ICIMOD

WWF

Grassland Ecology and Management in Protected Areas of Nepal

Volume 1: Action Summary

Editors
Camille Richard
Jay Prakash Sah
Khadga Basnet
Jhamak Karki
Basant Subba
Yogendra Raut

Jointly Organized by
Department of National Parks and Wildlife Conservation, HMG/Nepal
International Centre for Integrated Mountain Development
WWF Nepal Programme

Grassland Ecology and Management in Protected Areas of Nepal

Proceedings of a Workshop

Royal Bardia National Park
Thakurdwara, Bardia, Nepal
March 15-19, 1999

Volume I: Action Summary

Editors
Camille Richard
Jay Prakash Sah
Khadga Basnet
Jhamak Karki
Basant Subba
Yogendra Raut

Jointly Organized by
Department of National Parks and Wildlife Conservation, HMG/Nepal
International Centre for Integrated Mountain Development (ICIMOD)
WWF Nepal Programme

Credits:
Front cover - Rhino in the Royal Chitwan National Park (*C. Richard*)
Back cover - Blue Sheep in Shey Phoksundo National Park (*D. Miller*)
Elephant at Rest, Royal Chitwan National Park (*C. Richard*)

Published by
International Centre for Integrated Mountain Development
G.P.O. Box 3226
Kathmandu, Nepal

ISBN 92 9115 166 1
Vol. I 92 9115 135 1

Editorial Team
Greta Mary Rana (Senior Editor)
Beatrice M. Shrestha (Editor)
Dharma R. Maharjan (Layout Design)
Asha K. Thaku (Cartographer)

Typesetting at
ICIMOD Publications' Unit

Foreword

Globally, grasslands and rangelands occur in polar, temperate, sub-tropical, and tropical latitudes, from low to high elevations. In total, they cover 45 million square kilometres or one quarter of the earth's surface. In the Hindu Kush-Himalayan Tibet-Qinghai Plateau, rangelands and pastures cover some 60 per cent of the total area. They vary from sub-tropical savannas to alpine meadows in the eastern, central, and western Himalayas and steppe formations on the Plateau. As such, they contain a wide diversity of grasses and other plant species on which a number of endangered wildlife species depend. This diversity is matched by the cultural diversity of the people who have adapted their lifestyles to the harsh environment.

It is ICIMOD's, World Wide Fund for Nature's (WWF), and the Department of National Parks and Wildlife Conservation's (DNPWC) concern about the relationship between the people and their rangelands, between environment and development, and between nature and culture, that has brought together the scientists and managers represented here in these volumes. These proceedings provide valuable information on grassland ecology and management, not only for protected area managers here in Nepal, but also for scientists and managers working in other countries with similar ecological conditions.

It was only in 1995, when the first four-year Regional Collaborative Programme for the Sustainable Development of the Hindu Kush-Himalayas started, that ICIMOD could appoint its first rangeland management specialist and allocate some modest resources to a programme addressing rangeland issues. In ICIMOD's Second Regional Collaborative Programme (RCP-II), which covers the period from 1999-2002, rangelands have become an important focus of work on the mountain commons. We are very fortunate that the Government of Austria is funding the three-year Regional Rangeland Programme that allows us to carry out a comprehensive programme of research, capacity building, and extension, continuing until the end of 2001. The primary focus of the programme is to develop approaches that involve the local custodians of the rangeland resource – the communities themselves – in conservation and development of the rangelands upon which they so heavily depend. It is vital that collaborative management be the focus of future conservation efforts, both in Nepal and abroad, to ensure sustainable and equitable management of biological resources during this period of rapid change. This has been the approach of both WWF Nepal Programme and the DNPWC, who have pioneered work in collaborative management in the region.

Important issues that affect the grasslands and rangelands in protected areas of the Hindu Kush-Himalayas are the following:

- how to maintain biological diversity and multiple use of rangelands to promote co-existence of domestic and wild grazing ungulates and predators within and outside protected areas;

- how to find technical and institutional mechanisms to accommodate the needs of local communities to continue to access protected area resources while simultaneously promoting conservation;
- how to save and use the indigenous knowledge regarding use and management of rangeland resources; and,
- how do changing patterns of rangeland use and conservation affect the local communities, considering differential effects among diverse ethnic groups, on gender relations, and eventually on policy.

