

**Biodiversity Profile of the  
High Himal / High Mountains Physiographic Zones Biodiversity Profiles**

**Biodiversity Profile  
of the  
High Himal  
High Mountains  
Physiographic Zones**



**His Majesty's Government of Nepal/Government of the Netherlands**

**Biodiversity Profiles Project**

KEE-b  
D1417

**MFN/1863**

His Majesty's Government of Nepal  
Ministry of Forests and Soil Conservation  
Department of National Parks and  
Wildlife Conservation

Government of the Netherlands  
Ministry of Foreign Affairs  
Directorate General International Cooperation

Technical Assistance to  
ESTABLISHMENT OF BIODIVERSITY PROFILES  
NEPAL

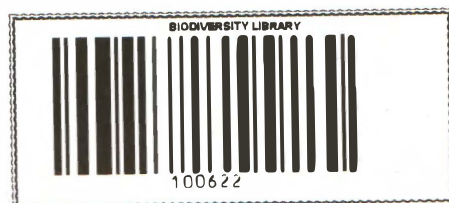
BIODIVERSITY PROFILE OF THE HIGH MOUNTAINS AND HIGH HIMAL  
PHYSIOGRAPHIC ZONES

Technical Publication No. 14

December, 1995  
417/4308.2

622  
KEE-b  
D 1417

Euroconsult  
Arnhem, The Netherlands





## COLOPHON

<b>Text by:</b>	S.J. Keeling, R.N. Suwal and W.J.M. Verheugt; with contributions from Hari Sharan Nepali "Kazi", C. Smith, B. Uprety, and Dr P.R. Shakya
<b>Edited by:</b>	S.J. Keeling and W.J.M. Verheugt
<b>Typing:</b>	S. Neupane and D. Limbu
<b>Processing of wildlife data:</b>	R.N. Suwal
<b>Drawings:</b>	P. Shakya (EastConsult)
<b>Cover photograph:</b>	W.J.M. Verheugt, Sagarmatha National Park
<b>Project Core Group:</b>	Dr B. Kattel (Deputy Director General, Department of National Parks and Wildlife Conservation) B. Upreti (Assistant Planning Officer, Ministry of Forests and Soil Conservation) W.J.M. Verheugt (Team Leader, Biodiversity Profiles Project/Senior Environmental Specialist, Euroconsult)
<b>Graphics, lay-out and printing:</b>	Comex Design, Kathmandu
<b>Mammal illustrations:</b>	Centre for Environment Education, Ahmedabad

This document has been prepared as part of the programme of technical and financial assistance of the Netherlands' Directorate General International Cooperation, by:

Biodiversity Profiles Project  
Department of National Parks and Wildlife Conservation  
Babar Mahal  
P.O. Box 860  
Kathmandu  
Nepal

This publication should be cited as follows:

Biodiversity Profiles Project. 1995. Biodiversity Profile of High Mountains and High Himal Physiographic zones. Biodiversity Profiles Project Publication No. 14. Department of National Parks and Wildlife Conservation, Ministry of Forests and Soil Conservation. His Majesty's Government of Nepal, Kathmandu.

ISBN No: 90-73287-15-4



His Majesty's Government  
**MINISTRY OF FORESTS AND SOIL CONSERVATION**

Phone 220067  
223862  
224891  
217115  
221936

**Post Box No. 3987**  
**Babar Mahal,**  
**Kathmandu, NEPAL**

**FOREWORD**

18 January 1996

It is widely acknowledged that Nepal has biodiversity values that are of global significance. Due to its diverse topography, numerous of ecosystems are found which host a large array of fauna and flora elements. Nepal has been involved in conservation efforts for over two decades. The country has 15 protected areas covering over 2 million ha, or 14 percent of the country's surface area. Very few countries in Asia have designated such a large percentage of their land as protected area.

The Biodiversity Profiles Project (BPP) has assessed the present state of biodiversity conservation in Nepal and identified whether gaps in the protected areas system exist. This project is one of the follow ups given by His Majesty's Government to the Forestry Sector Master Plan. A comprehensive review of the biodiversity contained in the High Himal and High Mountains physiographic zones has been compiled by BPP. This document describes the protected areas as well as other conservation areas found within this and the biodiversity and conservation values contained. The profile provides detailed recommendations to HMGN for the management of important flora and fauna species as well as for identifying areas meriting inclusion in the protected areas system. These outputs will lay the foundation for the HMGN/UNDP funded Biodiversity Action Plan, which hopefully ensures an immediate implementation of measures urgently required to safeguard Nepal's rich biodiversity.

The report represents the product of numerous consultants, scientists and research institutes; both Nepalese and foreign, who have generously contributed data or assistance to the compilation of this report.

It is hoped that the results of the project will act as a vanguard for future policies and directions for the concerned agencies for the management of the natural resources in pursuit of biodiversity conservation.

Mr Narayan Raj Tiwari  
Secretary  
Ministry of Forests and Soil Conservation



33403  
33402  
33401  
33400  
33399  
33398

His Majesty's Government  
MINISTRY OF FORESTS AND SOIL CONSERVATION



Post Box No. 3927  
Rabat, Morocco  
KABONAT AL-KHAYMA

FORESTWARD

28 January 1966

It is widely acknowledged that the problem of forest conservation is a complex one, involving not only the physical aspects of the forest but also the social and economic aspects. The Ministry of Forests and Soil Conservation is aware of this and is committed to a policy of integrated forest management, which takes account of all these factors. This policy is embodied in the Forestry Act of 1964, which provides a framework for the development of a comprehensive forest policy.

The Ministry of Forests and Soil Conservation is pleased to announce that it has received the report of the Forestry Commission, which has been set up to advise the Government on the state of the forests and to recommend measures for their conservation. The report is a valuable contribution to the knowledge of the forests and will be of great assistance to the Government in formulating its policy. The report is divided into two parts: the first part deals with the general state of the forests and the second part deals with specific measures for their conservation. The report is a comprehensive and detailed study of the forests and will be of great assistance to the Government in formulating its policy.

