_ Seasonally only: \_\_\_\_\_

What is your opinion about snow leopards? Are they: Good? \_\_\_ Bad? \_\_\_ No opinion? \_\_\_\_\_

Should be protected or eliminated and why? \_\_\_\_\_

Do local people have any kinds of belief about the snow leopard? \_\_\_\_\_  
\_\_\_\_\_

**Threats and Conservation Issues:**

Do snow leopard kill livestock in your area? Yes: \_\_\_ No: \_\_\_ Do not know: \_\_\_\_\_

If yes, which kind of livestock are killed (please list in order): \_\_\_\_\_  
\_\_\_\_\_

How many were killed in the last 12 months? \_\_\_\_\_

List months of year with most losses: \_\_\_\_\_

How many in winter? \_\_\_\_\_ How many in summer? \_\_\_\_\_

Is there any poaching in your area? Yes: \_\_\_ No: \_\_\_ Do not know: \_\_\_\_\_

If yes, which wildlife species? \_\_\_\_\_

Kind of weapons/methods are used? \_\_\_\_\_

Have other persons visited and inquired about snow leopard pelts or body parts? When and how many? (mention day, month, year, and number of persons): \_\_\_\_\_

Were they locals: \_\_\_\_\_ or foreigners: \_\_\_\_\_ and how were they dressed?

Where they interested in (1) seeing a snow leopard: \_\_\_\_\_ (2) buying a pelt: \_\_\_\_\_  
or (3) purchasing its bones: \_\_\_\_\_?

How much were they willing to pay (price in Rs)? \_\_\_\_\_

Was the informant(s) offered or given any kind of incentive or reward? \_\_\_\_\_

If so, was in cash? \_\_\_\_\_ or in-kind? (e.g., cigarettes, or goods) \_\_\_\_\_

**Other Wildlife Present in the Area:**

What other predators occur here? Tiger: \_\_\_\_\_ Common leopard: \_\_\_\_\_ Lynx: \_\_\_\_\_

Wolf: \_\_\_\_\_ Wild-dog: \_\_\_\_\_ Other Species: \_\_\_\_\_

What prey species like blue sheep occur here? (please list in order of abundance):  
\_\_\_\_\_

Are blue sheep seen: \_\_\_\_\_ very often/often \_\_\_\_\_ commonly \_\_\_\_\_ uncommonly \_\_\_\_\_ rarely or \_\_\_\_\_ never?

Please indicate how often you see other species or their sign like musk deer, argali or Himalayan tahr?

Species: \_\_\_\_\_ Very often/often \_\_\_\_\_ commonly \_\_\_\_\_ uncommonly \_\_\_\_\_ rarely \_\_\_\_\_ never? \_\_\_\_\_

Species: \_\_\_\_\_ Very often/often \_\_\_\_\_ commonly \_\_\_\_\_ uncommonly \_\_\_\_\_ rarely \_\_\_\_\_ never? \_\_\_\_\_

Species: \_\_\_\_\_ Very often/often \_\_\_\_\_ commonly \_\_\_\_\_ uncommonly \_\_\_\_\_ rarely \_\_\_\_\_ never? \_\_\_\_\_

Have numbers declined over the past 5-10 years? If so, for which species? \_\_\_\_\_

Have numbers increased over the past 5-10 years? If so, for species? \_\_\_\_\_

Are any of these species hunted or poached? Yes \_\_\_\_\_ No \_\_\_\_\_ Don't know \_\_\_\_\_

If so, which species? \_\_\_\_\_

Who are the main persons responsible for poaching? \_\_\_\_\_

Please list areas you think have the most poaching: \_\_\_\_\_

During what seasons does poaching occur? \_\_\_\_\_

How would you rank the informant's reliability on a scale of 0 to 3 (see below): \_\_\_\_\_

Comments and Other Observations: Use the space below to add any comments or observations you may have.





(c) How have animal husbandry practices and guarding changed since your grand-fathers time?