This compilation of working group outputs and research is a vital step in beginning to answer these important questions and provides working guidelines for protected area managers to help them prioritise future activities. The grasslands of the Himalayas are not only vital to the livelihood of many poor mountain families but to the sustainability of the varied and beautiful ecosystems that our in our trust. This work, and the innovative and committed people who have contributed to it as authors and editors, will help to conserve our mountain future.

J. Gabriel Campbell PhD.
Director General, ICIMOD

Acknowledgements

First we would like to offer our thanks to the Department of National Parks and Wildlife Conservation (DNPWC), the International Centre for Integrated Mountain Development (ICIMOD), and WWF NEPAL Programme for the support provided for organizing and conducting this workshop on "Grassland Ecology and Management in Protected Areas of Nepal.' Staff from the organizations working in the Royal Bardia National Park (RBNP), the Bardia Integrated Conservation Project (BICP), WWF Nepal Programme, Care Nepal, and The King Mahendra Trust for Nature Conservation KMTNC) - were instrumental in making this workshop successful on the ground. In particular we would like to thank Mr. Shiva Raj Bhatta (Chief Warden and BICP manager) for taking on all the responsibility for local management and facilities; Dr. Shanta Raj Jnawali (Director, KMTNC, Bardia) for supporting local management; Ms. Sushila Nepali (Assistant Manager, BICP) for her active role in public relations and logistics; Mrs. Sarita Jnawali for her management of food and beverages; Mr. C. P. Bhandari (Finance and Administration Assistant, BICP) for financial matters and logistics; Mr. Ramesh Thapa (Ranger, RBNP) for taking care of the workshop complex; Mr. Bhusal (Health Assistant) for providing first aid services; Mr. Ramji Shivakoti (RBNP/CARE Nepal), Mr. Naresh Subedi (Park and People Project) Ashok Bhandari, and the senior game Scouts for their logistical support, and the drivers of RBNP for their invaluable assistance transporting participants.

We are also grateful to the following people for their direct and indirect support in helping to make the workshop run effectively: Mr. Sushil Bhattarai, Joint Secretary, Ministry of Forest and Soil Conservation (MoFSC) for inaugurating the workshop; Mr. D. D. Bhatta (Director, Regional Forest Directorate), Mr. Shyam Bajimaya (Conservation Officer, DNPWC), Mr. Sawarkar (Scientist, Wildlife Institute of India), and Mr. Krishna Man Shrestha (former Chief warden of RBNP) for chairing various sessions of the workshop; and Basant Subba for serving as rapporteur. Special thanks are due to the editorial committee for their hard work in bringing this document to its present shape.

Finally, we would like to thank Dr. T.M. Maskey (Director General, DNPWC), Dr. U.R.Sharma (Joint Secretary, MoFSC), Mr. Egbert Pelinck (ex-Director General, ICIMOD), and Mr. Mingma N. Sherpa (Country Representative, WWF Nepal Programme) for their continuing support to conservation efforts in Nepal.

The Steering Committee

Narayan Poudel, DNPWC
Narendra Pradhan, DNPWC
Jhamak Karki, DNPWC
Hum Prasad Adhikari, MoFSC
Camille Richard, ICIMOD
Ukesh Raj Bhuju, WWF
Anil Manandhar, WWF

