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TRACKING THE MOUNTAIN GHOST

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TRACKING THE MOUNTAIN GHOST

MARCO LAMBERTINI

DIRECTOR GENERAL
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This majestic elusive cat is unique, mysterious and amazing. A cat like no other. An icon and inspiration for local cultures and the global community. The thick spotted fur, the green gray eyes and the unique ability to survive in the harshest conditions. But besides its beauty, there is another vital dimension that we often forget. In order to conserve snow leopards we must preserve the vast wilderness of Asia's highest mountains, which are critical water towers supporting billions of people downstream, their livelihoods, their economy and societies.

If you think in these terms, suddenly conserving snow leopards is as much about them as it is about us. It's about the beauty and inspiration of nature, but also the benefits that nature provides us every day - the inextricable connection between our health and prosperity, our happiness and fulfillment, and a rich, healthy, productive natural world. This is the core of the imperative for development which is sustainable ecologically and economically and why the Global Snow Leopard and Ecosystem Protection Program (GSLEP), will help us achieve green, smart, and sustainable development through multi-sectoral and international partnerships.

As an organization committed to nature conservation and sustainable development, WWF has been working on the frontlines to conserve snow leopards and secure their home in Asia's high mountains. WWF Nepal's important publication on snow leopards is very timely, coming as we take decisive steps towards the goals outlined, with practical lessons from the field.

This book takes stock of what Nepal has accomplished in snow leopard conservation, while appraising new challenges, that will help guide us towards our common goal of sustainable development in snow leopard landscapes with new insight and resolve.

GHANA S. GURUNG, PhD

SNOW LEOPARD CHAMPION OF WWF NETWORK
SR. CONSERVATION PROGRAM DIRECTOR, WWF NEPAL

My journey from herding livestock in the high Himalayas of Nepal with fierce encounters with snow leopards to becoming a conservationist and a Snow Leopard Champion for the WWF Network has been a very fulfilling experience. Fighting for the survival of my old foe has been a passion that I have held for the last twenty years.

While there have been concerted efforts by range countries, WWF Network offices, development aid agencies, local communities and other conservation partners to protect the snow leopard, the work is far from over. It is estimated that as few as 4,000 of the endangered snow leopard now survive in the wild globally, with one snow leopard being killed every day on average.

The political will of the 12 snow leopard range states as well as continued support from the global conservation community is imperative to achieve the Global Snow Leopard and Ecosystem Protection Program (GSLEP) goal of securing 20 snow leopard landscapes by 2020, and the long-term survival of the "Ghost of the Mountains".

Indeed, everything is connected in nature. Under the face of climate change and speedy development, we are not only fighting to save the snow leopard, but also battling to protect everything that their survival represents – a healthy and thriving ecosystem with humans.

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THE GHOST OF THE MOUNTAINS

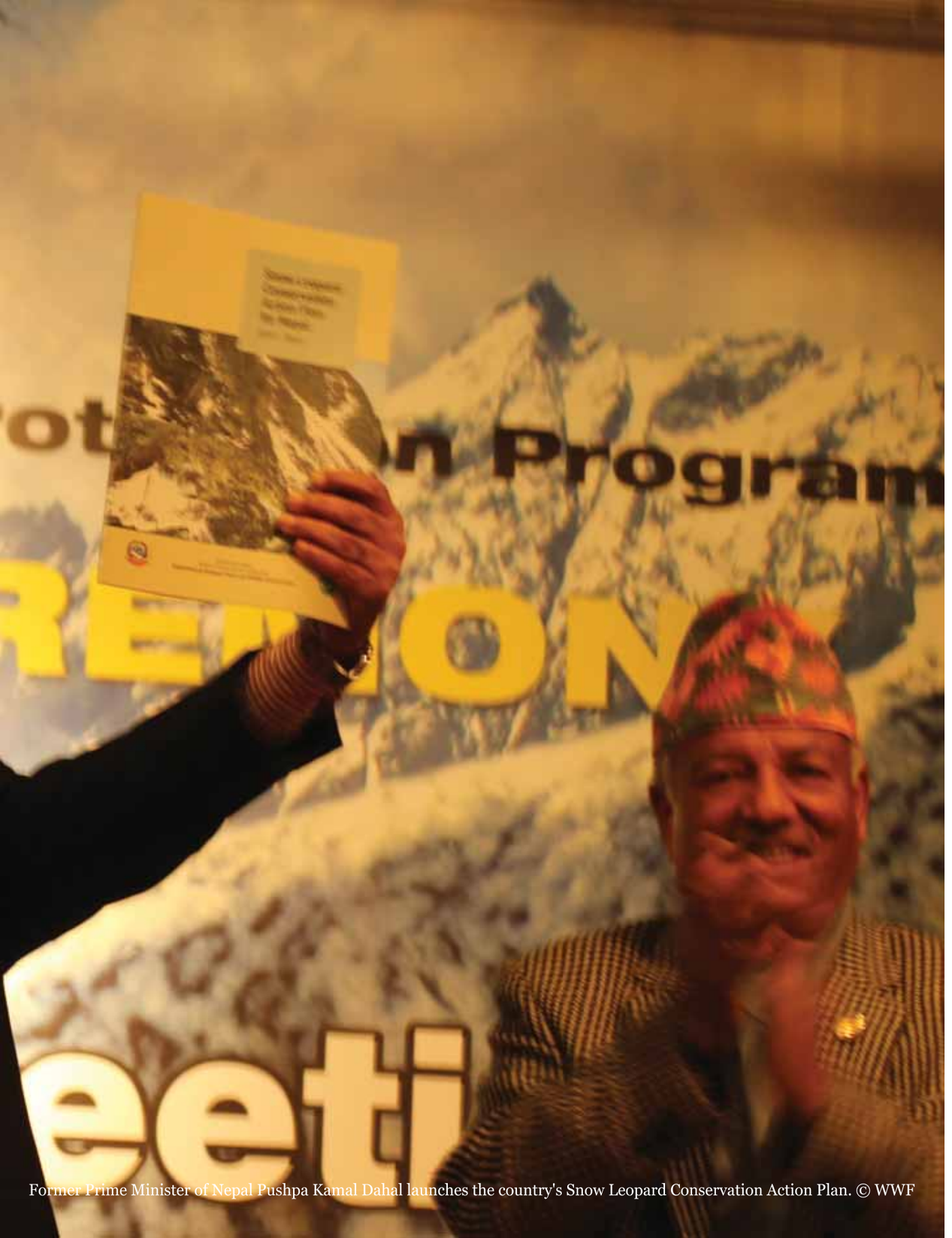
MAN BAHADUR KHADKA, MAHESHWAR DHAKAL , SHIV RAJ BHATTA

Nepal is fortunate to host three of the world's big cats - the snow leopard, the leopard and the tiger - with the snow leopard *(Panthera uncia)* being the most elusive among these wild cats. Their ability to thrive in seemingly inhospitable terrains in the remote high mountains of the world, blending into their surroundings, and remaining hidden from people, have earned them the name “Ghost of the Mountains”. Suiting their epithet, the species is among the most difficult to study, making scientific information as elusive as the species itself.

Globally, snow leopards are found in 12 countries – Afghanistan, Bhutan, China, India, Kazakhstan, Kyrgyz Republic, Mongolia, Nepal, Pakistan, Russia, Tajikistan and Uzbekistan. Listed as endangered by the International Union for Conservation of Nature (IUCN) Red List, the species is estimated to currently number at 4,080 - 6,590 individuals. However, these global numbers are derived based on national estimates from individual range countries, whose uncertainties are being improved upon with advancements in technology. In addition to numbers, technological advancements have also facilitated the study and mapping of snow leopard habitats globally, providing deeper insights into their behavior and thereby helping us conserve them better.

Even as we work towards figuring out the species, the world has come together to save it in a unified manner through the Global Snow Leopard and Ecosystem Protection Program (GSLEP), which for the first time brought all range countries under one roof to conserve the snow leopard in 2012. Under the leadership of the Government of the Kyrgyz Republic, led by President Almazbek Atambayev, this program is modeled based on the Global Tiger Initiative (GTI)'s Global Tiger Recovery Program (GTRP).

With the participation of all 12 range countries, and supported by the GTI Secretariat at the World Bank, the Snow Leopard Trust, and the Nature and Biodiversity Conservation Union, GSLEP was developed. In 2013, this culminated in the endorsement of the global Bishkek Declaration on the Conservation of Snow Leopards “to protect and recover snow leopard populations and their fragile habitats”, by all



Former Prime Minister of Nepal Pushpa Kamal Dahal launches the country's Snow Leopard Conservation Action Plan. © WWF

range countries. With GSLEP as the roadmap, the range countries and conservation partners have committed to help conserve 20 snow leopard landscapes by 2020.

As part of this commitment, individual countries including Nepal have been working to secure this common goal through their respective national plans and conservation initiatives. Nepal has three snow leopard conservation landscapes, and its Snow Leopard Conservation Action Plan (SLCAP) 2005-2015, now updated to SLCAP 2017-2021, guides national conservation efforts towards achieving the global goal of securing the species.

While conservation of any wild species is a cause in itself, conservation of the snow leopard and their ecosystem is imperative for the long-term survival of human kind; this would mean securing the world's water towers that provide drinking water to over a billion people. As such conservation of snow leopards provide a strong incentive, and GSLEP, like the GTI, becomes the first important global step.

Considering that the world is one common system, the conservation of snow leopards and their habitats cannot be looked at in isolation. All efforts to secure the species will be rendered weak if global threats such as climate change and increased anthropogenic activities are ignored. While range countries and partner organizations have the biggest stake in conserving the snow leopard, securing the species, their habitat, and the ecosystem services they provide, will require a global movement.

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ON TOP OF THE WORLD

GHANA S. GURUNG

For communities sharing the magnificent Himalayan landscape with mountain wildlife, occasional encounters with the elusive snow leopard has always been a part of life. Most of such interactions involve predators attacking the community's livestock. Response of these communities vary with some accepting it as an act of god, while others see it as a threat to their livelihood, thereby retaliating by killing the snow leopards.

Decades since interest in snow leopard conservation was first realized, the species continue to thrive in Nepal - one of the 12 extant range countries. While retaliatory killings persist, new and more complex threats risk pushing them to the brink of extinction, globally.

With the works of eminent conservation biologists George Schaller and Rodney Jackson providing valuable information and impetus to understanding this mysterious species, Nepal's conservation fraternity has found an effective approach to secure snow leopards. Focusing on community-based interventions, the country has fared well in protecting the species, although there is still much to be done.


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The snow leopard habitat in Nepal is divided into three administrative snow leopard conservation landscapes. The eastern landscape spreads from Kangchenjunga Conservation Area (CA) in the far-east to Langtang National Park (NP), covering three additional protected areas – Makalu Barun NP, Sagarmatha NP and Gaurishankar CA. The central landscape extends from west of Langtang NP to the Mount Dhaulagiri range; encompassing the Manaslu and Annapurna CAs. The western landscape extends west of the Mount Dhaulagiri range to the country's far-west, covering Shey Phoksundo NP and Api Nampa CA. Much of the conservation work has been carried out in the eastern and central landscapes; meanwhile the western landscape, that purportedly has the highest snow leopard density within the country, has been relatively under-studied.