The report also contains a number of recommendations for the improvement of the forests and for the conservation of the soil. These recommendations are of great importance and will be taken into account by the Government in formulating its policy. The report is a valuable contribution to the knowledge of the forests and will be of great assistance to the Government in formulating its policy.

It is hoped that the report will be of great assistance to the Government in formulating its policy. The report is a valuable contribution to the knowledge of the forests and will be of great assistance to the Government in formulating its policy.

For the Secretary of State  
Ministry of Forests and Soil Conservation

## TABLE OF CONTENTS

Table of Contents	i
List of Tables	v
List of Figures	vii
List of Appendices	viii
Abbreviations	ix
Acknowledgement	xi
Glossary	xiii
Summary	xviii
<b>1. INTRODUCTION</b>	<b>1-1</b>
1.1 Objectives of BPP's biodiversity profile reports	1-2
1.2 Approach	1-2
1.2.1 Bio-geographical classification	1-3
1.2.2 Biodiversity studies in Nepal	1-6
1.2.3 Enumeration of flora and fauna	1-6
1.3 Scope and limitations of the profiles	1-9
1.4 Biodiversity database	1-9
1.5 Digitization of ecological maps	1-10
1.6 Lay-out of report	1-11
<b>2. GENERAL DESCRIPTION OF THE PHYSIOGRAPHIC UNIT</b>	<b>2-1</b>
2.1 Area description	2-1
2.2 Population	2-2
2.3 Land use pattern	2-3
2.4 Socio-economic conditions	2-6
<b>3. BIOGEOGRAPHICAL ASSESSMENT</b>	<b>3-1</b>
3.1 Zoogeographic classification	3-1
3.2 Phytogeographic classification	3-4
3.3 Ecological classification	3-7
3.4 Altitudinal classification	3-7
3.5 Biogeographical classification adopted by BPP	3-9



<b>4.</b>	<b>BIODIVERSITY</b>	<b>4-1</b>
4.1	Major ecosystems	4-1
4.2	Flora	4-2
4.2.1	Flowering plants	4-2
4.2.2	Gymnosperms	4-2
4.2.3	Pteridophytes	4-3
4.2.4	Bryophytes	4-3
4.2.5	Other flora elements	4-4
4.3	Fauna	4-5
4.3.1	Butterflies	4-5
4.3.1	Fish	4-6
4.3.2	Herpetofauna	4-8
4.3.3	Birds	4-8
4.3.4	Mammals	4-9
4.4	Distribution patterns in the High Mountains/High Himal	4-11
4.4.1	Flora	4-11
4.4.2	Fauna	4-14
4.5	Protected and threatened species	4-23
4.5.1	Protected species	4-23
4.5.2	Threatened species	4-25
4.5.3	Threatened and protected species confined to the Highlands	4-30
4.6	Extinction rates	4-34
4.6.1	Global extinction pattern	4-34
4.6.2	Extinction pattern in Nepal	4-35
4.7	Level of endemism	4-38
4.7.1	Endemic flora species	4-38
4.7.2	Endemic fauna species	4-40
4.8	Biodiversity significance	4-42
4.8.1	Flora	4-42
4.8.2	Fauna	4-42
<b>5.</b>	<b>PROTECTED AREAS AND FOREST AREAS</b>	<b>5-1</b>
5.1	Highlands protected areas	5-1
5.1.1	Rara National Park	5-3
5.1.2	Shey-Phoksundo National Park	5-4
5.1.3	Dhorpatan Hunting Reserve	5-6
5.1.4	Annapurna Conservation Area	5-8
5.1.5	Langtang National Park	5-11
5.1.6	Sagarmatha National Park	5-13
5.1.7	Makalu-Barun National Park and Conservation Area	5-15
5.2	Proposed protected areas	5-20
5.2.1	Kanchenjunga Conservation Area	5-20
5.2.2	Manaslu Conservation Area	5-22
5.3	Trans-boundary protected areas	5-22
5.4	National forests	5-26

5.4.1	Implementation of forest management legislation	5-26
5.4.2	Management of Highlands national forest areas	5-28
<b>6.</b>	<b>CONSERVATION ASSESSMENT</b>	<b>6-1</b>
6.1	Representation of species and ecosystems in Protected Area System	6-1
6.1.1	Occurrence of endangered species inside Protected Area System	6-2
6.1.2	Representation of ecosystems within Protected Area System	6-5
<b>7.</b>	<b>ECONOMIC IMPORTANCE</b>	<b>7-1</b>
7.1	Introduction	7-1
7.2	Environmental protection	7-1
7.3	Eco-tourism	7-2
7.4	Forest management for timber products	7-6
7.5	Non-Timber Forest Products trade	7-7
7.5.1	Highlands NFTP products	7-10
<b>8.</b>	<b>POLICIES, LEGISLATION AND PRACTICES</b>	<b>8-1</b>
8.1	Forest management	8-2
8.2	Protected areas and wildlife conservation	8-5
8.3	Resolution of park-peoples conflict	8-7
8.3.1	Buffer-zone management rules	8-8
8.4	Biodiversity conservation	8-9
<b>9.</b>	<b>INSTITUTIONAL RESPONSIBILITY FOR BIODIVERSITY CONSERVATION</b>	<b>9-1</b>
9.1	Ministry of Forests and Soil Conservation	9-1
9.2	Department of Forests	9-2
9.3	Department of Plant Resources	9-3
9.4	Department of National Parks and Wildlife Conservation	9-4
9.5	Department of Soil Conservation	9-6
9.6	Forest Research and Survey Centre	9-6
9.7	Central Zoo	9-7
9.8	Herbs Production and Processing Co. Ltd.	9-7
9.9	King Mahendra Trust for Nature Conservation	9-8
9.10	Ministry of Population and Environment	9-9
<b>10.</b>	<b>REVIEW OF ONGOING PROJECTS</b>	<b>10-1</b>
<b>11.</b>	<b>CONCLUSIONS</b>	<b>11-1</b>