Abbreviations and Acronyms

ACA	Annapurna Conservation Area
ACAP	Annapurna Conservation Area Project
AGB	above ground biomass
APPA	appreciative participatory planning and action
BZ	Buffer Zone
CAMC	Conservation Area Management Committee
DHR	Dhorpatan Hunting Reserve
DNP	Dudwa National Park
DNPWC	Department of National Parks and Wildlife Conservation
ERBC	ecoregion-based conservation
GIS	geographical information system
HKH	Hindu Kush-Himalayas/Himalayan
HMG/N	His Majesty's Government of Nepal
ICIMOD	International Centre for Integrated Mountain Development
KCA	Kanchenjunga Conservation Area
KMTNC	King Mahendra Trust for Nature Conservation
KNP	Khaptad National Park
KWR	Koshi Tappu Wildlife Reserve
LNP	Langtang National Park
masl	metres above sea level
MBNP	Makalu Barun National Park
MCA	Manaslu Conservation Area
NGO	non-government organization
PA	protected area
PAN	Protected Area Network
PAR	participatory action research
PPP	Plants and People Project (WWF)
PRA	participatory rural appraisal
PWR	Parsa Wildlife Reserve
RBNP	Royal Bardia National Park
RCNP	Royal Chitwan National Park
RNP	Rara National Park
RRA	rapid rural appraisal
RS	remote sensing
RSWR	Royal Shukla Phanta Wildlife Reserve

SNP	Sagarmatha National Park
SPNP	Shey Phoksundo National Park
SRV	species richness value
UNDP	United Nations Development Programme
WWF	Worldwide Fund for Nature

Glossary

Physiographic Regions of Nepal (Carson 1992)

- ***Terai*** — Alluvial piedmont plain occurring at the base of the Himalayan range, from 60-300masl. This is an extension of the broad Gangetic plains including Bhabar region and alluvial fans of the Siwaliks. The region is heavily traversed by the major river systems of Nepal. It exhibits a tropical type of climate. *Dalbergia sissoo, Shorea robusta,* and *Eucalyptus* are the major vegetation types of forest, interspersed with riverine savanna grassland. Much of the forests and savannas of the *Terai* have been converted to agriculture.

- ***Churia Hills (Siwaliks)***— The outermost Himalayan foothills are classified as the Siwaliks, ranging from 300-1,000m, and they represent the most recent zone of uplift. The soils are shallow, erodible, and drought prone, originating primarily from highly erodible sedimentary rock composed of previous piedmont plain alluvial sediments. The climate and vegetation of this region are mainly sub-tropical depending on the elevation, but forests are dominated by *sal* (*Shorea robusta*). Due to the fragility of the landscape, land-use pressures are not severe.

- ***Middle Hills*** — Landscape between 1,000-2,000m occurs throughout the Mahabharat range. Slopes are more gentle than in the Siwaliks and a significant portion of the sloping hills is cultivated under relatively sophisticated terrace systems in the form of low (irrigated) and upland (dry). The forests of the Middle Mountain are heavily exploited for fodder, firewood, litter, and timber collection.

- ***High Mountains*** — Landscape ranges between 2,000-3,000m, however, a range of sub-tropical to cool temperate conditions can occur within the same valley. Bedrock is predominantly highly metamorphosed sedimentary rocks, thus landscapes are steeper than in the Middle Hills because rocks are relatively more resistant to weathering. Deep 'V'-shaped valleys are common throughout the region. Forests in the High Mountains tend to be in better condition than in the Middle Hills due to lower population densities.

- ***High Himalayas*** — Landscapes are usually >3,000m in altitude. Most of the area below 4,300m is natural forest with alpine above. Bedrock is predominantly more competent and forms very steep and rugged terrain. Dry forest types and grassland steppes occur in the rainshadow behind the main mountain ranges. The area has a very low population density because of lack of cultivable land and cold winter conditions.

Seral — Early to mid-stage in ecological succession.

Climax —Final stage of a succession where a given assemblage of species is in equilibrium with the prevailing natural environment.

Phanta(s) — Grasslands dominated by short perennial grasses, such as *Imperata cylindrica*, which have originated following human intervention (forest clearing, burning, domestic stock grazing, and cultivation); they occur on more or less stabilised soils.

Tall (riverine) grassland — Riverine grassland dominated by tall grass species' assemblages maintained by inundation during the monsoon and/or by fire and grazing. These grass species range from *Typha elephantina, Phragmites karka,* and *Saccharum spontaneum* assemblages that colonise new alluvial deposits in flood plains to assemblages on drier and better developed soils dominated by *Narenga porphyrocoma, Saccharum bengalense,* and *Themeda arundinacea*. These herbaceous species eventually give way to dominance by non-flooded climax deciduous forest which is predominantly composed of *sal* (*Shorea robusta*).