Nepal's efforts have focused on making mountain communities the cornerstone of snow leopard conservation. Focus has been placed on awareness programs mobilizing mountain people from all walks of life into Snow Leopard Conservation Committees (SLCCs); that will ultimately hold the key to the future of snow leopards, along with insurance schemes that provide relief to herders for livestock lost to the species.

A generation of citizen scientists have also been mentored over a decade, and are now key members of research teams working on prey base surveys, camera trap surveys, and collaring missions. Working hand in hand with communities has thereby ensured the safety of mountain spaces for the snow leopard, allowing mountain communities and the snow leopard to coexist.

When WWF first started working in the Kangchenjunga region there were no scientific records of snow leopard sightings. However, 20 years down the line, a 2012 survey identified 23 snow leopards in the region, including the four that have been satellite-collared.

The country's most recent estimates indicate a snow leopard population of 301 – 400 (2009), comprising of over 6% of the base population. As research advances, understanding of the species will also increase, providing better insights for population size and conservation. Nepal's efforts in snow leopard conservation has also inspired conservation action elsewhere. Nepal's climate change smart snow leopard landscape management plan for instance is among the first, and will pave the way for all 12 snow leopard range nations to secure their snow leopard landscapes, as part of the Global Snow Leopard and Ecosystem Protection Program (GSLEP).

Conservation of snow leopards in Nepal cannot be viewed in isolation. All of Nepal's snow leopard habitat is transboundary, shared with India, China, or both, indicating a rare opportunity to pioneer new models of transboundary and long-term global cooperation for snow leopard conservation. Without transnational collaborations, Nepal's success in snow leopard conservation will be undermined. As such, Nepal has also prioritized building transboundary coordination with its mighty neighbors through agreements and resolutions followed by cooperation meetings from site and trans-border to the central level. This publication takes stock of what Nepal has accomplished in snow leopard conservation, while appraising new challenges, and looking ahead into the future.

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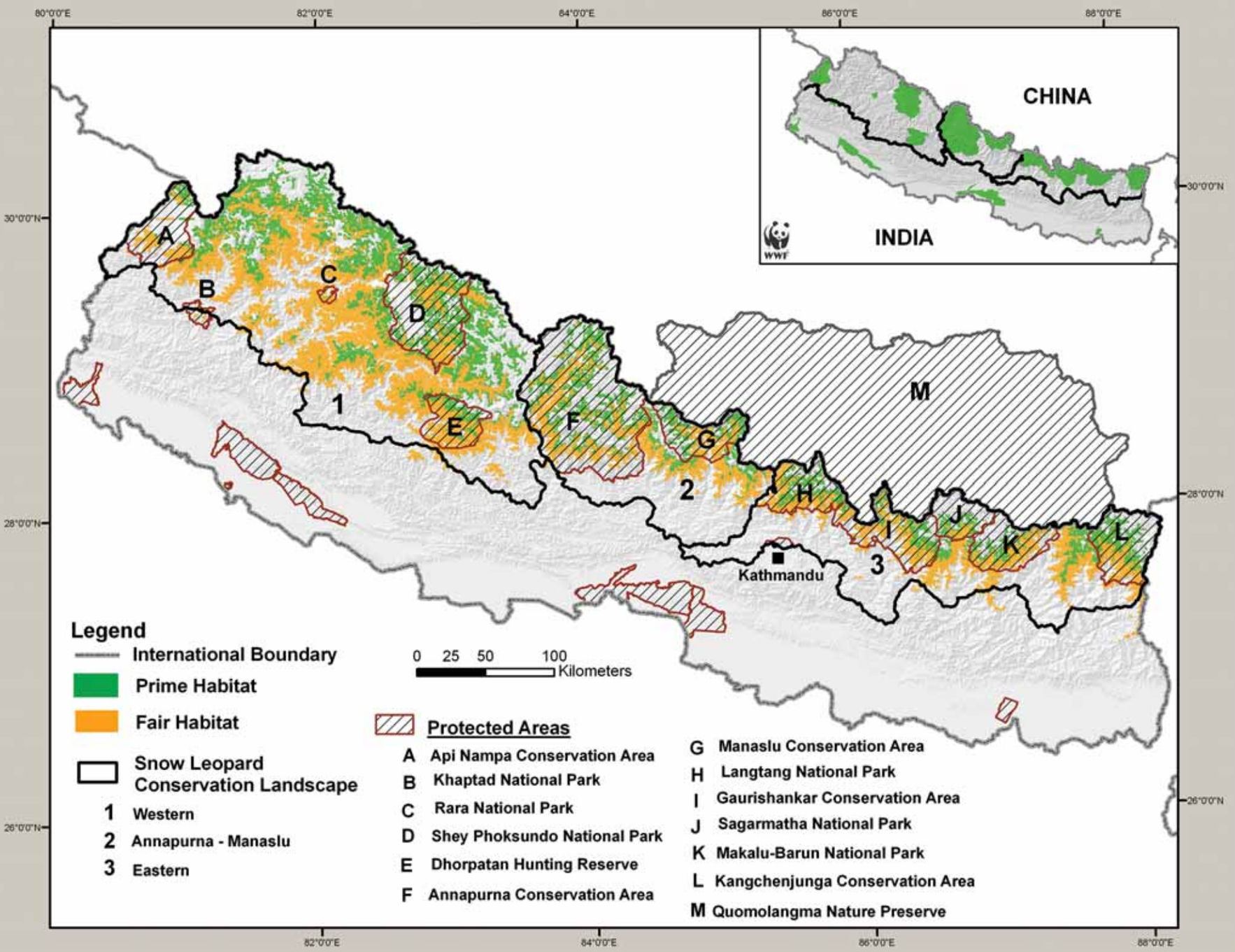
SNOW LEOPARD CONSERVATION LANDSCAPE



SLCC members trained on snow leopard and prey base monitoring in Shey Phoksundo National Park. © WWF Nepal

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OF THE PEOPLE

DHAN PRASAD RAI

The extreme habitat inhabited by snow leopards in Nepal is also shared by the people of the mountains. A majority of these communities practice Buddhism, a religion founded on non-violence and respect for all life forms. With the religion espousing beliefs in nature as the supreme power and that human existence is possible only in harmony with nature, snow leopards as such are part of this nature they worship. Nature and local culture are therefore two very important factors that have helped snow leopards thrive in the Himalayas of Nepal.

Yet, this precarious balance is tested by occasional negative interactions between snow leopards and humans. With temperatures in the region at extreme lows, agriculture is limited and soil conditions poor. Livestock rearing subsequently emerges as the main and only source of livelihood for communities in the region. Cattle including yaks, cows, goats, and animals like horses are the economic lifeline of these communities. Owners spend a lot of time and effort to protect and maintain their livestock, traversing treacherous landscapes to access remote grazing pastures. Meanwhile, from the snow leopard's perspective, these livestock provide an alternate diet to their more agile wild prey. While some losses are tolerated by people, cases of mass killing of livestock have led to retaliations against snow leopards.


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CONSERVATION INITIATIVES

As such, conservationists have focused on preserving the inherent tolerance of these mountain communities focusing on three key aspects: reducing the burden from losses due to wildlife, enhancing livelihood opportunities from wildlife, and building greater awareness and engagement to develop community stewardship in conservation.

Among the more successful schemes within the country has been the community-run Livestock Insurance Scheme (LIS). With endowment provided by organizations including WWF Nepal, many communities living in or around snow leopard protected areas now run their own LIS. The basic principle requires for the communities to provide a nominal amount to insure their livestock, and when a livestock kill occurs, the scheme provides relief to households incurring the loss. The Government of Nepal's Wildlife Damage Relief Guidelines, 2011, provides country-wide coverage of relief in case of livestock loss caused by protected wildlife, helping mitigate negativity towards wildlife.

ENGAGING COMMUNITIES

Engagement of communities in snow leopard conservation in Nepal is relatively widespread. Individuals have been trained and engaged as citizen scientists, forming local Snow Leopard Conservation Committees (SLCCs). With their extensive knowledge of the landscape, citizen scientists or SLCC members aid in snow leopard research, enhancing our understanding of the species and their prey. They help conduct regular wildlife monitoring and play an important role in mitigating human-snow leopard conflict.

Local communities have also organized themselves into Community Based Anti-Poaching Units (CBAPUs). These units counter illegal killing of snow leopards and their prey, as well as illegal extraction of other resources from Protected Areas.

EMERGING THREATS

While extensive efforts have been made to secure livelihoods of people in these remote parts, changing lifestyles in mountain communities and a tilt towards consumerism has increased non-biodegradable waste in these regions. Infrastructure development while necessary to meet national as well as individual aspirations, represents another growing threat to snow leopard habitats.

The romantic notion of conservation by communities will hold true so long as people have opportunities to meet their basic needs or improve their livelihoods. Nepal's snow leopard conservation efforts therefore encompasses the welfare of people. Supporting alternate agriculture, sustainable harvest of Non-Timber Forest Products (NTFPs), and promoting eco-tourism are some initiatives that have brought economic benefits to local households. With focused awareness activities, local communities are now cognizant about the significance of snow leopard as well as habitat conservation, for their own long-term well-being.

Nepal is fortunate to have an extensive cultural and religious bond with wildlife. Scientific understanding of the concept of 'interconnectedness' is fortifying these bonds, as well as aiding in finding a balance between the needs of nature and aspirations of people. These, combined with necessary political will, technical capacity of partner organizations, and positive attitudes of the mountain people towards nature, has helped make Nepal a 'prototype' for snow leopard conservation.

Thinley Lhondup, actor of the Oscar nominated film Caravan and also a strong supporter of snow leopard conservation.

© Samir Jung Thapa

COMMUNITIES IN CONSERVATION

Thinley Lhondup, the lead actor in the Oscar-nominated film, Caravan (Himalaya), was a man of many talents. Other than his role in the 1999 film by director Eric Valli, that brought international recognition to him and his homeland Dolpa, he also served as a village chief.

He made his mark in the conservation of snow leopards, as a member of the Snow Leopard Conservation Committee. In one instance, he helped save a snow leopard from retaliation by the local people. The animal was caught by a crowd, angered by the killing of a 2-year-old horse. He intervened and requested the people to release the snow leopard, with a promise to seek relief for the victims. WWF Nepal supported his initiative and provided the relief amount.

Lhondup's contributions were recognized in 2001 with the Abraham Conservation Award. He passed away after falling off a cliff while traversing the treacherous landscape, on his way back home from Kathmandu.