<b>12.</b>	<b>RECOMMENDATIONS</b>	12-1
12.1	Nationwide recommendations	12-1
12.1.1	National co-ordination	12-1
12.1.2	Policy and legal instruments	12-2
12.1.3	Strengthening of DNPWC	12-3
12.1.4	Inventories	12-4
12.1.5	Information exchange	12-5
12.1.6	<i>In-situ</i> conservation	12-6
12.1.7	<i>Ex-situ</i> conservation	12-6
12.1.8	Promotion of NGOs	12-8
12.2	Highlands specific recommendations	12-9
12.2.1	Improved management of Highlands protected area system	12-9
12.2.2	Extending the current system of protected areas in Highlands	12-11
12.2.3	Buffers-zones	12-12
12.2.4	Trans-boundary protected areas	12-12
12.2.5	Economic benefits of biodiversity conservation	12-13
12.2.6	Forest management	12-14
<b>13.</b>	<b>REFERENCES</b>	13-1

## LIST OF TABLES

Table 1-1	Nepal's physiographic zones
Table 1-2	Overview of biodiversity studies in Nepal
Table 1-3	Species per faunal group for which Nepalese occurrence and distribution is known
Table 1-4	Ecological maps of Nepal prepared by CNRS
Table 2-1	Populations projection for the Highlands
Table 2-2	Land use pattern in Nepal's High Himal
Table 2-3	Land use pattern in Nepal's High Mountain
Table 2-4	Forest cover of Nepal by physiographic zone
Table 2-5	Nepal's livestock population (1991/92)
Table 2-6	Projected livestock population for Nepal's High Mountains
Table 3-1	Corresponding bioclimatic and physiographic zones
Table 3-2	Highlands sub-regions
Table 4-1	Distribution of flowering plants in different physiographic (with corresponding bioclimatic) zones
Table 4-2	Regional distribution of Bryophytes and Pteridophytes of Nepal
Table 4-3	Distribution of Bryophytes and Pteridophytes in different physiographic (with corresponding bioclimatic) zones
Table 4-4	Nepalese vertebrates in a global context
Table 4-5	Distribution of butterflies by physiographic zone
Table 4-6	Occurrence of fish species by physiographic zone
Table 4-7	Distribution of herpetofauna by physiographic zone
Table 4-8	Distribution of bird species by physiographic zone
Table 4-9	Distribution of Nepal's mammal species by physiographic zone
Table 4-10	Distribution of Nepal's vertebrates by physiographic zone
Table 4-11	Distribution of vertebrates in the Highlands
Table 4-12	Butterflies recorded in the Nepal Highlands
Table 4-13	Number of Highland butterflies per families
Table 4-14	Highlands confined butterfly species
Table 4-15	Physiographic zone confined bird species
Table 4-16	CITES listed plant species occurring in Nepal
Table 4-17	BPP's threat categories
Table 4-18	Threatened butterfly species by physiographic zone
Table 4-19	Threatened fish species by physiographic zone
Table 4-20	Threatened herpetofauna by physiographic zone
Table 4-21	Threatened bird species by physiographic zone
Table 4-22	Threatened and protected mammals by physiographic zone
Table 4-23	Protected and endangered bird species found in the Highlands
Table 4-24	Protected and threatened mammals of the Highlands
Table 4-25	Physiographic zone confined fish species
Table 4-26	Physiographic zone confined, threatened herpetofauna
Table 4-27	Physiographic zone confined, threatened bird species
Table 4-28	Threatened (Susceptible) and confined bird species (Vagrants and Under-recorded) restricted to the Highlands
Table 4-29	Distribution of threatened mammal species confined to one physiographic zone



Table 4-30	Endangered and Critically Endangered mammal species of the Highlands
Table 4-31	Number of species extinct and threatened with extinction since 1600's in the world
Table 4-32	Extinct plant species of Nepal
Table 4-33	Extinct bird species of Nepal
Table 4-34	Extinct mammal species of Nepal
Table 4-35	Mammals likely to go extinct in the Highlands of Nepal
Table 4-36	Altitudinal and regional distribution of endemic plant species in Nepal
Table 4-37	Endemic fishes of Nepal
Table 4-38	Endemic species of herpetofauna of Nepal
Table 4-39	Endemic bird and mammal species of Nepal
Table 4-40	Occurrence of vertebrates and number of threatened species by physiographic zone
Table 5-1	Percentage of physiographic zone within PAS
Table 5-2	Area of Nepal's Highlands lying within protected areas
Table 5-3	Key features of Rara National Park
Table 5-4	Key features of Shey-Phoksundo National Park
Table 5-5	Key features of Dhorpatan Hunting Reserve
Table 5-6	Key features of Annapurna Conservation Area
Table 5-7	Key features of Langtang National Park
Table 5-8	Key features of Sagarmatha National Park
Table 5-9	Key features of Makalu Barun National Park and Conservation Area
Table 5-10	Data on community forestry for three Highlands districts
Table 6-1	Expected number of flowering plants and endemic species in the protected area system of the Highlands
Table 6-2	Distribution of gymnosperms within in the protected area system of the Highlands
Table 6-3	Occurrence of endangered wildlife species in the protected area system of the Highlands and their estimated population
Table 6-4	Total number of wildlife species found in the protected area system of the Highlands and the number of threatened species
Table 6-5	CNRS's Highlands ecosystems (as defined by BPP)
Table 6-6	CNRS's ecosystems by physiographic zone
Table 6-7	Area of CNRS's ecosystems by protected area
Table 6-8	Representation of Highlands ecosystems within the protected area system
Table 6-9	Extent of the three predominant CNRS's ecosystems for each of the Midhills and Highlands protected areas
Table 6-10	Highlands ecosystems not covered in Highlands protected areas
Table 7-1	Main tourist attractions
Table 7-2	Tree growing stock by physiographic zone
Table 7-3	The NFTP product trade through Hile and Basantapur in 1991/92 by air dry weight and value
Table 8-1	Forest types under the 1993 Forest Act
Table 9-1	Botanical conservatories
Table 9-2	Staffing of DNPWC for 1990 and 1994
Table 12-1	Proposed staff levels at DNPWC HQ and at field level