Himalayan Alpine Shrub/Meadow — Mesic herbaceous and scrubby meadows that occur above the treeline on the south facing Himalayan range, dominated by herbaceous grassy genera such as *Kobresia, Poa, Deyeuxia, Agrostis,* and *Festuca* and shrubby species such as *Rhododendron, Juniperus,* etc. These regions contain a rich floral and faunal diversity.

Trans-Himalayan Rangelands — Vegetation communities dominated by desert steppe vegetation such as *Caragana, Lonicera,* and xeriphitic grass genera such as *Stipa*. Although relatively low in floral species' diversity, these rangelands support large herds of ungulates and wild predators.

Buffer Zone — Areas adjacent to or within a PA in which land use is partially restricted and managed to give an added layer of protection to the PA itself while providing valued benefits to the neighbouring rural communities (MacKinnon *et al.* 1986).

Eco-development — A site-specific package of measures, developed through peoples' participation, with the objective of promoting sustainable use of land and other resources, as well as farm and off-farm income generating activities not deleterious to protected area values (Panwar 1992).

Eco-development area — (as used in India, similar to a Buffer Zone in Nepal) – a conservation designation in the Indian Wildlife Act for areas adjacent to core Protected Areas. The area is managed so as to reduce or eliminate human pressure on core protected areas using eco-development measures.

Workshop Summary

Natural grasslands cover approximately 14 per cent of Nepal and are important areas in terms of biodiversity and sources of forage for wild ungulates and domestic livestock. In the plains of Nepal (the *Terai*), natural grasslands occur along flood plains and terraces. As a result of increasing population pressures in this region, these grasslands only exist in their natural state within protected areas (PAs) as neighbouring grassland and sub-tropical forest habitats have been rapidly converted into agricultural land and grazing commons. At higher altitudes, trans-Himalayan and alpine rangelands are home to a diverse array of wildlife and are grazed by livestock, which are an integral part of the livelihood of several different ethnic groups. While there is a general assumption that these high elevation areas are being overgrazed, little is known about the ecology and sustainability of prevailing land-use practices.

To address these issues, a workshop on Grassland Ecology and Management in Protected Areas of Nepal was organized jointly by HMG/N's Department of National Parks and Wildlife Conservation (DNPWC), the International Centre for Integrated Mountain Development (ICIMOD), and WWF Nepal Programme, from March 15-19, 1999, at Royal Bardia National Park, Nepal. The idea for the workshop arose from discussions on protected area (PA) management during the Wardens' Seminar in 1998 in the Annapurna Conservation Area. The DNPWC endorsed the recommendation of the Wardens' Seminar, and ICIMOD and WWF pledged financial and technical support. The goal of the workshop was to summarise the major grassland ecological research work conducted to date and devise effective research and management strategies for grasslands in PAs in the mountain and *Terai* areas of Nepal. Participants included representatives from the Ministry of Forest and Soil Conservation, protected area managers from Nepal, independent researchers from Nepal and abroad, and guest scientists from India who have worked in similar environments in their own country. Some papers invited from research workers who were unable to attend the workshop were included in the background papers (and will be published in the proceedings) to ensure completeness in the coverage of technical information.

A series of technical and status papers was presented summarising research for both *Terai* and Himalayan grassland ecosystems. Working groups were formed to prioritise issues, to identify research and management gaps, and to devise research and management guidelines for both grassland ecosystems. The *Terai* working group sessions revealed that, whereas much research on grasslands has been conducted to date, the results have not been incorporated into grassland management practice. The participants of the *Terai* working group outlined a number of management strategies to address these gaps, primarily focussing on maintenance of grassland habitats for key wildlife species. The mountain group sessions indicated a significant absence of research related to high elevation rangelands. Thus these participants focussed on developing research strategies to address the high priority issues of wildlife-livestock competition, crop and livestock depredation, medicinal plant extraction, stakeholder involvement, and transboundary protection. Research and management committees have been

recommended to follow up and refine these guidelines. The proceedings from the 'Workshop on Grassland Ecology and Management in Protected Areas of Nepal' are divided into three volumes. Volume I is the Workshop Action Summary and contains a brief summary of the papers presented in Volumes II and III, as well as a summary and synthesis of the workshop findings and recommendations; Volume II presents the status and research papers from the *Terai* protected areas of Nepal and India; and Volume III presents the status and research papers from protected areas in the mountains.