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MYTH TO FLAGSHIP

SHEREN SHRESTHA, NARESH SUBEDI, SOM B. ALE

Several decades ago, the snow leopard was as much a myth as it was a species few knew about. Beyond the knowledge of communities who share the snow leopard habitat, in the remote Himalayas, scientists knew little about this rare and mysterious large cat. Today, the snow leopard is a flagship for conservation of mountain ecosystems across Central Asia. Nepal - one of the 12 snow leopard range countries - is at the core of this shift. Hosting just half a percent of the global snow leopard habitat, spread over 1.7 million sq. km, Nepal is considered a hotspot for pioneering snow leopard research and conservation.

Snow leopard conservation in Nepal began much earlier than contemporary initiatives. For Nepali mountain communities, this elusive predator is an embodiment of their gods; some considering it as the god of the mountains, while others, the dog of the mountain gods. Such beliefs have played a significant role in securing the coexistence of snow leopards amongst local communities, despite occasional resentment emerging from attacks on livestock. Nonetheless, circumstances and situations change, perpetually, impacted by local as well as global factors. Comprehensive research to understand the dynamics underlying these shifts is therefore critical for conservation and management of the species.

Rodney Jackson collaring a snow leopard for radio-telemetry studies © Snow Leopard Conservancy

SNOW LEOPARD RESEARCH: THE BEGINNING

Early scientific research on snow leopard ecology in Nepal dates back to the 1970s, with the Government of Nepal's (GoN) keen interest and patronage expediting early efforts in understanding the country's wildlife and other biota. Scientific expeditions by preeminent biologist George Schaller were among the first to unravel the mysteries of these “Ghosts of the Mountains”. His work in west Nepal focused on assessing snow leopard presence, understanding its behavior and requirements, as well as its interaction with humans.

Following in Schaller's footsteps, Rodney Jackson, another leading expert on snow leopard, raised the stakes in snow leopard research capturing, for the first time in history, five snow leopards in the Langu valley in Mugu district, fitting them with radio-collars. His team revealed the snow leopard's home range and other secretive behaviors typical of other large predators. By nature, snow leopards are a challenging subject for study. They inhabit extreme terrains, with wide home ranges spread over several hundred sq. km, at altitudes above 3000 metres. These pioneering studies in such challenging environments have provided valuable information, paving the way for further research initiatives and effective conservation of the snow leopard, as we see today.

A NEW ERA FOR RESEARCH IN NEPAL

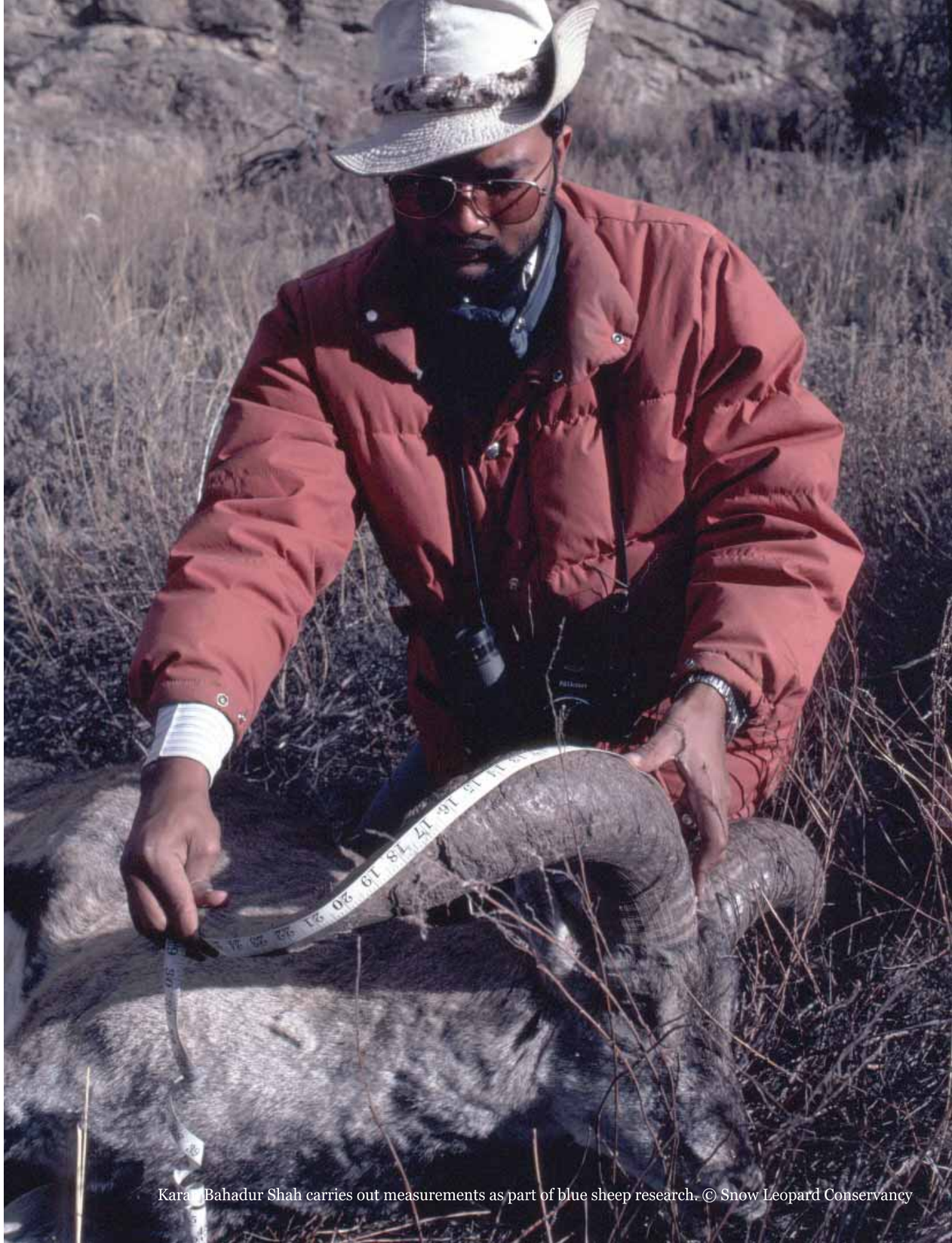
Jackson's studies were complemented by Karan B Shah's study on blue sheep; the principal prey of snow leopards. Since then, many researchers including Madan Oli, Rinjan Shrestha, Madhu Chettri have added to the current knowledge of snow leopard and prey ecology in Nepal. Meanwhile advances in technology has helped a new generation of researchers overcome geographic and ecological constraints faced by the pioneers.

Satellite telemetry in the Kangchenjunga Conservation Area (KCA) by the GoN, assisted by WWF Nepal and the National Trust for Nature Conservation (NTNC), has been effective in remote tracking of collared snow leopards and generating crucial data. Through this satellite data, researchers have been able to showcase wide-ranging movement of the snow leopard, thereby building a strong case for transboundary collaborations for effective long term snow leopard conservation. Furthermore, non-invasive genetic studies, using DNA extracted from scats, have further helped in understanding the snow leopard metapopulation. Meanwhile camera-trapping, a tool that revolutionized wildlife research and conservation, continues to aid population monitoring.

There have also been other approaches to wildlife research and monitoring that has proven to be effective at local levels; for instance, the engagement of local communities as citizen scientists. With efforts also focused towards enhancing livelihood opportunities, such involvements have been shown to generate community stewardship and ensure sustainability of conservation initiatives.

However, the species continues to face threats from illegal trade, human-snow leopard conflict and retaliatory killings. Furthermore, changing climate and increased infrastructure development presents new and often unpredictable challenges to the species and its habitat. Meanwhile prey populations face pressures of poaching as well as potential diseases and inadequate forage due to habitat degradation.

Given the above-mentioned circumstances, multi-dimensional research has been, and remains, a crucial component in guiding Nepal's holistic approach in snow leopard research and conservation. With the incorporation of ever evolving research and monitoring tools and approaches, and through the tenets of multi-stakeholder partnership, Nepal is dedicated to preserve snow leopards - the mountain ghost - in perpetuity.



Karan Bahadur Shah carries out measurements as part of blue sheep research. © Snow Leopard Conservancy

Snow leopards inhabit extreme terrains with wide home ranges © Snow Leopard Conservancy

WWF researcher and SLCC members place camera traps for snow leopard research. © Phiru Lal Tharu / NTNC

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SELFIES FOR SURVIVAL

SAMUNDRA A. SUBBA, SABITA MALLA

Non-invasive techniques such as camera trapping has proven to be one of the most effective methods in monitoring the snow leopard. The challenge of monitoring such an iconic species however is impeded by their elusive nature and inhospitable Himalayan terrain, which makes spotting them in the wild a hard-earned nickel.

While, snow leopards and their habitats were initially monitored through surveys for wildlife scratches and other signs, ever-evolving science now allows researchers and citizen scientists to monitor these amazing cats through camera traps. These are remotely triggered cameras that capture photos of wildlife in rarely seen natural moments. This has opened a small window for researchers to peek into the secretive lives of the species bringing greater understanding on population, movement and life history.

The dawn of camera trap monitoring in Nepal began in the early 2000s in the Annapurna Conservation Area. WWF Nepal's monitoring work is however currently focused in eastern Nepal in the Kangchenjunga Conservation Area (KCA). This was initiated following a pilot study in the Ghunsa region of KCA in 2011 through a community based approach. This approach has been very successful in initiating a new dimension whereby communities engage in monitoring and conserving this iconic species.

First snow leopard camera trapped in KCA, in 2011. © DNPWC / WWF Nepal

Ghangjenjwenga recaptured on camera trap in KCA , in 2016. © DNPWC / WWF Nepal

Since 2011, camera trap monitoring has been successfully carried out by communities with technical and financial support from WWF Nepal in partnership with the Government of Nepal (GoN). Through the five-year monitoring period, the spatial and temporal range of monitoring has been extended covering all potential snow leopard habitats in KCA. In 2015 a systematic approach of camera trap survey was implemented resulting in robust and empirical evidence of population and density estimates.

GENERATING INFORMATION THROUGH CAMERA TRAPS

Camera traps have been essential in precisely distinguishing one snow leopard from another, through their unique pelage patterns. In the last five years, 14 individual snow leopards have been recorded. Out of these 14, two have been identified as males and four as females, while the gender of the rest could not be identified. Such information has helped in estimating snow leopard population and density in the region, aiding in formulating and enhancing effective conservation plans. Furthermore, camera traps not only facilitate understanding of the species but also its entire ecology. Systematic camera trap monitoring has opened a new paradigm to comprehend species richness, occupancy and co-occurrence with co-predators such as wolves and common leopards.

In KCA, other than snow leopards, 15 mammalian species and 27 birds have been captured. Recolonization of the Grey Wolf in the rugged snow leopard habitat has long intrigued wildlife biologists and managers. Co-occurrence of these predators with the snow leopard have also raised human-wildlife conflict due to livestock depredation. These critical issues are now addressed under the GoN's wildlife damage relief program.