## LIST OF FIGURES

- Figure 1-1 Nepal's physiographic zones  
Figure 2-1 Altitudinal profile of Nepal from north to south  
Figure 2-2 Forest and scrub cover by altitude for Nepal's Central Development Region  
Figure 3-1 Indian and Indo-chinese sub-regions in the Indo-Malayan Realm showing overlap in eastern Nepal  
Figure 3-2 Sub-divisions of Indo-Malayan Realm  
Figure 3-3 Chorological divisions of the world  
Figure 3-4 Phytogeographic divisions of southern Asia  
Figure 3-5 Climatic and vegetational divisions of Nepal  
Figure 4-1 Occurrence of fish species by bioclimatic zone  
Figure 4-2 Distribution of major forest ecosystems by altitude and by horizontal orientation  
Figure 4-3 Distribution of major forest ecosystems in Eastern Nepal  
Figure 4-4 Horizontal distribution of *Aconitum* species (Dobremez and Shrestha, 1980)  
Figure 4-5 Number of breeding birds in Nepal's climatic zones (Inskipp 1989)  
Figure 4-6 Percentage of breeding birds in Nepal's climatic zones which may have internationally significant populations in the country (Inskipp 1989)  
Figure 4-7 Number of breeding birds in Nepal's climatic zones (Inskipp 1989)  
Figure 4-8 Number of breeding birds at risk in Nepal's climatic zones (Inskipp, 1989)  
Figure 4-9 Distribution of endemic plant species by climatic zone and subregion  
Figure 4-10 Localities of endemic plants in Nepal (Shrestha and Joshi, 1992)  
Figure 5-1 Initial zoning of Annapurna Conservation Area  
Figure 5-2 Management zones for Makalu-Barun National Park  
Figure 5-3 Map of proposed Kanchenjunga Conservation Area  
Figure 5-4 Map of proposed Manuslu Conservation Area  
Figure 5-5 Adjoining protected areas in Nepal and China  
Figure 6-1 Expected number of flowering plants and endemics in the protected area system of the Highlands  
Figure 6-2 Endemic number of endemic plant species in protected area system of Nepal  
Figure 6-3 Total number of mammal, bird, herpetofauna and fish species found in the seven protected areas of the Highlands and the number of threatened species  
Figure 7-1 Tourist arrivals in Nepal  
Figure 7-2 Visitors to Nepal's Highland protected areas FY 1994/95  
Figure 7-3 Growth in number of trekkers (1980-1994) in Highlands protected areas  
Figure 7-4 Trends in HMGN royalties generated from the harvesting of NTFP FY 1989/90 - 1993/94  
Figure 9-1 Organisational structure of the Department of National Parks and Wildlife Conservation

## LIST OF APPENDICES

- Appendix 4-1 Ecosystems found in Nepal by physiographic zone
- Appendix 4-2 Vascular plants recorded in the Highlands
- Appendix 4-3 Gymnosperms recorded in the PAS of the Highlands
- Appendix 4-4 Pteridophytes recorded in the Highlands
- Appendix 4-5 Bryophytes recorded in the Highlands
- Appendix 4-6 Status and distribution of butterflies found in the Highlands
- Appendix 4-7 Status and distribution of fish species found in the Highlands
- Appendix 4-8 Status and distribution of herpetofauna found in the Highlands
- Appendix 4-9 Status and distribution of bird species found in the Highlands
- Appendix 4-10 Status and distribution of mammal species found in the Highlands
- Appendix 4-11 List of threatened plants showing regional and altitudinal distribution in Nepal
- Appendix 4-12 List of non-endemic threatened plants occurring in the Highlands
- Appendix 4-13 Protected fauna under the 1973 NPWC Act
- Appendix 5-1 Occurrence and status of vertebrates in the protected area system of the Highlands
- Appendix 5-2 Data sheets on protected areas along the Nepalese border with China and India
- Appendix 7-1 Distribution of medicinal plants in Nepal by altitudinal zone and sub-region
- Appendix 7-2 Common NFTP in trade
- Appendix 7-3 Main royalty paid for NFTP collected FY 1993/94 by weight (kg)
- Appendix 7-4 Main royalty paid for NFTP collected in the Highlands and amount of royalty paid to HMGN
- Appendix 7-5 Revenues generated for HMGN from royalty payments on NTFPs collection by physiographic zone and development region
- Appendix 8-1 Main policy and programme highlights of HMGN Development Plans
- Appendix 8-2 Chronology of biodiversity conservation and related legislation
- Appendix 8-3 Protected areas of Nepal
- Appendix 8-4 Bio-conservation related treaties and conventions ratified by Nepal
- Appendix 8-5 Chronology of major events related to biodiversity conservation
- Appendix 9-1 Biodiversity conservation related responsibility of HMGN agencies and other agencies
- Appendix 10-1 Overview of ongoing biodiversity projects in the Highlands