Volume I. Action Summary

Volume II. Technical and Status Papers on Grasslands of *Terai* Protected Areas

A. Technical Papers on *Terai* Protected Areas

A Landscape Approach to Managing the Indian *Terai* Ecosystem with Reference to Uttar Pradesh, India
Vishwas B. Sawarkar

Status of Research and Monitoring in Protected Areas of the Indian *Terai*: An Overview
Pradeep Kumar Mathur

Managing the *Terai* Grasslands in Nepal: Recent Research and Future Priorities
Nic Peet, Diana J. Bell, and Andrew R. Watkinson

The Organization and Human Use of *Terai* Riverine Grasslands in Royal Chitwan National Park, Nepal
John F. Lehmkuhl

Grasslands and Large Mammal Conservation in the Lowland *Terai*: A Preliminary Synthesis Based on Field Research Conducted in Royal Bardia National Park, Nepal
Per Wegge, Shant Raj Jnawali, Torstein Storaas, Morten Odden

Koshi Tappu's Treasure: Grasslands or Wetlands?
Jay Prakash Sah

Effects of Management Practices on the Grassland Vegetation and Their Use by Ungulates in Dudwa National Park, Uttar Pradesh, India
Harish Kumar

Importance of Tall Grasslands in Mega Herbivore Conservation
Shanta Raj Jnawali and Per Wegge

Grassland Management Impacts on Small Mammals
Tika Ram Adhikary

Impact of Grassland Management on Avian Fauna
Hem Sagar Baral

B. Status of Grasslands in *Terai* Protected Areas: Management Issues and Gaps

Parsa Wildlife Reserve (PWR)
Surya Bahadur Pandey

Royal Bardia National Park (RBNP)
Shiv Raj Bhatta

Royal Shukla Phanta Wildlife Reserve (RSWR)
Ram Prit Yadav, Sher Singh Thagunna, and Jay Prakash Sah

Volume III. Technical and Status Papers on Grasslands of Mountain Protected Areas

A. Technical Papers on Mountain Protected Areas

Indigenous Livestock Management Systems on the Upper Slopes of Central Nepal
Santosh Rayamajhi, Don Messerschmidt and Bill Jackson

Alpine Vegetation of North Western India: An Ecological Review
Gopal S. Rawat

Rangeland, Animal Husbandry and Wildlife in Annapurna, Nepal: A Case Study
Som Ale

Grasslands in the Damodar Kunda Region of Upper Mustang, Nepal
Rita Arjel Koirala, Rinjin Shrestha, and Per Wegge

Ecological Separation between Ibex and Resident Livestock in a Trans-Himalayan Protected Area
Yashveer Bhatnagar, Gopal S. Rawat, A.J. Thomas Johnsingh, and Michael Stüwe

A Participatory Approach to Rangeland Research and Management: Developing an Action Plan for Rangeland Conservation in Mountain Protected Areas
Camille Richard and Colleen McVeigh

Managing People-Wildlife Conflict on Alpine Pastures in the Himalayas
Rodney Jackson

B. Status of Grasslands in Mountain Protected Areas: Management Issues and Gaps

Langtang National Park (LNP)
Jhamak Karki and Colleen McVeigh

Kanchenjunga Conservation Area (KCA)
Fanindra R. Kharel

Dhorpatan Hunting Reserve (DHR)
Ramchandra Kandel

Khaptad National Park (KNP)
Nilamber Mishra

Rara National Park (RNP)
Gopal Ghimire

Shey Phoksundo National Park (SPNP)
Tulsi Ram Sharma

Contents

Workshop Background 1

Overview of the Ecology and Management of Himalayan Grasslands 5

Representation of Grassland Ecosystems in the Himalayan Ecoregions 7
An Agro-ecological Perspective on Grassland Management in the *Terai* and Mountain Protected Areas 15