Camera traps have also revealed many novel and intriguing findings - such as the first ever camera trap records of the melanistic common

leopard and the highest altitude evidence of the Pallas cat, leopard cat, Himalayan grey langur and jungle cat. Camera traps have also been critical in making ground breaking discoveries of new species such as the steppe pole cat in Mustang and recolonizing evidence of wolves in the alpine terrains of Kanchenjunga.

Long term camera trap monitoring has also allowed researchers to explore snow leopard population dynamics based on life history, survival and recruitment rates. For instance, the presence of six resident and two transient snow leopards can be confirmed in KCA based on five years of camera trap data. The study also suggests low recruitment and turnover of 14% in the snow leopard population of KCA. Camera trap monitoring of snow leopards has also built the foundation for the nation's first ever GPS collaring in November 2013; thereby generating greater insights into the snow leopard's range and spatial ecology proving that it extends beyond national and international boundaries. The information has been vital in understanding that protected areas alone cannot sustain their viability and has led to the design of new concepts to protect the species through landscape scale management plans.

CHALLENGES IN OPERATION

Despite the prospects of camera trap studies in understanding the snow leopard's ecology and population dynamics, hard hitting Himalayan terrain, unstable working dynamics and limited capacity of local citizen scientists have been major challenges. Like any evolving science, camera trap monitoring through a community based approach is also a gradual process and will require time, resource and steady technical input to deliver in the long run. Satellite telemetry of snow leopards have already uncovered critical information for conservation. Joint monitoring between Nepal-India and Nepal-China through camera traps could further reveal extensive information on transboundary movement and critical dispersal patterns of these magnificent predators.

Female snow leopard with cubs camera trapped in Mustang in 2012. © NTNC / Snow Leopard Conservancy

Reappearance of the grey wolf in the alpine terrains of KCA. © DNPWC / WWF Nepal

AMMA: STORY OF A MOTHER

Long term monitoring through camera traps in the Kangchenjunga Conservation Area (KCA) has provided rare insights into the world of the mysterious and elusive snow leopard. It also highlights the continuity of conservation efforts as well as results over a long period of time. An adult snow leopard named Amma (mother in Nepali), for instance, is a residential female of the Ghunsa region who has been captured in the region's camera traps for over five years.

In 2013, Amma was captured with a single cub of 12-14 months. The following year she was seen alone on several occasions, and with another females on two occasions. A harsh reality for any cat species, especially the snow leopard is the low recruitment rate, with one in three cubs generally surviving to adulthood. It is therefore very likely that Amma's cub did not survive into the next year. Amma was also seen occasionally with another residential female who might have been related to Amma, but separated. This kind of behavior is encountered often among leopards and cheetahs where related cats meet occasionally during movement.

Amma and her cub, camera trapped for the first time in May 2013. © DNPWC / WWF Nepal

Amma with one of her three cubs, captured in December 2014. © DNPWC / WWF Nepal

Amma with her remaining two cubs camera trapped in July 2015 © DNPWC / WWF Nepal

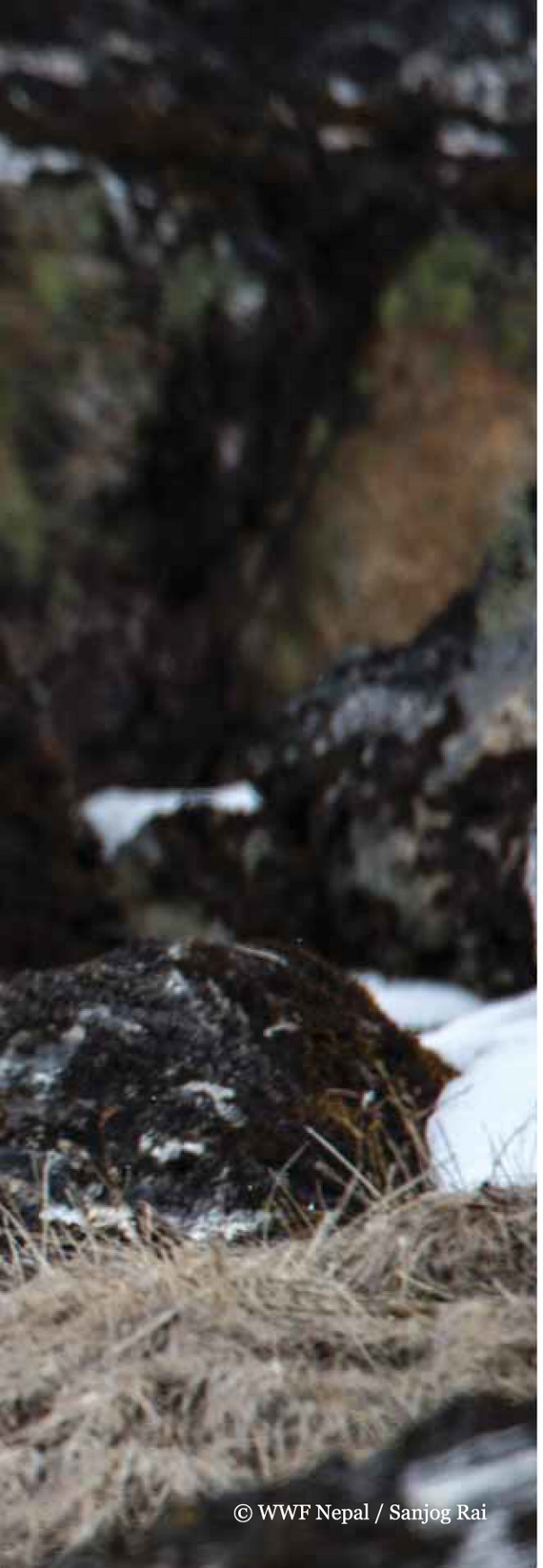
Amma with her two teenage cubs camera trapped in KCA in 2015. © DNPWC / WWF Nepal

The autumn of 2014 was an elating moment, when the camera trap visual showed her with 3 cubs of 6-8 months. Cubs generally start accompanying their mother at the age of 2-3 months and become independent at 18-22 months. Come 2015 summer, the cubs had reached 12-14 months, but only two of the three cubs were camera trapped. Chances are that the third cub did not survive the harsh Himalayan winter. In the summer of 2016 despite intensive camera trap monitoring, the resilient Amma could not be spotted, however we did spot one of her cubs in Ramjer, moving independently. Amma was therefore successful in raising her cubs and introducing another snow leopard into the dynamic pool of snow leopard populations in KCA.

The impacts and outcomes of conservation efforts on snow leopard population can only be measured over a long period and should be continued perpetually. Till date, camera trap monitoring is the only mechanism that delivers a strong and vivid picture of the status of these amazing felines, as well as the threats that they are vulnerable to.

Early camera trap image of a snow leopard. © Snow Leopard Conservancy

Camera trap image of a snow leopard in Mustang, 2011 © NTNC / Snow Leopard Conservancy



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COLLARING THE CAT

SHEREN SHRESTHA, SAMUNDRA A. SUBBA, HEM RAJ ACHARYA, LAXMAN POUDYAL, RINJAN SHRESTHA, NARESH SUBEDI, KANCHAN THAPA

Traversing a remote mountain pass in north-east Nepal, a young female snow leopard notices a curious object along her path. She approaches the contraption, an automated heat-sensing camera installed for wildlife research. Unsuspectingly, she steps on a neatly covered trap nearby. Her left foreleg falls into the trap, a foot-deep dig, and a snare catches her limb.

Soon after, researchers and citizen scientists approach the site, sedate the animal, and free her from the snare. They quickly examine her health status, place a GPS collar around her neck and administer the reversal drug to wake her from her slumber, letting her back into the high wild. The entire operation lasts less than an hour - from sedation to release.

On May 8, 2017, a fourth snow leopard, named Yalung; after a local mountain peak, by the locals, was thus captured and collared in the Kangchenjunga Conservation Area (KCA), as part of a long-term satellite telemetry study led by the Government of Nepal's (GoN) Department of National Parks and Wildlife Conservation (DNPWC). This collaborative project began in November 2013 with coordination support from the Kangchenjunga Conservation Area Management Council (KCAMC), technical support from WWF Nepal and National Trust for Nature Conservation (NTNC), and funds provided by USAID and WWF UK. Two male and two female snow leopards; including Yalung, have been collared in this region.

Team members plan the placement of snares to capture a snow leopard. © WWF Nepal / Sanjog Rai

Inhabiting remote and largely inaccessible Himalayan ecosystems, snow leopards are a difficult subject to study. In these circumstances, satellite telemetry offers a unique opportunity to follow the movement of these felines with minimal disturbance. Even so, the study presents its share of challenges, from reaching these snow leopard sites to capturing the animal in these habitats, alongside guaranteeing lack of technical glitches.

THE SCIENCE BEHIND THE TRAPS

Extensive planning and strategies are deployed to trap the snow leopard - an exercise akin to finding a needle in a haystack. Previous research and understanding of snow leopard ecology and landscape, including movement preferences, is crucial in strategic placement of the traps. The role of local communities who form the Snow Leopard Conservation Committee (SLCC) is also critical for this exercise, because of their extensive knowledge of the landscape and their ability to access these difficult areas. Trap sites are therefore narrowed down and identified based on scientific research combined with local knowledge.

Installing a trap also requires extensive effort and care. As such, trap locations are determined based on evaluations of the site from the perspective of the animal; with researchers placing themselves in the 'paws' of the animal, to generate least suspicion in the trap site. The traps are placed in such a way so as to function without any glitches, and to ensure no injury to the animal stepping on it. On being trapped - to minimize the level of stress to the animal -the team coordinates to reduce the amount of time spent by the animal in the trap, or in human company. These are done using trap transmitters that immediately notify the team when a trap has been triggered, with effective pre-planning ensuring that no time is wasted once the collaring operation begins.

TRACKING THE MOUNTAIN GHOST

The collars used weigh less than 2% of the animal's body weight, thereby ensuring that the animals continue their lives normally post-collaring. These collars are programmed to provide point locations of the respective snow leopard every four hours, for 18-24 months, after which the collars automatically drop off.

Data generated from satellite collars has helped in identifying animal movement patterns, defining habitat usage, and tracking transboundary movement and predation patterns. Subsequently satellite telemetry has revealed home ranges and territories traversed by snow leopards, found to be significantly larger than previously estimated. For instance, an adult male has been found to roam an area of around 1000 sq. km. Meanwhile, a transient young female was found to roam an area of more than 3000 sq. km - moving into China and India - finally seemingly stabilizing her territory in an area of around 200 sq. km. These areas fall outside the Protected Area boundaries of the KCA, thereby providing impetus for extension of geographic coverage for conservation interventions. Satellite telemetry has subsequently been crucial in reinforcing understanding of corridors and critical habitats that need to be secured.

The collared cats are observed to be killing large-sized prey every fortnight, with frequent killings occurring during autumn (up to three a month). Interestingly, the frequency of large prey killing is lower in summer, plausibly indicating the abundance and richness of diverse prey, with the snow leopard avoiding the risk of injury from bringing down large-sized prey.