## LIST OF ABBREVIATIONS

ACA	Annapurna Conservation Area
ADB	Asian Development Bank
BDP	Biodiversity Database Project
BDS	Biodiversity Database System
BPP	Biodiversity Profiles Project
c.	circa
C	Critically endangered
CBS	Central Bureau of Statistics
CNRS	Centre Nationale de la Recherche Scientifique
DDC	District Development Committee
DFO	District Forest Office
DHR	Dhorpatan Hunting reserve
DNPWC	Department of National Parks and Wildlife Conservation
DoF	Department of Forests
DWR	Department of Water Resources
E	Endangered
EXN	Extinct
FINNIDA	Finnish International Development Agency
FRISP	Forest Resource Information System Project
FUG	Community Forest User Group
F.Y.	Financial year
GoN	Government of The Netherlands
HLFDP	Hills Leasehold and Forage Development Project
HMGN	His Majesty's Government of Nepal
INGO	International Non-Governmental Organization
IUCN	International Union for Conservation of Nature and Natural Resources
KCA	Kanchenjunga Conservation Area
KNP	Khaptad National Park
KTWR	Kosi Tappu Wildlife Reserve
LNP	Langtang National Park
LRMP	Land Resources Mapping Project
MBCA	Makalu-Barun Conservation Area and National Park
MBNP	Makalu-Barun National Park
MENRIS	Mountain Environment and Natural Resources Information Systems
MFSC	Ministry of Forests and Soil Conservation
MPFS	Master Plan for the Forestry Sector
NACFP	Nepal-Australia Community Forestry Project
NBCIC	National Biodiversity Coordination and Information Centre
NCS	National Conservation Strategy
NEPAP	Nepal Environmental Policy and Action Plan
NPWC	National Parks and Wildlife Conservation Act
NR	Nepali rupees
NRDB	National Red Data Book
NUKCFP	Nepal-UK Community Forest Project
PAS	Protected Areas System

RNP	Rara National Park
S	Susceptible
SIWDP	Shivapuri Integrated Watershed Development Project
SNP	Sagarmatha National Park
SPCP	Sagarmatha Pollution Control Project
SWWR	Shivapuri Watershed and Wildlife Reserve
UNCED	UN Conference on Environment and Development
V	Vulnerable
VDC	Village Development Committee

## ACKNOWLEDGEMENTS

The Biodiversity Profiles Project would like to thank the many individuals and organisations who have contributed to the production of this report and without whose co-operation and contributions this Biodiversity Profile could not have been produced.

In particular BPP is indebted to the Core Group and Review Team. We thank the Core Group members, Dr B. Kattel (Department of National Parks and Wildlife Conservation-DNPWC) and Mr B.K. Upreti (Assistant Planning Officer, Environmental Section, Ministry of Forests and Soil Conservation-MoFSC) for their co-operation and efforts in smoothing the path of the project. The Review Group of Dr T.M. Maskey, Dr B. Kattel, Dr U.R. Sharma (Executive Director, Central Zoo), and Mr D.P. Parajuli (Chief Monitoring and Evaluation Division, MoFSC) made many valuable suggestions for improving the content of this report.

To enable the assessment of the representation of species and ecosystems within the Protected Areas System of the Highlands, the project used the ecological maps of Nepal, prepared by Prof Dobremez and associates over the period 1970 - 1985. These maps were digitized through the assistance of ICIMOD, Resources Nepal and the Makalu Barun National Park and Conservation Area Project (MBNPCA). We acknowledge the painstaking work of Mr P. Yonzon (Resources Nepal); Messrs P.S.S. Pradhan, H. Trapp (ICIMOD); R. Shrestha (MBNPCA) and Mrs J. Shrestha of the Forest Research and Survey Centre for checking the ecosystem labels and producing the GIS maps of the ecosystems within each of Nepal's protected areas. Printing of the ecosystem maps would not have been possible without the generous co-operation of Mr E. Harkonen - Remote Sensing Advisor for the Forest Information Systems Project (FRISP). The MBNPCA Project willingly co-operated with BPP on work on the Biodiversity Database. We like to thank Dr P.R. Shakya and R. Joshi.

A number of national and international conservation specialists provided valuable information. All of the information on butterflies in BPP's reports comes directly from the contributions of Mr C. Smith. We thank him for his prompt and thorough replies to our requests and recognise his dedication to nature conservation in Nepal. Dr T.B. Shrestha lent a number of documents to the project and gave valuable advice on questions relating to Nepal's vegetation, so did Dr K.R. Rajbhandari, whilst Mr A.V. Upadhyay, former Deputy Director General, Royal Botanical Garden, provided valuable comments regarding the role of the Herbarium and Plant Laboratory. Mrs C. and Mr T. Inskipp, Mr H.S. Nepali, Mr H. S. Baral, Mrs K. and Mr D. White, Mr M. Crosby (ornithologists); Prof J. Shrestha (ichthyologist); Dr L.R. Sharma (lichenologist); Dr S. Baral (algae taxonomist); Mr K. Shah Dr B. Groombridge and Dr H.H. Schleich (herpetologists), Prof J. Martens, Prof T.C. Majupuria, Dr P. Yonzon, Dr K. Basnet and Dr M.J.B. Green (mammalogists); and Mr B. Jackson (forestry expert, Team Leader, Nepal-Australia Community Forestry Project) provided valuable information in their specialised fields. We are grateful to Dr C.P. Gurung (Team Leader, Quality Tourism Project UNDP), Mrs J. Kloosterman (Buffer Zone Specialist, SIWD), Mr B.K. Shrestha (Team Leader, GDP/GTZ) for providing valuable suggestions and various documents.

We also benefitted from the contributions and comments of many biodiversity specialists visiting the office, DNPWC and who joined the BPP team for a discussion on the approach and methodology for the report. In particular we would like to single out the role of E. Dinerstein, PhD, Director, Conservation Science Program, World Wildlife Fund-US, J. Bauer, PhD., Charles Sturt University, and J.T. Heinen, PhD., Florida International University.