Highlights of Grassland Research Conducted in the *Terai* and Mountain Protected Areas of India and Nepal 23

Terai Grasslands 25
A Landscape Approach to Managing the Indian *Terai* Ecosystems with Reference to Uttar Pradesh, India 25
Status of Research and Monitoring in Protected Areas of the Indian *Terai*: An Overview 26
Managing the *Terai* Grasslands in Nepal: Recent Research and Future Priorities 28
The Organization and Human Use of *Terai* Riverine Grasslands in Royal Chitwan National Park, Nepal 29
Grasslands and Large Mammal Conservation in the Lowland *Terai* : A Preliminary Synthesis Based on Field Research Conducted in Royal Bardia National Park, Nepal 31
Koshi Tappu's Treasure: Grasslands or Wetlands? 33
Effects of Management Practices on the Grassland Vegetation and the Use by Ungulates in Dudwa National Park, Uttar Pradesh, India 34
Impacts of Grassland Management Practices on Grassland Communities at Royal Bardia National Park, Nepal 36
Importance of Tall Grasslands in Mega Herbivore Conservation 38
Grassland Management Impacts on Small Mammals 39
Impact of Grassland Management on Avian Fauna 40
Mountain Forests and Rangelands 42

Indigenous Livestock Management Systems in Upper Slope Forests of Central Nepal 42
Alpine Vegetation of North Western India: An Ecological Review 43
Rangeland, Animal Husbandry and Wildlife in Annapurna, Nepal: A Case Study 45
Grasslands in the Damodar Kunda Region of Upper Mustang, Nepal 46
Ecological Separation between Ibex and Resident Livestock in a Trans-Himalayan Protected Area 48
A Participatory Approach to Rangeland Research and Management: Developing an Action Plan for Rangeland Conservation in Mountain Protected Areas 50
Managing People-Wildlife Conflict on Alpine Pastures in the Himalayas 51

Status of Grasslands in Protected Areas of Nepal— Management Isues and Research Gaps 55