Team members carry out measurements of the captured animal. © WWF Nepal / Sanjog Rai

CONTRIBUTIONS TO NATIONAL PLANS

Data obtained from satellite telemetry and subsequent analysis and studies have been critical in shaping the Snow Leopard Conservation Action Plan for Nepal, 2017-21, as well as the first ever landscape management plan for snow leopards, being prepared by the GoN. This climate smart plan for the Eastern Snow Leopard Conservation Landscape of Nepal, including KCA, will additionally serve as a prototype for integrated landscape planning for the conservation of the species and its habitat. Extending similar research in other areas across their local distribution range, Nepal is striving to better understand its snow leopards and their ecological requirements.

Satellite telemetry while seemingly intrusive in comparison to other research approaches, has helped researchers in tracking them in their natural habitat. Meanwhile, information generated continues to guide conservation policies, prioritize interventions, as well as track efficacy of the implemented interventions to help secure the species, the keystones of the High Asia ecosystems - on whose services depend over 60% of the world's human population.

© WWF Nepal / Sanjog Rai

Citizen scientists in KCA prepare snares for the collaring expedition. © WWF Nepal / Sanjog Rai

Team members place a snare to capture the snow leopard. The snare transmits a signal to HQ once an animal is caught in it. © WWF Nepal / Sanjog Rai

The snow leopard is sedated by a wildlife technician. © WWF Nepal / Sanjog Rai

The sedated animal is carried to a safe location for collaring. © WWF Nepal / Sanjog Rai

A radio GPS collar is fitted on the snow leopard by the expedition team. © WWF Nepal / Sanjog Rai

The snow leopard is measured. © WWF Nepal / Sanjog Rai

The snow leopard's health status examined. © WWF Nepal / Sanjog Rai

The snow leopard is released back into the wild. © WWF Nepal / Sanjog Rai

© Naresh Kusi

SCAT SPEAKS

KANCHAN THAPA, MADHU CHETRI

Faeces! While uncomfortable to talk about, copromancy; a simple and non-invasive technique used to collect information without touching an animal, is in fact a wildlife biologist's best asset. Snow leopards live in remote, high-altitude, nearly inaccessible terrains and their rarity and secretive nature make them even more difficult to study. Any indirect signs, including scat (animal droppings), is therefore one of the primary means of procuring information on the species. Collecting scat samples from wildlife trails used by these elusive cats allows researchers to scientifically study their ecological make up in the Himalayas.

WWF and other partner organizations like the National Trust for Nature Conservation (NTNC), has been involved in monitoring and studying snow leopard ecology: population, diet, spatial ecology etc. through scat studies. Research based on scat DNA is increasingly gaining popularity as DNA can be extracted from scats to identify an individual snow leopard. The technique is simple. Food, that is consumed by the animal, passes through the digestive system and accumulates DNA in the scat, which thereby possess the unique identity of each individual animal.

Snow leopard scat. © Naresh Kusi

DETERMINING DIETARY CONTENT AND PREY CHOICE

Given the wide array of prey base species available in Nepal's Himalayas, such as the blue sheep, Himalayan tahr, Tibetan argali, Himalayan marmots etc., scat analysis is the most feasible means of studying the dietary content of the snow leopard to determine their food requirements and prey choice. While visual identification and study of scats has been widely used in the past, it is not as reliable as faecal DNA identification; preferred by scientists and researchers, in identifying the diet content of the snow leopard. The chance of misidentification of snow leopard scats through traditional visual identification, ranges from 30-60% as there are several other carnivores such as the wolf, brown bear, red fox, Eurasian lynx and stone marten that share the same habitat. Much of the misidentified scat often belong to these species. Recent studies indicate that 58-75% of the snow leopard's diet consists of wild prey from its origin area, while the rest comprise of livestock.

IDENTIFICATION THROUGH FAECAL DNA

Scientists around the world have recently identified three distinct sub-species of snow leopards in the 12 range countries. The meta-analysis for this has been based on genetic assessment through analysis of DNA found in scat samples collected from trails used by the snow leopard. The Government of Nepal (GoN) initiated the first DNA based population monitoring of snow leopards using scat as a source of DNA in the Kangchenjunga Conservation Area. The study was a collaboration between the GoN, WWF Nepal, and the Centre for Molecular Dynamics Nepal (CMDN). Realizing the importance of scats the GoN and WWF Nepal has commissioned a nation-wide scat sampling survey to estimate the population of snow leopards in Nepal's Himalayas - the first of its kind for any snow leopard country.

Given the harsh and difficult terrain of the Himalayas, efforts to save to the snow leopard in the long term depends on how effectively we know the ecology of these magnificent cats. This includes getting the scats in a 1.5 ml tube and making it speak for itself. Scat analysis has thereby ushered in a new paradigm for endangered species monitoring in Nepal and elsewhere.

Collection of snow leopard scat. © WWF Nepal

Scat analysis being conducted by a scientist to determine the snow leopards diet. © WWF Nepal

© WWF Nepal / Sanjog Rai

PREY FOR THE GHOSTS

NARESH KUSI, SAMUNDRA A. SUBBA, KARAN BAHADUR SHAH

Snow leopard *(Panthera uncia*) is an apex predator of the Himalayan landscape. Often called the 'Ghost of the Mountains' the elusive cat is rarely sighted in its natural habitat. While the globally endangered high altitude carnivore plays an important role in maintaining the health of the alpine ecosystem, its own health is determined by the presence of a healthy population of its wild prey.

The snow leopard is found in the high mountains of 12 countries in Central and South Asia where it relies on blue sheep *(Pseudois nayaur)* and Himalayan tahr *(Hemitragus jemlahicus)* or Alpine ibex *(Capra ibex)* as its principal prey. In Nepal, the blue sheep is its main food throughout its distribution range, however in areas like the Sagarmatha National Park (SNP) and Langtang National Park (LNP) where blue sheep are absent, the Himalayan tahr takes over as its principal prey. Therefore, depending on the availability, both these species are the principal prey for the snow leopard.

A male Tibetan argali. © Naresh Kusi / WWF Nepal

In Nepal, the snow leopard occasionally also preys on mammals such as the wild boar *(Sus scrofa)*, Tibetan argali *(Ovis ammon hodgsoni)*, Tibetan gazelle *(Procapra picticaudata)*, Himalayan goral *(Naemorhedus goral)*, Himalayan marmot *(Marmota himalayana*), wild ass *(Equus kiang)*, langur *(Semnopithecus sp.)*, musk deer *(Moschus spp.)*, woolly hare *(Lepus oiostolus)* and pika *(Ochotona spp)*. The cat also preys on ground feeding birds such asthe Tibetan snowcock *(Tetraogallus tibetanus)*, Himalayan snowcock *(Tetraogallus himalayensis)*, snow partridge *(Lerwa lerwa)*, Himalayan monal *(Lophophorus impejanus)*, blood pheasant *(Ithaginis cruentus)*, chukar *(Alectoris chukar)* etc., to supplement its dietary needs. Surprisingly, snow leopards are also occasionally found to consume vegetation, however the reason behind this is still not clear.

PREY BASE PROTECTION AND SUBSEQUENT BENEFITS

The importance of protecting wild prey bases for survival of snow leopards is interestingly demonstrated in the SNP. As a positive consequence of increment in Himalayan tahr numbers in the park, this 'God's Pet', after nearly four decades of local extirpation, is believed to have made a recent comeback in the area. The presence of healthy populations of wild prey base is also imperative to reduce predation on domestic livestock for food. This in turn could make way for a significant drop in incidences of human-snow leopard conflict, which is a perpetual incidence throughout snow leopard ranges in the country.

Livestock such as young yak, horse, mule, sheep, goat etc., are often depredated by snow leopards when there is lack of a healthy wild prey base, or wild prey is difficult to find or kill. While livestock is not a major food source, it is a proven fact that the snow leopard preys on them where they are abundant and easy to kill. Furthermore, it is suggested that humans and snow leopards can co-exist to a certain threshold, if human livestock remains safe and associated human activities do not impart negative impacts to the wild prey population and snow leopard habitat.

INTERVENTIONS AND INITIATIVES IN PREY BASE PROTECTION

The population of snow leopard's principal prey species, the blue sheep and Himalayan tahr, is steadily increasing due to several management interventions in various Protected Areas in Nepal. The Kangchenjunga Conservation Area Management Council (KCAMC) and the Department of National Parks and Wildlife Conservation (DNPWC), in partnership with WWF Nepal, has played a pivotal role in increasing blue sheep population in the Kangchenjunga Conservation Area (KCA), subsequently leading to a significant increase in snow leopard population. For instance, blue sheep has increased from 1157 in 2006 to 1641 in 2015; a 42% increase over the last decade. Meanwhile, according to the 2016 blue sheep survey, there is an estimated 2122 individuals in the area. Similarly, a community managed snow leopard conservation program in Bhijer area of Shey Phoksundo National Park (SPNP) has led to greater understanding and positive attitudes towards snow leopards, consequently leading to increased blue sheep numbers.

The National Trust for Nature Conservation (NTNC) has also assisted in efforts that helped maintain viable blue sheep and Himalayan tahr populations in the Annapurna, Manaslu and Gauri-Shankar Conservation Areas. Meanwhile, DNPWC has also been able to retain adequate populations of principal prey species in the SNP, LNP and other Himalayan Protected Areas of Nepal.