We thank the various government agencies, projects and organisations who provided information on their activities and copies of their reports: Mr I.S. Karki (Director General) Department of Forests; Mr K.M. Sthapit (former Director General) Department of Soil Conservation; Mrs T.K. Rajbhandari (former Director General) Department of Plant Resources; Mr G. Jha (former Officiating Director) Forest Research and Survey Centre; Mr R.B. Rawal (General Manager) Herbs Production and Processing Co. Ltd; Mr M.N. Sherpa (Country Representative) and the staff of WWF Nepal Program; Dr M. Odell (Team Leader) and staff of MBNPCCA Project; Dr J. McEachern (Senior Advisor) and the staff of The International Union for the Conservation of Nature - Nepal Office; Mr R. Laamanen (Team Leader-Forest Information Advisor) FRIS; Mr P.S. McCarter (Team Leader) Nepal-UK Forestry Research Project; Messrs O. Rautiainen (CTA) and A. Wikberg (Forestry Training and Extension Expert), Forest Management and Utilization Development Project; Mr A. Sterk (CTA) Hills Leasehold Forestry and Forage Development Project; Messrs A. Rajauria (Project Director), S. Thakali (Senior Programme Officer) and Mrs M. Joshi (Programme Officer) of the King Mahendra Trust for Nature Conservation. The World Conservation Monitoring Centre (Dr M.J.B. Green, Dr B. Groombridge and Mr J. Paine), Birdlife International (Mr M. Crosby) and The CITES Convention Secretariat (Dr J. Berney, Deputy Secretary General) provided various unpublished documents. We hope that reciprocal copies of our reports will repay the debt we owe.

We are indebted to the foresightedness of Ir. E. Pelinck, Director General, ICIMOD, who was the initial supporter of this project during the formulation stage in the late eighties, during which time he was with the Netherlands' Ministry of Foreign Affairs (DGIS). We further wish to express our sincere gratitude to the responsible officers at DGIS: Dr T. van der Zon and Mrs G. Willems. SNV provided valuable logistical support on many occasions. We would like to mention Messrs H.E.B. Kamphuis (former SNV Field Director - Nepal and former Honorary Consul), T.P.A. Derksen (SNV Field Director) and F. Prins (Deputy Field Director). Ms S. Neupane and Ms D. Limbu of the BPP office did the typing and preparation of many of the figures in this report. They are thanked for their hard work and for putting up with the often unreasonable deadlines forced on them by the editors. Mr P. Shakya of Eastconsult did a very good job of preparing the figures within often very limited periods of time.

The authors are grateful for the assistance provided by the librarian of the Natural History Museum (London) for providing numerous copies of articles. Euroconsult's librarian Ms M van der Ven located many publications through on-line connection with Netherlands based University libraries.

We are grateful to DNPWC for providing us office space and we like to express a final word of thanks to Messrs L. Manandhar (Planning Officer), S. Bajimaya (Manager, MBNPC), M. Shrestha (Conservation Officer), P. Shrestha (Planning Officer), N.M.B. Pradhan (Assistant Ecologist), L.B. Yadav (Assistant Conservation Education Officer), I. Bhusal (Librarian), P. Shrestha (PA to the Director General) and other staff of DNPWC for their valuable guidance and assistance. We are grateful to all the Chief Wardens, Wardens and Assistant Wardens for their generous replies to our queries.

Last but not least we like to express our grateful thanks to the Chairman, Steering Committee (BPP), Dr T.M. Maskey, Director General, DNPWC and Mr A.L. Joshi, Chief Planning Officer, MoFSC for their constant support, true and sincere cooperation and valuable guidance to make this project a success.



**Extinct (EXN).** A taxon is Extinct when there is no reasonable doubt that its last individual has died in the country.

**Extinction.** Process by which an individual, species or population disappears from a given habitat or biota.

**Extinction rate.** Number of species in a given habitat or region that become extinct per given unit of time.

**Extirpation.** Process by which an individual, population or species is totally destroyed.

**Faunal collapse.** Rapid or dramatic losses of species in fauna due to increased insularity (e.g., due to the disappearance of a corridor or bridge).

**Fragmentation.** Process by which habitats are increasingly subdivided into smaller units, resulting in their increased insularity as well as losses of total habitat area.

**Gap phase species.** Taxa adapted to vegetation gaps created by small-scale disturbances, such as tree falls, particularly in tropical moist forests.

**Gene pool.** Total genetic material of a freely inter-breeding population.

**Generalist.** Species that has a broad habitat range of food preference (also called habitat generalist).

**Genetic conservation.** Conservation measures emphasizing the maintenance of genetic systems and levels of genetic variation to provide for continued persistence and evolution; also considered generally under the broader term of biological conservation.

**Genetic diversity.** (also referred to as Genic diversity or Total genetic diversity [ $T$ ]). Measures of genetic variation calculated from allelic frequencies and their combinations. Various comparisons among species allow their genetic diversity to be interpreted in terms of certain ecological and evolutionary features (e.g., gene flow among populations, rarity versus commonness over time). Total genic diversity can be partitioned into within-population diversity and between-population diversity.

**Habitat degradation.** Decline in habitat quality that accompanies non-natural forms of disturbance.

**Habitat patchiness.** Quality of many communities that exist in discrete units separated by other kinds of habitats.

**Hot spots.** Areas which have an internationally important assemblage of flora and fauna elements.

**In-breeding.** The mating of close relatives, that is, the mating of individuals likely to share some of their genes due to common ancestry; any mating between individuals more related than expected with the assumption of random mating.

**In-situ conservation.** Conservation of individuals, species, or habitats in their places of origin and natural occurrences.

**Keystone resources.** Resources, such as lipid-rich seeds, on which a large number of species within a given community depend for survival.

**Keystone species.** Species that serve as keystone resources. Their removal from an ecosystem leads to serious disfunctioning or even collapse of an ecosystem's balance

**Landrace.** Ecological mosaic of specific ecosystems; "a kilometer-wide area where a cluster of interacting stands or ecosystems is repeated in similar form"

**Minimum viable population (MVP).** As defined by Shaffer (1981), the smallest isolated population having a 99 percent chance of remaining extant for 1,000 years despite foreseeable effects of demographic, environmental, and genetic stochasticity as well as natural catastrophes; others subsequently have altered the time scale and survival probability.