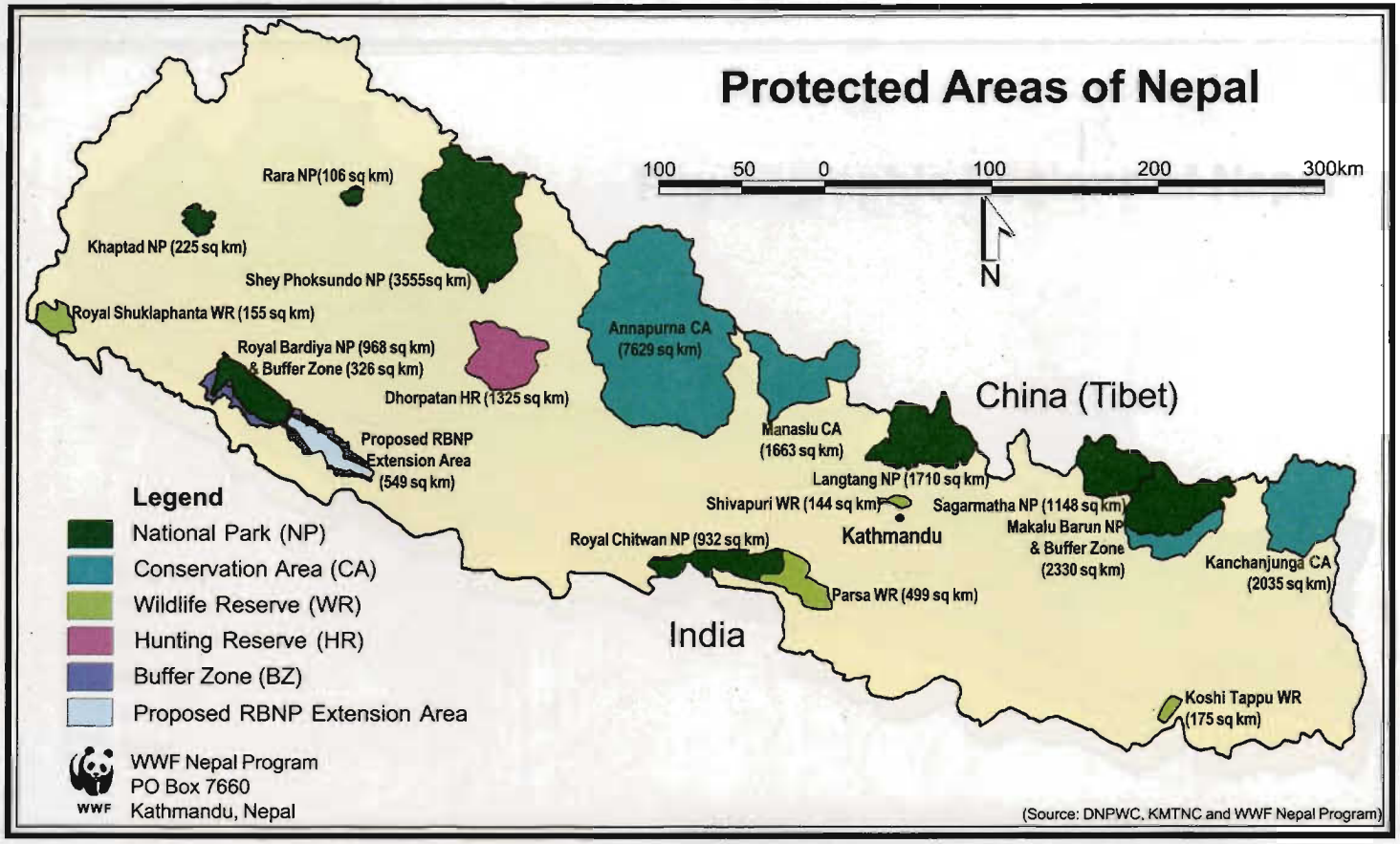
Terai Protected Areas 57
Parsa Wildlife Reserve (PWR) 57
Royal Bardia National Park (RBNP) 58
Royal Shukla Phanta Wildlife Reserve (RSWR) 59
Mountain Protected Areas 61
Langtang National Park (LNP) 61
Kanchenjunga Conservation Area (KCA) 63
Dhorpatan Hunting Reserve (DHR) 64
Khaptad National Park (KNP) 65
Rara National Park (RNP) 66
Shey Phoksundo National Park (SPNP) 67