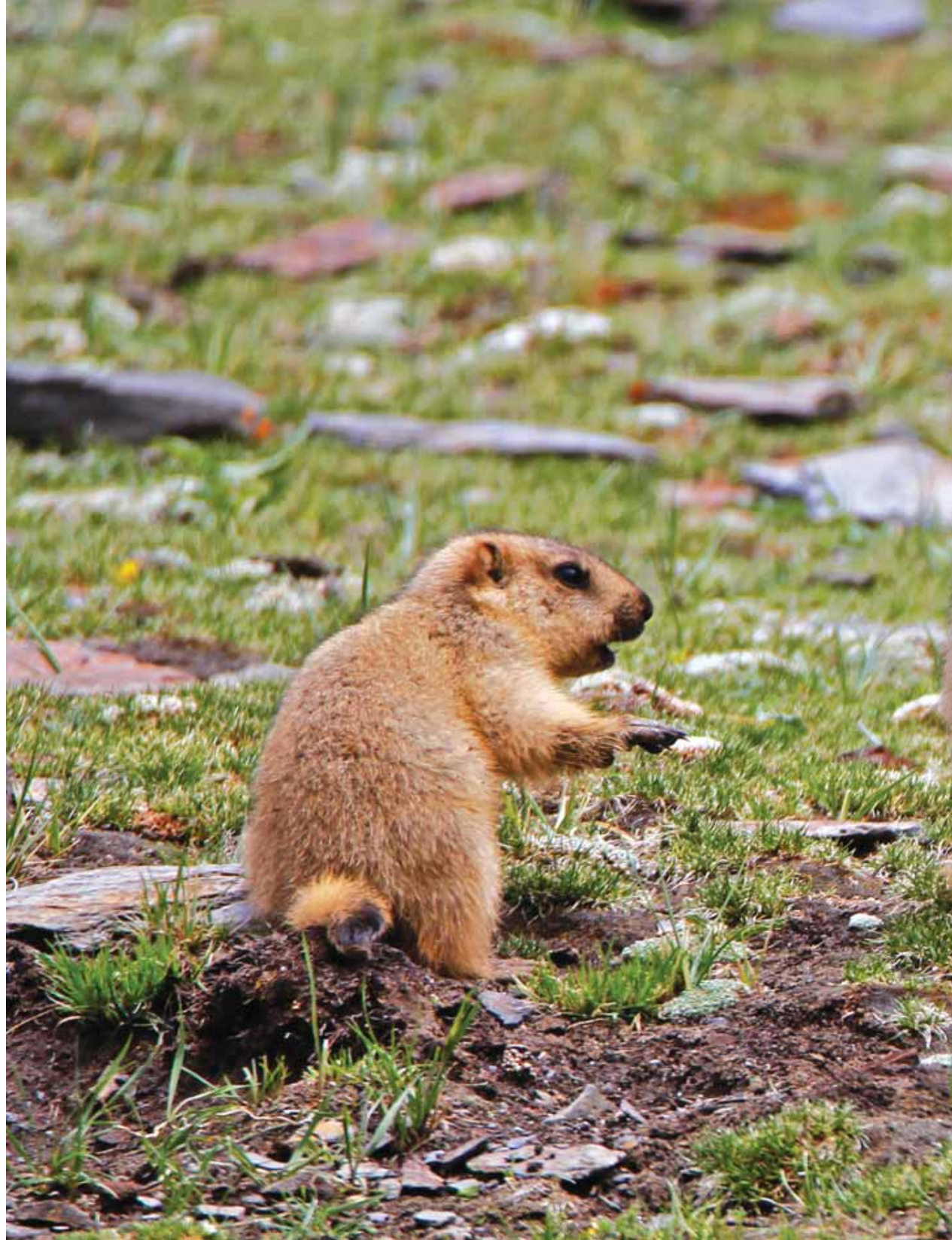
A woolly hare. © Naresh Kusi

ONGOING CHALLENGES TO PREY BASE PROTECTION

Anthropogenic activities and indiscriminate killing of wild prey species by poachers however continues to threaten the natural prey base for snow leopards. Significant killing of wild prey is reported during the harvesting of the caterpillar fungus Yarsagumba *(Ophiocordyceps sinensis)*, when thousands of locals as well as outsiders camp in snow leopard habitats. Incidences of illegal hunting is relatively higher in the winter months when ungulates descend to lower elevations, closer to human settlements due to heavy snowfall.

Habitat encroachment, degradation and food shortage caused by domestic livestock has also had direct negative impact on wild prey. With the same habitat being shared by both livestock and wild prey, threats of transmission of communicable diseases remain high. A huge number of Himalayan goral, musk deer, blue sheep and Himalayan tahr is said to have died due to a contagious skin disease - mange, in the Langu Valley region of SPNP about 50 years ago. Similarly, a significant number of blue sheep in SPNP fell victim to foot and mouth disease, in 1991, believed to be transmitted from domestic yak.

Yet, the good news is that the country has seen a drastic paradigm shift from illegal hunting of wildlife



Himalayan marmots at Shey Phoksundo National Park © Naresh Kusi / WWF Nepal

towards community stewardship in conservation of the snow leopard and its wild prey, presenting itself as a model approach in nature conservation efforts.

Given the importance of protecting wild prey base to facilitate improved snow leopard numbers, it is essential that concerned government authorities and other conservation organizations work closely with local communities to regulate livestock numbers and facilitate initiatives such as rotational grazing practices to maintain the quality of habitats.

Meanwhile, the annual Yarsagumba harvesting activity, especially within snow leopard habitats should strictly be monitored throughout the harvest period by park and district forest office authorities as well as other concerned community institutions. Such initiatives, alongside conservation awareness programs that educate local communities on the importance of conserving the habitat and wild prey species, will be crucial in determining the future of the snow leopard.

Tibetan snowcock at the Shey Phoksundo National Park © Naresh Kusi

An adult male Himalayan tahr at the Sagarmatha NP; a principal prey of the snow leopard © Naresh Kusi

© WWF Nepal / Sanjog Rai

KEEPING THEM ALIVE

MADHAV KHADKA, RUPAK MAHARJAN, SUNIL SHAKYA, PUSPA PANDEY

Hunting and trade of snow leopards is prohibited in all 12 range countries, which are party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Yet, recent reports on snow leopard trade paint a worrisome picture. Data between 2008-2016, indicate that 220-450 snow leopards are killed and traded annually, translating to roughly 4-8 snow leopards killed every week. These numbers could be significantly higher as many killings in remote areas often go undetected.

Snow leopards are susceptible to poaching because of their beautiful fur and bones. © WWF Nepal

GLOBAL PHENOMENA

A 2016 report by TRAFFIC, a wildlife trade monitoring network, indicates that most killings are in retaliation to attack on livestock (55%), whereas other reasons include illegal trade (21%) and non-targeted snares (18%). China, India, Mongolia, Pakistan and Tajikistan have been identified as regions vulnerable to snow leopard poaching; with Nepal being flagged equally vulnerable due to its proximity and shared borders with China and India.

Although the snow leopard is recognized as an umbrella species for alpine ecosystems, less attention has been paid to its conservation as compared to the tiger. The primary reason behind this is its remote existence in high mountain areas which are relatively inaccessible, consequently necessitating higher investment of resources - financial as well as human. With less resources available for protecting this iconic species, they are more vulnerable to poachers who target them for their fur, bones or other body parts, that are illegally traded for oriental medicines among other purposes. The illicit trans-border market that exists between the northern frontiers of Nepal and the Tibet Autonomous Region of China, continues to be another challenge in snow leopard conservation; with poachers using local villagers as a conduit in areas where vigilance and border surveillance is minimal.

GOVERNMENT INITIATIVES IN WILDLIFE CRIME CONTROL

The Government of Nepal has now stepped forward in snow leopard conservation with various institutional structures and tools developed that directly or indirectly support it. The National Park and Wildlife Conservation Act, 2029 BS (1973 AD) with the fifth amendment in 2073 BS (2017 AD), strengthens legal provisions to control wildlife crimes, particularly for protected species like the snow leopard. The provisions include imprisonment for 5 -15 years or a penalty of Nrs 500,000-1,000,000 or both.

The government's Snow Leopard Conservation Action Plan 2005-2015 (revised 2012) is another benchmark for snow leopard conservation. Meanwhile an Action Plan for 2017-2021 has also been developed. The Wildlife Crime Control Bureau (WCCB) established in wildlife trade prone districts are now responsible for controlling wildlife crime, with 22 WCCBs units established in 24 districts. The WCCB's Executive Body at the national level draws its members from the Department of National Parks and Wildlife Conservation (DNPWC), Department of Forests, Department of Customs, Nepal Army, Nepal Police, Armed Police Force, National Investigation Department, WWF Nepal and the National Trust for Nature Conservation (NTNC). Similarly, in district cells it comprises of District Forest Offices or Protected Areas, District Administration Office, District Police, District Armed Police Force, District Government Attorney, District Investigation Office and Nepal Army. The Central Investigation Bureau's (CIB) focus on controlling wildlife crime has also been effective in curbing poaching and illegal wildlife trade.

WWF Nepal's support to WCCB, CIB and other wildlife law enforcement agencies in capacity enhancement and effective mobilization has had tremendous conservation impacts, preventing killing, apprehending illegal traders and busting illegal networks. These include seizure of two snow leopard skins from two poachers in Mustang in 2011, and a skin and 5 kg of bones from two poachers in Darchula in March 2016.

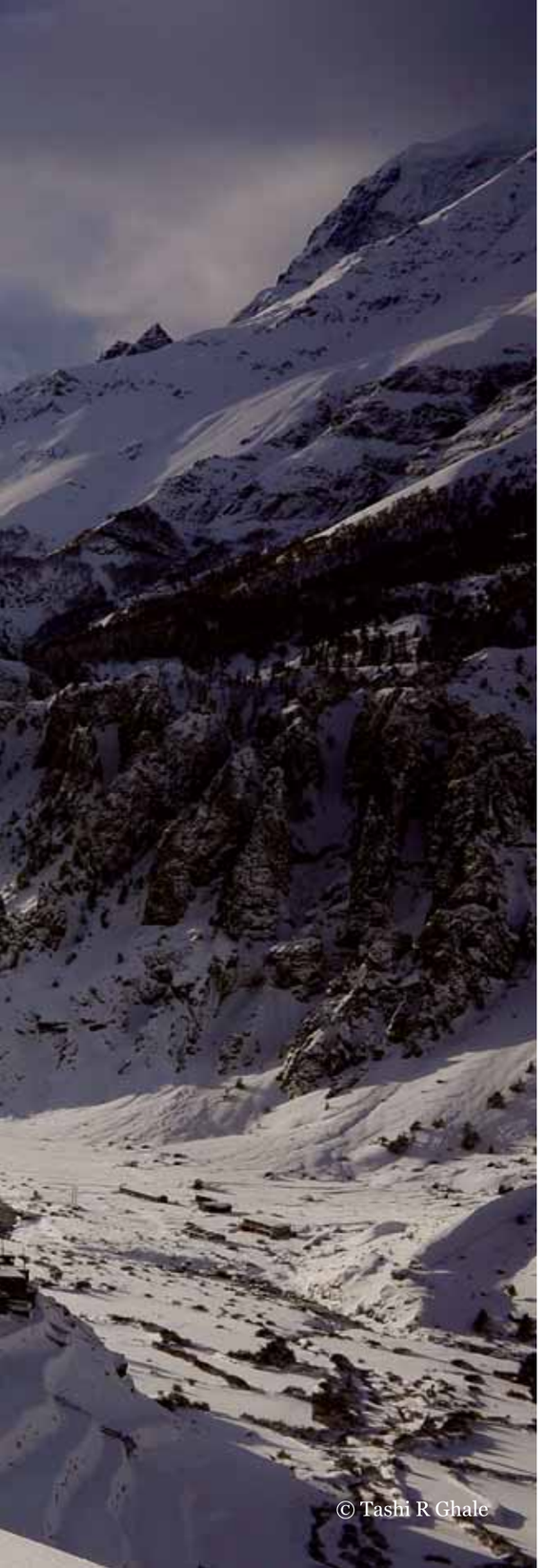
Poison tipped bamboo spears used to kill wildlife. © Snow Leopard Conservancy

COMMUNITY ENGAGEMENT

WWF Nepal has also focused its activities in generating community stewardship towards snow leopard conservation. The formation and mobilization of Snow Leopard Conservation Committee (SLCC); comprising of herders, women and village leaders in snow leopard zones, alongside Community Based Anti-Poaching Units (CBAPU) have been very effective. In November 2000, SLCC was successful in rescuing a female snow leopard nursing two cubs from being killed by villagers in Kangchenjunga Conservation Area (KCA). Similarly, in 2002, more than 200 large mammal traps and snares were removed and confiscated along with two muzzle-loading guns from KCA.