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(d) During which seasons (months) and where (pastures) do you or other villagers suffer most depredation?

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(e) What measures, that meet with the Parks regulations, would you recommend for reducing losses or alleviating hardships?

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(f) Have you observed any changes in the number of blue sheep, musk deer and other ungulates in your pastures or village area? Please explain what these are:

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5. Other Observations of Interviewer and/or Villagers:

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### Methods for Livestock Depredation Baseline Information Survey:

- 1) Visit each village located in or near your National Park or Wildlife Reserve that has reported loss of livestock to wildlife predators.
- 2) Try to find out the names of all households who have lost animals to predators over the past 2-3 years and then interview as many of them as possible for details regarding their losses, as indicated in the questionnaire.
- 3) Find out the names of households who also own livestock but have not lost any livestock to predators during the same time period (although, of course they have probably lost animals to other sources of mortality). Make a list of these households, using the name of the family head and their ward number. In order to select a random sample for you to interview, first write each household number and/or name on a piece of paper and then place these into a bowl or hat. Now have someone close their eyes, then draw the papers until you match the same number of households who reported their livestock was killed by predators. These are the households you will interview and try to determine if they use different pastures, guard their animals more closely or simply have been lucky in suffering no predation losses! In either case, it is best to interview as many households as possible so that you get a good sample size.
- 4) When asking questions follow these rules to increase the likelihood of getting factual and accurate answers, while minimizing possible bias or sources of mis-information:
  - Before you start your interview, ask them if they can spare the 30-60 minutes it will take. If not, try to schedule the interview for another time that is more suitable.
  - Enlist their cooperation by carefully explaining the purpose for your questions, making sure that they understand you are not, during this visit at least, making any promises that DNPWC or HMG will provide compensation or take any other specific action that they may request. Rather, you are trying to learn what kind of problems they face and how you can help (while also protecting the areas wildlife and natural resources, as mandated under the National Parks Act of 1973), so that you can report back to your superior. Emphasize that it is very important that they provide reliable information, otherwise they will lose credibility and risk getting any assistance. Reliable baseline data is vital to the process of properly managing the park and also improving the local peoples livelihood. Let them know that you would be happy to take any recommendation that is reasonable back to your superiors for their consideration and action.
  - State each question clearly and ask people if they need clarification before they answer. Make sure that you ask complete sentences, paying special attention to the wording and literal meaning.
  - Avoid asking people a leading question: For example, instead of asking someone, **A**Did you lose many animals to predators last year, first ask them **A**What are the sources of mortality your herd or village suffers from? and then ask them, **A**How many animals did you lose to each of this factors last year?
  - Make sure that the person being interviewed is given all of the alternative choices for the item that you are investigating. For example, list all sources of mortality before asking people what their losses were to a particular kind. The correct sequence is: **A**I am going to ask you about the different types of mortality that your livestock has suffered from in the last 12 months, and then ask you to rank these in order of greatest concern to you (Item 3a) and **A**I would like to know how many animals you have lost to each

source of mortality over the last 12 months. Please give me the numbers by the kind of livestock, and if possible separately for adult males, adult females and juveniles. (Item 3b).

- Be careful of ambiguous and general **A**why questions. In general, there are 4 practical standards that all questions should meet. These are: (1) Is this a question that can be asked exactly the way it is written? (2) Is this a question that will mean the same thing to everyone? (3) Is this a question that people can answer? and (4) Is this a question that people will be willing to answer, given the data collection procedures being used, including the background of the interviewer?

- The interviewer should ask questions in a standardized, objective manner, making sure that the respondents are not rushed or otherwise pressured to answer in ways the interviewer may wish. It is highly desirable that interviewers be carefully selected and properly trained so that they can perform their job well and thus better ensure a reliable, consistent survey.

- It may help to **A**pretest questions on representative persons prior to finalizing the format of your interview. This helps to identify ambiguous questions.

- Make frequent use of the technique known as **A**Triangulation. That is, cross check the figures given to you by one person by interviewing a non-family member and asking if they recall such incidents or know how many animals that **A**Family X lost over last year or during last winter. Compare the numbers (or information) to see how closely they match one another.