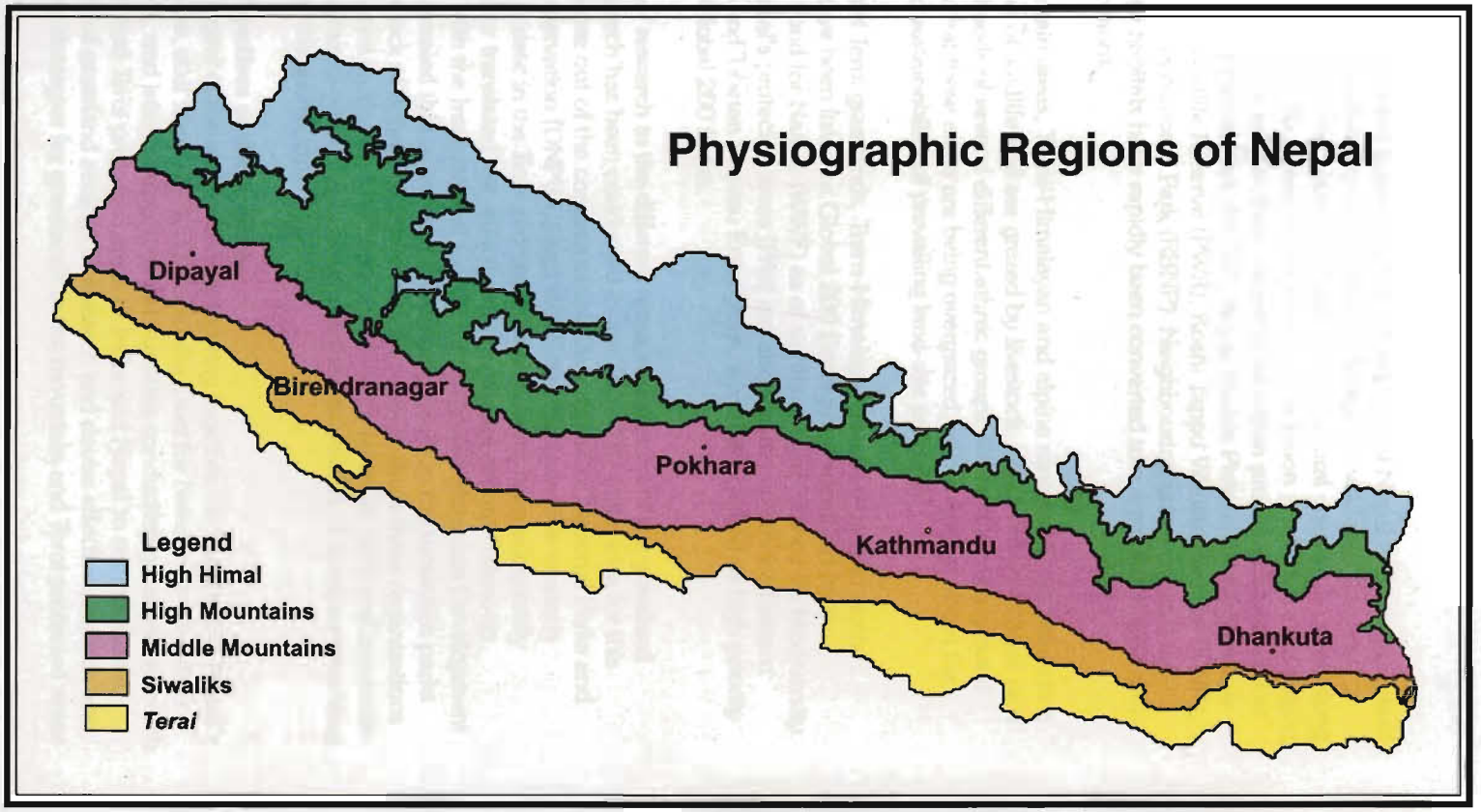
Prioritising Research and Management Initiatives for the Terai and Mountain Protected Areas of Nepal— Summary of Working Group Sessions .. 71

Working Group Objectives 73
Terai PA Working Group Sessions 74
Mountain PA Working Group Sessions 76

Annexes 91

Annex 1: Research and Management Tables from Working Groups 93
Annex 2: List of Participants 96
Annex 3: Workshop Programme 100


Protected Areas of Nepal
100 50 0 100 200 300km
N
Rara NP(106 sq km)
Khaptad NP (225 sq km)
Shey Phoksundo NP (3555sq km)
Royal Shuklaphanta WR (155 sq km)
Royal Bardiya NP (968 sq km)
& Buffer Zone (326 sq km)
Dhorpatan HR (1325 sq km)
Proposed RBNP
Extension Area
(549 sq km)
Annapurna CA
(7629 sq km)
Manaslu CA
(1663 sq km)
China (Tibet)
Langtang NP (1710 sq km)
Shivapuri WR (144 sq km)
Kathmandu
Sagarmatha NP (1148 sq km)
Makalu Barun NP
& Buffer Zone
(2330 sq km)
Kanchanjunga CA
(2035 sq km)
Royal Chitwan NP (932 sq km)
Parsa WR (499 sq km)
India
Koshi Tappu WR
(175 sq km)
Legend
National Park (NP)
Conservation Area (CA)
Wildlife Reserve (WR)
Hunting Reserve (HR)
Buffer Zone (BZ)
Proposed RBNP Extension Area
WWF
WWF Nepal Program
PO Box 7660
Kathmandu, Nepal
(Source: DNPWC, KMTNC and WWF Nepal Program)


Physiographic Regions of Nepal
Dipayal
Birendranagar
Pokhara
Kathmandu
Dhankuta
Legend
High Himal
High Mountains
Middle Mountains
Siwaliks
Terai