TRANSBOUNDARY COOPERATION

Agreements on cooperation in forestry and biodiversity conservation between Nepal and China, and Nepal and India respectively have been an important step forward in conservation of these wide-ranging species. More recently, the guardians of Asia's snow leopard ranges (12 countries) signed a 'Kathmandu Resolution' on January 20, 2017 to create a platform to protect and safeguard snow leopards in the wild. Such actions give impetus to create changes and conserve this iconic species, not only at higher levels of government, but also to communities working towards conservation.



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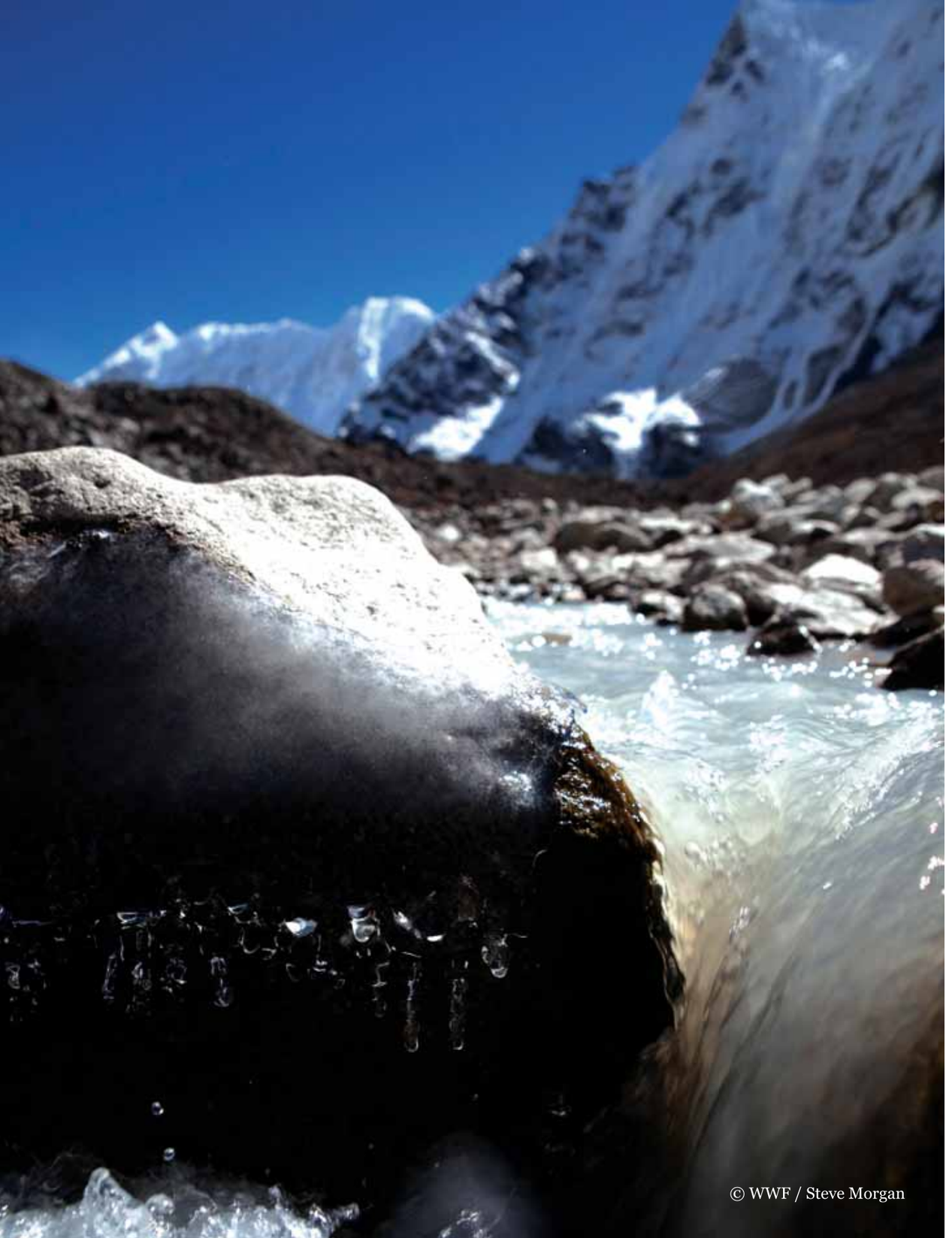
SHRINKING HIMALAYAS SHRINKING HABITATS

UGAN MANANDHAR, GOKARNA JUNG THAPA, ARATI KHADGI

Climate change trends have been on an increase over the past few years with 2014, 2015 and 2016 successively going on record as the hottest years till date, since climate monitoring was initiated. Climate experts and media around the world have highlighted the ever-increasing frequency of extreme weather events. Little spoken, but critical nonetheless is the changing climate and thereby the changing biogeography which is expected to aggravate threats to wildlife. Amongst the endangered animals, the snow leopard, is likely be among the keystone species affected severely, with prospective habitat transformation resulting from climate change.



© WWF / Steve Morgan

A study shows that snow leopard habitat in the Himalayas is expected to decline by around 30%, as climate in the Himalayas is trending towards wetter and warmer conditions (WWF, 2015). The major repercussions being the tree line shift which narrows and overlaps habitats preferred by the snow leopard.

This has potential implications such as increased human-wildlife conflict as well as inter-species conflict. Predictive research apart, an analysis of snow cover across the Nepal Himalayas between 2002 and 2016, by the Government of Nepal's Department of Hydrology and Meteorology shows severe inconsistencies in temperature, water availability as well as snow cover. As such, analysis of maximum temperatures during winter seasons (December-February) between 1990 and 2010 reveal drastic increases. Its plausible implications are evident in global data as well as among others, on-going wildlife research by the Department of National Parks and Wildlife Conservation (DNPWC), Kangchenjunga Conservation Area authorities and WWF Nepal.

HABITAT OVERLAP WITH OTHER SPECIES

Camera trap surveys and photos from the Kangchenjunga region in eastern parts of Nepal, conclusively indicate habitat overlap with common leopards; generally inhabiting lower altitudes, being sighted as high as 4500 masl. What impacts might materialize from increase in such inter-species interactions are yet to be seen. However, it is not hard to fathom the possibility of competition for resources including prey, and a sidelining of the snow leopard by the common leopard. It is also not difficult to imagine the possibility of increased conflict with people and livestock predation, undoing decades of conservation achievements in reducing retaliatory killings. Combined with loss of 30% of its Himalayan habitat; with Bhutan and Nepal losing about 55% and 40% of its current habitat respectively, the cumulative impact on the snow leopard could be drastic.

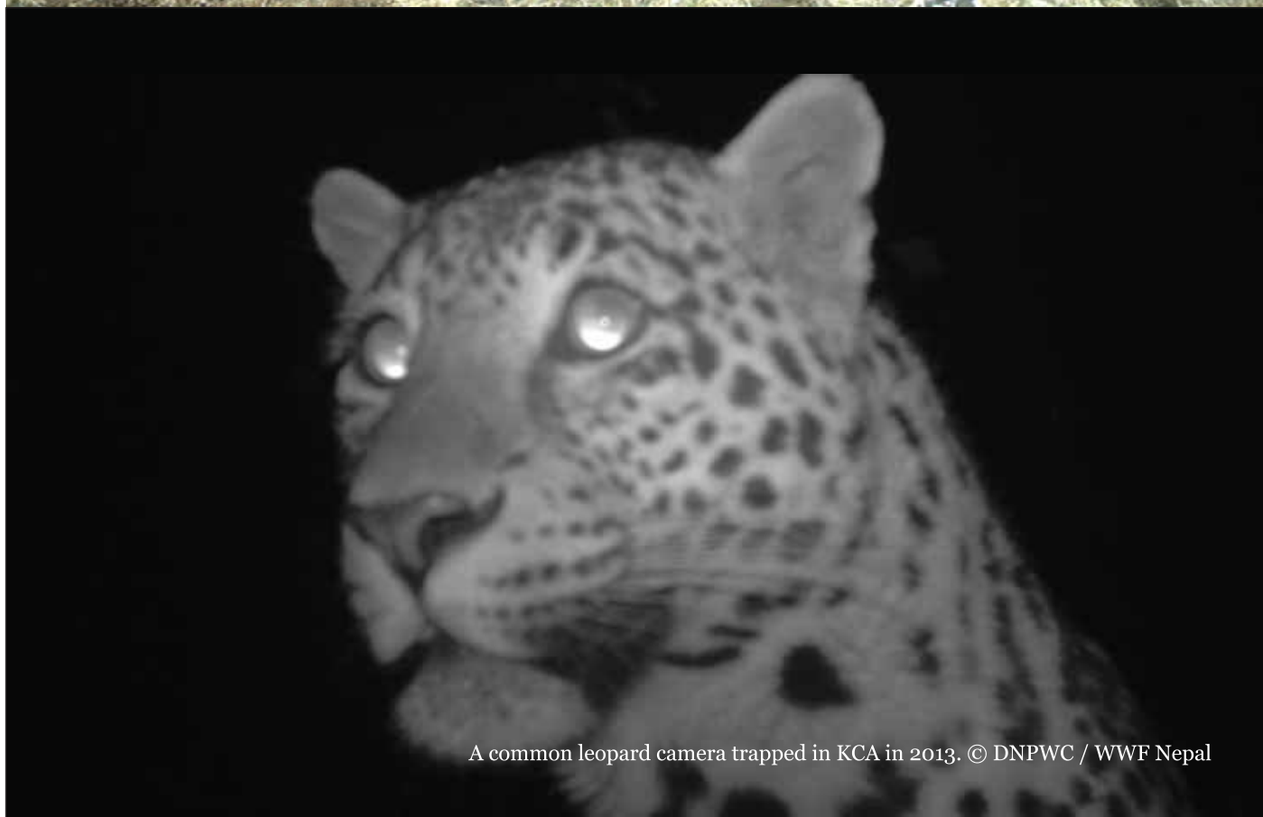
GLOBAL IMPACT

The fate of snow leopards, is of course, only an indicator of the potential fate of the human population. These Himalayas act as the water towers to South Asia, providing for over a billion people. It would be a grim situation indeed for humanity, if nothing is done to preserve the integrity of these habitats. Fortunately, there is an increasing number of people, institutions and governments around the world, working to address the threats of climate change. WWF is among many organizations implementing mitigative as well as preventive measures in the grassroots, as well as at the highest policy levels.

Nepal is among the countries, most vulnerable to the impacts of climate change, aggravated further by weak GDP, poor economy, and high dependence on natural resources. In collaboration with local communities across sections of Nepal's Himalayas, WWF Nepal is working towards tracking inevitable changes to the climate and subsequently wildlife habitats, to inform as well as mitigate these threats.