- Make sure that you interview persons from all ethnic groups or social castes, as well as income groups (i.e. the rich and the poor).

- Talk to men as well as women, to the elderly as well as the young.

- Try to classify the reliability of each informant (person interviewed) on a simple scale of 1-3, where 3 = considered to be very reliable, and 1 = considered to be unreliable due to the misinformation they supplied.

- Finally, and by no means least, go into the field and verify for yourself that the animal husbandry and guarding practices described to you by respondents are in fact correct.

# References

- Ahlborn, G. and R. Jackson. 1988. Marking in free-ranging snow leopards in west Nepal: A preliminary assessment (ed. H. Freeman). Proceedings of the Fifth International Snow Leopard Symposium. International Snow Leopard Trust and Wildlife Institute of India. 5:25-19.
- Bajimaya, S. 1998. Status of World Heritage Sites in Nepal (Country Paper). Conserving Himalayan Heritage- The Role of World Heritage Convention Aug 31- 2 Sept. Lalitpur, Nepal.
- Bajimaya, S. 1990. A Report on Overall Assessment of Dhorpatan Hunting Reserve. Submitted to the Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.
- Blomqvist, L. and V. Nystrom. 1980. On identifying snow leopards by their facial markings. International Pedigree Book of Snow Leopards Vol 2:159-167.
- Bookhout, T. A. (Ed.) 1994. Research and management techniques for wildlife and habitats. Fifth edition. The Wildlife Society, Bethesda, Maryland. 740 pages.
- Fox, J. L. 1989. A review of the status and ecology of the snow leopard (*Panthera uncia*). Unpub. Rept., International Snow Leopard Trust, Seattle. 40 pages.
- Fox, J. L. 1989. An annotated bibliography of literature on the snow leopard (*Panthera uncia*). Unpub. Rept., International Snow Leopard Trust, Seattle, 72 pages.
- Fox, J.F. and D. Jizeng (editors). Proceedings of the Seventh International Snow Leopard Symposium, China. July 25-30, 1992. Northwest Plateau Institute of Biology, Chinese Academy of Sciences, Agriculture and Forest Bureau of Qinghai Province, People's Republic of China, and International Snow Leopard Trust. International Snow Leopard Trust, Seattle, Washington, USA.
- Freeman, H. (editor). 1988. Proceedings of the Fifth International Snow Leopard Symposium, India. October 1986. Government of India, Department of Environment, Forests and Wildlife, Wildlife Department of State of Jammu and Kashmir, Wildlife Institute of India, United States Fish and Wildlife Service, and International Snow Leopard Trust. International Snow Leopard Trust and Wildlife Institute of India.
- Giles, R.H. (editor). 1981. Wildlife Management Techniques (3<sup>rd</sup> revised edition). The Wildlife Society, Washington, D.C. Natraj Publishers, Dehradun, India.
- Jackson, R.M. 1996. Home range, movements and habitat use of Snow leopard (*Uncia uncia*) in Nepal. Ph.D. thesis, University of London, External Programme, London. 233 pages.
- Jackson, R.M. and G. Ahlborn. 1989. Snow Leopards (*Panthera uncia*) in Nepal: home range and movements. National Geographic Research 5(2): 161-175.
- Jackson, R. and G. Ahlborn. 1990. The role of protected areas in Nepal in maintaining viable populations of snow leopards. International Pedigree Book Snow Leopards 6:51-69.
- Jackson, R.M. and A. Ahmad (editors). 1997. Proceedings of the Eight International Snow Leopard Symposium, Pakistan. Nov.12-16, 1995. International Snow Leopard Trust and World Wide Fund for Nature-Pakistan. International Snow Leopard Trust. Seattle, Washington, USA.
- Jackson, R.M. and D. Hillard. 1986. Tracking the elusive Snow Leopard. National Geographic Magazine 169(6): 796-809.
- Jackson, R.M. and D.O. Hunter. 1996. Snow Leopard Survey and Conservation Handbook (2<sup>nd</sup> Edition). International Snow Leopard Trust. Seattle, Washington, USA.