**Niche.** Ecological role of a species in a community.

**Parapatric.** Referring to populations with contiguous but not overlapping geographic ranges.

**Population structure.** Distributions of individuals, potential mates, genotypes, or genes in space and time; furthermore, age-specific birth-and-death-rate processes that determine the life history and reproductive strategy of a population or a series of populations in a species.

**Preservation.** Form of passive management that does not advocate any form of intervention or habitat manipulation by humans for a specific purpose.

**Protected area system.** All areas officially designated with the protection of biodiversity as the main objective.

**Pruning.** A forest management practise removing lower branches of trees.

**Refuge.** Area in which a prey individual or species may escape from or avoid a predator.

**Resilience (of an ecosystem).** Degree to which an ecosystem's structure and long-standing composition can be disturbed and yet retain or return to its original features.

**Silviculture.** Forest management.

**Singling.** A forest management practise, removing one trunk of trees with multiple trunks.

**Standing timber volume.** In a forest the trunks and branches of trees of sufficient diameter and form for conversion into sawn timber

**Susceptible (S).** A taxon is Susceptible when it does not qualify for any of the categories above, but is of concern because its range areas is restricted (typically less than 100 sq km) and/or it is found at only a few locations, which render it prone to the effects of human activities.

**Sympatric.** Referring to populations, species, to other taxa that occur exchange and competition.

**Threatened.** Any taxa that are either Critically Endangered, Endangered, Vulnerable or Susceptible.

**Vagrant.** Species which occur outside of their normal range.

**Thinning.** A forest management practise systematically removing a percentage of trees from the forest.

**Vulnerable (V).** A taxon is Vulnerable when it is not Critical or Endangered but is facing a high risk of extinction in the wild in the medium-term, or if the animal is rare.

## SUMMARY

The report notes that the biodiversity contained in the Highlands ecosystems is of international importance both in view of the number of globally threatened wildlife and flora elements as well as the diversity of ecosystems contained within the area. Species diversity is high. The Highlands are the meeting place of two major zoogeographical regions of the world the Palaearctic region to the north and the Indo-Malayan region to the south. The upper altitudinal range of the two important Endemic Bird Areas (EBA) as identified by Birdlife International fall within the Himalayan range of Nepal; the endemic species rich Eastern Himalaya (between 900 - 4000 meters) and the Western Himalaya (between 1600 - 3600m). The political border of Nepal touches the Eastern Himalaya EBA and most of the Nepal Himalaya falls within the Western Himalaya EBA.

The Highlands supports 39 % of the vertebrates (521 species) found in Nepal. Over 25% of the threatened vertebrates of Nepal are found in the Highlands. Ten threatened mammal species are confined to the Highlands, of those six species are legally protected. Thirteen percent of the Nepal's butterfly species (82 species) have been recorded from the Highlands of Nepal. The distribution of twenty eight butterfly species are confined to the Highlands physiographic zones. One hundred and fifty nine butterfly species are considered as threatened for their survival.

Of the 38 major ecosystems found within the Highlands, 30 of these are represented within the PAS. Of these three have areas of less than 1000 ha (10 km<sup>2</sup>). According to this study only eight ecosystems are not covered within the PAS, whilst three have only a small presence. Coverage of the Highlands ecosystems within the PAS is good. Some of the areas not included in the PAS have only a limited occurrence but no matter how small an area covered by any ecosystem each one provides a unique set of habitat conditions for fauna and flora. Studies using the latest techniques of satellite imagery and GIS systems await for a comprehensive mapping of Nepal's ecosystems.

Nine of Nepal's protected areas under the jurisdiction of DNPWC lie partly within the Highlands and partly in the Midhills physiographic zones. Most of the Highland's natural and semi-natural habitats are however national forests lying under the jurisdiction of the Department of Forests. Five of the national parks and the one hunting reserve lie predominantly above 3000 m. Only the southern fringes and river valleys of these areas lie below this level. Twenty per cent of the Midhills KNP lies above 3000 m. Of the two conservation areas over half of Annapurna Conservation Area (ACA) and 70% of Makalu Barun National Park and Conservation Area (MBCA) lie below 3000 m. The total area of the Highlands is 63 090 km<sup>2</sup> of which 12 405 km<sup>2</sup> falls above 3000 m within nine of HMGN's protected areas. Nepal's Highlands are well represented in the PAS with 19.6% of their area covered.

National forests are those areas under the authority of the DoF and include grassland as well as forested areas. Although under the DoF's authority, hardly any of the extensive areas of national forest's grassland and forest in Nepal's Highlands are under active management by HMGN.

Two areas are under consideration for designation as Conservation Area. Work is well advanced for the creation of a new protected area - Kanchenjunga Conservation Area (KCA) - including Kanchenjunga Himal and its surrounding areas in the northern parts of Taplejung district. The new protected area will cover an area of over 2000 km<sup>2</sup>. It will adjoin the 850 km<sup>2</sup> Kanchenjunga National Park in Sikkim, India. The establishment of KCA would create nearly 3000 km<sup>2</sup> of trans-boundary protected area. The other area under consideration is Manaslu. We have recommended that the Manaslu Region also be designated as Conservation Area.



## 1. INTRODUCTION

Biological diversity encompasses the variety and abundance of plants, animals and micro-organisms and the ecosystems and ecological processes to which they belong. Nepal is characterised by great geographic and biological diversity including the world's highest mountain system, large areas of low-lying tropical forest and parts of two of the world's eight biogeographical realms. These characteristics account for the high level of species diversity in such a relatively small area.

Efforts to protect Nepal's biodiversity have taken place against the background of a number of policy directives and initiatives. The main initiative to date for protecting Nepal's biological diversity is the 1973, National Parks and Wildlife Conservation (NPWC) Act. Under this Act a number of key areas for wildlife and threatened species were given legal protection. Important areas for wildlife conservation were designated as protected areas within the protected area system (PAS) to date including eight national parks, four wildlife reserves, one hunting reserve and two conservation areas.