At a regional scale, Nepal is among the first to develop a climate integrated landscape management plan for snow leopards. These strategies outline approaches for not just species conservation, but understandably, welfare of communities that share these habitats. However additional scientific evidence through research and mobilization of citizen scientists will be critical to bring about innovative ideas that builds on traditional and customary practices of conservation.

A melanistic common leopard camera trapped in KCA in 2013. © DNPWC / WWF Nepal



A common leopard camera trapped in KCA in 2013. © DNPWC / WWF Nepal

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BUILDING BLOCKS

PRASAN KARMACHARYA, SANTOSH MANI NEPAL

Infrastructure development is a key factor for a country's economic development; it supports increased connectivity, enhanced productivity and provides economic encouragement for the public and private sector to thrive. Nepal however is currently ranked among the Least Developed Countries (LDCs) in the global index. The country is presently making efforts to move out of its extended political transition, and has resolved to accelerate its graduation from a LDC to a developing country by 2022. The Government of Nepal (GoN) is subsequently investing heavily in the infrastructure sector to achieve this goal.

This has culminated in agreements between the GoN and China in improving north-south connectivity through feasibility over seven new trade routes. Meanwhile the Trans -Himalayan Railway line connecting Nepal with Shigatse (Tibet) is targeted for completion in2020. The Railway is expected to be the gateway connecting the emerging giants of the world economy - China and India - mean while also supporting China's 'One Belt One Road' initiative. These initiatives provide Nepal with a unique development opportunity to be a dynamic bridge between the two giants, emerging as a key link country that facilitates trilateral trade and exchange.

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MOUNTAIN ECOSYSTEMS & INFRASTRUCTURE DEVELOPMENT

While these development initiatives are necessary, the impact of such infrastructural development on the natural ecosystem and subsequently wildlife and their habitats cannot be overlooked. The snow leopard for instance is the least known among the big cats, primarily due to its secretive nature, poor density, and sparse distribution in the highly inaccessible mountains. Nepal is among 12 countries that provide promising habitats for snow leopards in the cold and high mountains, above tree lines at elevations of 3,000 to 5,500 masl.

The infrastructure development scenario in this elevation range is relatively poor in the current country context; however upcoming cross-border road and railway connectivity and subsequent new settlements could potentially impact the snow leopard habitat directly or indirectly.

Fragmentation of the snow leopards' habitat and dispersal of the species is a major concern emerging out of infrastructure development, as this may have impact at the landscape level in the long run. This is a major concern, especially given that the

planned north-south roads and railways to China, will potentially traverse through critical habitats of this mountain cat. Additionally, infrastructural development and subsequent habitat fragmentation could also have some indirect impacts such as loss of genetic diversity due to population minimization and reduced dispersal, not only for the snow leopard but also prey species such as the blue sheep and Himalayan tahr, thereby changing the structure and dynamics of the mountain ecosystem itself.

Meanwhile, development of rural roads and new settlements not only fragments the habitat but also provides easier access and new markets to poachers, that could subsequently increase illegal hunting activities in and around the vicinity. Similarly, it also increases the likelihood of human-wildlife conflict. Wide roads could also have a barrier effect for the species, along with other disturbances such as noise, light, and pollution, which may restrict wildlife movement. Infrastructure construction, particularly hydropower and mining activities, also produce significant noise such as blasting and drilling, thereby disturbing the natural surroundings and wildlife.

© Dipesh Joshi / WWF Nepal

DEVELOPMENT OF ECOFRIENDLY INFRASTRUCTURE

Given that infrastructure development is crucial for economic growth and prosperity, the process of development cannot be stopped. However, it is possible to limit the potential negative impacts to a minimum. Development of effective mitigation strategies, especially when applied early in the project cycle, during the design and planning phases, has proven to be successful, rather than addressing impacts through project modification at a later phase. The mitigation hierarchy concept of i) Avoidance, ii) Minimization, and iii) Compensation, for instance is a widely-advocated process developed to limit the impact of infrastructure development that traverses through environmentally-sensitive areas.

Avoidance: Avoid prime and sensitive habitats during design of any linear infrastructure, such as roads, is a key priority step to prevent potential conflict and limit ecological impact.

Minimization: Focus on minimizing the effects, if avoidance is not practically possible. Use ecological mitigation actions such as construction of crossing structures (Overpass/Underpass), modified culverts and viaducts to ease animal movement.

Compensation: Includes all measures designed to balance ecological impact by providing an equivalent amount of ecological improvement.

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Development of ecofriendly linear infrastructure is crucial to protect snow leopard habitats alongside the mountain ecosystem. WWF Nepal has been supporting scientific research and studies to identify gaps in the conservation of snow leopards. To effectively mitigate the potential negative impacts of infrastructure development, a landscape level assessment is essential to identify potential conflicts and risks between conservation and development goals.

WWF Nepal along with its partners has taken initiative in drafting the 'Eco-friendly Linear Infrastructure Guideline' that prioritizes the construction of wildlife-friendly passes and related mitigative structures. It is also continuously engaging with infrastructure development authorities, planners and policy makers to effectively plan and design mitigative structures for eco-friendly infrastructure. However effective coordination between various development organizations is essential to build a sustainable infrastructure framework and ensure a future that takes into consideration conservation of endangered species such as the snow leopard.


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LOOKING AHEAD

GHANA S. GURUNG

Nepal has come a long way in ensuring the protection of snow leopards in partnership with local communities. In addition to research and conservation interventions, the country has also introduced major policy initiatives that ensures continuity of the species well into the future. Nepal's Snow Leopard Conservation Action Plan, 2017-2021 is one such initiative. The plan builds on achievements of the previous ten-year plan, including satellite telemetry of snow leopards, innovative community-based livestock insurance schemes, and increased participation of local mountain communities, particularly the youth, in research and conservation.

This new plan puts Nepal on the road to achieve its commitments made under the Global Snow Leopard and Ecosystem Protection Program (GSLEP), a combined effort in transboundary cooperation among all 12 snow leopard range countries. In line with GSLEP priorities, Nepal's plan focuses on scaling up best practices in snow leopard conservation efforts, and includes five broad objectives - continue research and monitoring using cutting-edge technology; improve habitat and corridors; mitigate conflict through community engagement; reduce wildlife crimes; and, strengthen trans-boundary coordination and cooperation.


© WWF Nepal / Sanjog Rai

The plan includes a budget of NRs. 346 million (USD 3.46 million) for its implementation in partnership with conservation and development partners, as well as local communities. In addition, the former Prime Minister of Nepal, Mr. Pushpa Kamal Dahal also announced a NRs. 50 million (USD 500,000) fund for snow leopard conservation following the agreement by range country delegates to have a Himalayan snow leopard research centre in Nepal.

A new climate-smart landscape management plan for the eastern snow leopard conservation landscape is also in final shape. This plan is designed to address new challenges in the face of climate change as well as development in the region, that threatens to undo everything that has been achieved so far. These initiatives have been crucial for conservation of the species; however, it is not without challenges.

One of the major challenges has been snow leopard research. Despite progress, research on snow leopards is still in its infancy, primarily due to the harsh weather conditions and geographical inaccessibility of their habitats. Additionally, the country is yet to have a reliable snow leopard population as well as prey base, making it difficult to set concrete goals.

Another challenge has been transboundary cooperation, which has been relatively elusive; more so than the snow leopard. As a member of GSLEP, Nepal has been active in facilitating its role in international cooperation and coordination for snow leopard conservation. While current transboundary consultative meetings with China and India provide opportunities to understand and resolve common issues of conservation, challenges persist in terms of making it a norm for joint snow leopard conservation.

Infrastructure development and mining are also potential threats to snow leopard conservation on the ground. While Nepal is proactively working towards smart green infrastructure development, rapid development of linear infrastructure

such as roads, railways, hydropower, irrigation canals and transmission lines - ambitious regional infrastructure initiatives, have the potential to fragment the snow leopard landscape alongside other anthropogenic impacts. Meanwhile, growth of settlements along linear infrastructure hubs can also prove a threat if they fall in snow leopard hotspots.

For Nepal to achieve its GSLEP commitments it is essential that its neighbours are on board, investments are made in resources and conservation work is conducted in close partnership with mountain and conservation communities. Today, Nepal can rightly call itself a country that prioritizes its snow leopards. This has been significantly leveraged by the international community, including international aid agencies, governments, charitable individuals and institutions, through invaluable technical and financial support for snow leopard conservation which has helped Nepal reach where it is today. Nepal on its part, has been working towards citizen awareness, involving them in grassroots conservation, as well as in preserving and improving legislations and policies that benefit the species and local communities. Sustainable financing mechanisms have also been explored including community-based tourism in the mountains to further ensure sustainability of conservation initiatives.

These are precarious gains that can easily be lost if transboundary cooperation, smart green infrastructure and climate change are not addressed. Climate change in particular, is of grave concern as Nepal or even the entire international conservation community cannot address climate change single handed. For the survival of snow leopards well into the future, our hope lies in humanity, for all to join hands to preserve this beautiful global heritage and their home in the Himalayas.

ACKNOWLEDGEMENTS

WWF Nepal would like to express sincere heartfelt gratitude to institutions and individuals, whose administrative, financial and technical contributions continue to be critical in enabling snow leopard conservation in Nepal. Their support has been invaluable in bringing Nepal to the forefront of global snow leopard conservation efforts.

CREATING ENABLING POLICY ENVIRONMENT

Ministry of Forests and Soil Conservation
Department of National Parks and Wildlife Conservation
Department of Forests
Wildlife Crime Control Bureau

LEADING IMPLEMENTATION OF CONSERVATION INITIATIVES

Annapurna Conservation Area
Api Nampa Conservation Area
Gaurishankar Conservation Area
Kangchenjunga Conservation Area
Langtang National Park
Makalu Barun National Park
Manaslu Conservation Area
Sagarmatha National Park
Shey Phoksundo National Park

ENTRUSTING US TO THE CAUSE OF SNOW LEOPARDS AND THE MOUNTAIN COMMUNITIES

DFID
Hoffman-La Roche Limited
MacArthur Foundation
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WWF Australia
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WWF Canada
WWF Finland
WWF International
WWF Netherlands
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PROVIDING LEVERAGING SUPPORT

Centre for Molecular Dynamics, Nepal
Global Snow Leopard and Ecosystem Protection Program Secretariat
International Centre for Integrated Mountain Development
International Snow Leopard Trust
International Union for Conservation of Nature
National Trust for Nature Conservation
Snow Leopard Conservancy

PARTNERING ON THE GROUND CONSERVATION INTERVENTIONS

Buffer Zone Management Committees
Citizen Scientists of the Himalayan region of Nepal
Community-Based Anti-Poaching Units
Conservation Area Management Committees
Kangchenjunga Conservation Area Management Council
Snow Leopard Conservation Committees

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