- Jackson, R.M. and J.L. Fox. 1999. Report on the Fifth SLIMS Training Workshop conducted in Shey-Phoksundo National Park, Nepal (Final Draft). May-June 1999. International Snow Leopard Trust, Seattle, Washington, USA
- Jackson, R.M. and J. Singh. 1998. Snow Leopard Information Management System (SLIMS) Software User's Guide. International Snow Leopard Trust, Seattle, Washington USA.
- McCarthy, T.M. 2000. Ecology and conservation of snow leopards, Gobi brown bears and wild Bactrian camels in Mongolia. Ph.D. dissertation, University of Massachusetts, Amherst. 133 pages.
- Miller, D. J. and R.M. Jackson. 1992. Livestock and Snow Leopards: Making Room for Competing Users on the Tibetan Plateau. Proceedings of the Seventh International Snow Leopard Symposium. 7:315-328.
- Oli, M. 1991. The ecology and conservation of snow leopard (*Panthera uncia*) in the Annapurna Conservation Area, Nepal. M.Phil. Thesis, University of Edinburgh. 155 pages.
- Oli, M. K. 1993. A key for the identification of hair of mammals of a snow leopard (*Panthera uncia*) habitat in Nepal. Journal of Zoology (London) 231:71-93.
- Oli, M. K., I. R. Taylor, and M. E. Rogers. 1993. Diet of the snow leopard (*Panthera uncia*) in the Annapurna Conservation Area, Nepal. Journal Zoology (London) 231:365-370.
- Oli, M. K. 1994. Snow leopards and blue sheep in Nepal: densities and predator-prey ratio. Journal of Mammalogy 75(4):998-1004.
- Prater, S.H. 1971. The Book of Indian Animals (3<sup>rd</sup> revised edition). Bombay Natural History Society, Hornbill House. The Leaders Press Pvt. Ltd. Bombay, India.
- Schaller, G. B. 1977. Mountain Monarchs: Great Sheep and Goats of the Himalaya. University of Chicago Press, Chicago. 426 pages.
- Singh, L.A.K. 1999. Tracking Tigers: Guidelines for estimating wild tiger populations using the pugmark technique. WWF Tiger Conservation Programme, New Delhi, India.
- Wegge, P. 1976. Himalayan Shikar Reserves: Surveys and Management Proposals. FO NEP/72/002 Field Document No. 5. Kathmandu, Nepal.
- Wilson, P. 1981. Ecology and Habitat Utilization of Blue sheep (*Pseudois nayaur*) in Nepal. Biological Conservation 21:55-74.
- WWF-Nepal. 1998. Tiger Manual: Indirect Field Study Techniques for the Kingdom of Nepal. WWF Nepal Program, Kathmandu, Nepal.
- WWF-Nepal. 1999. Snow leopard in Nepal. DNPWC, WWF Nepal Program and International Snow Leopard Trust. WWF Nepal Program, Kathmandu, Nepal.
- WWF-Nepal. 1999. Snow Leopard Skills Training Workshop and Research Support for Park Management Plan for DNPWC. Co-sponsored by DNPWC, WWF-Nepal and the International Snow Leopard Trust.
- WWF-Nepal. 1999. "Snow Leopard Fact Sheet". International Snow Leopard Trust, Seattle, USA.



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**WWF** aims to conserve nature and ecological processes by:

- preserving genetic, species and ecosystem diversity
- ensuring that the use of renewable natural resources is sustainable both now and in the longer term
- promoting actions to reduce wasteful pollution, as well as the wasteful exploitation and consumption of resources and energy

**WWF** - World Wide Fund for Nature is the world's largest and most experienced independent conservation organization. It has 4.7 million regular supporters and a global network active in 96 countries. WWF is known as the World Wildlife Fund in Canada and the United States of America.