As part of the Master Plan for the Forestry Sector Project (HMGN/ADB/FINNIDA, 1988a), a sub-sector plan was published for the conservation of ecosystems and genetic resources (HMGN/ADB/FINNIDA, 1988b). The objectives of this plan were to review and assess past development efforts for the conservation of ecosystems and genetic resources. The plan recommended that a study be carried out to identify ecosystems and habitats not represented in the PAS - to achieve overall representation of threatened species and habitats.

His Majesty's Government Nepal (HMGN) is a signatory of the Global Convention on Biological Diversity. As part of the UN Conference on Environment and Development (UNCED) held in 1992 at Rio de Janeiro the Convention concluded that urgent action is necessary to slow the loss of global biodiversity. Nepal is heavily dependent on its natural resources to maintain its largely subsistence rural economy. Nepal's economy is therefore heavily dependent on the variety and variability of species and ecosystems genetic resources to maintain healthy ecological functioning. By signing the Biodiversity Convention, Nepal expressed its commitment - stated in Article 6 - to develop a national strategy for the conservation of biological diversity and the sustainable use of biological resources.

In 1993 HMGN produced the Nepal Environmental Policy and Action Plan (NEPAP) as part of the country's efforts to incorporate environmental concerns into the country's development process (HMGN, 1993a). The report along with a host of other recommendations identified the immediate need to review the representativeness of the PAS to preserve all endemic and endangered species and their habitats.

Against this policy background an agreement was signed in July 1994, between HMGN and the Government of The Netherlands (GoN) for the joint execution of the Establishment of Biodiversity Profiles (BPP) in Nepal. The project is based at the Department of National Parks and Wildlife Conservation (DNPWC), within the Ministry of Forests and Soil Conservation (MFSC).

The objectives of BPP are:

- to assess the present state of biodiversity conservation in Nepal
- to identify gaps in the protected area system in each of the ecological zones
- to prepare short profiles on biodiversity conservation in these zones
- to identify and formulate investment needs in short and long-term biodiversity

- management projects
- to quantify, where possible, the benefits of biodiversity conservation as a basis for economic development
- to develop, in close cooperation with the responsible authorities, policies for the conservation and management of biodiversity and for the sustainable management of natural resources
- to identify areas of co-operation with on-going and planned activities in this field.

The BPP is the first step in a systematic approach, with the ultimate aim of ensuring that Nepal's rich biodiversity is adequately and appropriately protected both within and outside of the PAS. To underpin policy development to this effect the project carried out a review of Nepal's biological diversity.

### **1.1 Objectives of BPP's Biodiversity Profile Reports**

This biodiversity profile is one of three compiled for each of Nepal's main physiographic zones. This report presents the findings of a biodiversity review of the Highland's physiographic zones representing the areas above 3000 m. To save on endless repetition the High Mountains and High Himal when being referred to jointly are termed "the Highlands". The other two cover the Terai and Siwaliks (BPP, 1995a) and the Midhills (BPP, 1995b). The review process was carried out between October and November 1995 by the BPP team with the support of a number of outside experts.

The main objectives of the Profiles series are:

- to determine if there are elements of biodiversity - both at the species and ecosystem levels - that are either not or are inadequately protected within the PAS
- to identify areas of high biodiversity value not included in the PAS that merit inclusion
- to identify proposals for the sustainable management of biodiversity values
- to communicate the findings of the BPP by publishing the results in a clear format with many illustrative figures and tables included.

### **1.2 Approach**

The major objective of Nepal's PAS is to maintain the diversity of plant and animal populations together with their ecosystems. To enable an objective review of the current representativeness of the network of protected areas, the nationwide distribution of species and ecosystems is detailed by physiographic zone. In Chapter 3 a rational conceptual basis for the review of the PAS using the concept of biogeography is given. Furthermore, for each zone the current extent of protected areas, and the overall conservation values contained in each zone emphasising the economically valuable species is analyzed. Proposals are detailed for the inclusion of additional areas both as protected areas under the DNPWC and as protected or community forests under the Department of Forests.

The Biodiversity Profiles were compiled step-wise by:

- (i) defining Nepal's biogeographic and ecological zones
- (ii) describing for each zone its biodiversity values
- (iii) describing for each zone other conservation values and their economic importance
- (iv) assessing the representativeness of protected areas: are important species and habitats included?
- (v) recommending proposals for the sustainable management of Nepal's biological diversity.

This work attempts to quantify, where possible, the economic and financial benefits of conserving biological resources as an integral and necessary component of Nepal's economic development.

The three levels at which biodiversity can be analyzed are at the ecosystem, the species and the within species levels. There are also "non-scientific" indigenous classification systems that reflect the way that local people classify their world in terms of their local experience and what is important to them. Indigenous systems have not been investigated here. This work has taken the approach of largely using the species level diversity as comprehensive information was not available across the various ecosystems. The species level was selected as having the most reliable and available information and as the level at which Nepal's biodiversity could best be represented.

The three physiographic zone biodiversity profiles have a common layout with the general text largely common. Chapters 2 - describing the physiographic unit; 4 - describing the biodiversity; 5 - detailing the protected areas; 6 - the conservation assessment; and the conclusions (Chapter 11) and recommendations (Chapter 12) have been tailor-made for each profile.

### **1.2.1 Biogeographical classification**

For the production of the biodiversity profile reports a biogeographical classification was necessary to provide the framework for understanding and cataloguing species biodiversity. The most used classification of Nepal's physiographic zones is that of the Land Resources Mapping Project - LRMP (Kenting, 1986; IUCN, 1994). The LRMP study divided Nepal into five physical zones, horizontal bands stretching west to east across Nepal's 800 km length (Figure 1-1). Table 1-1 describes the approximate altitudinal range of each of these five zones ranging from the Terai below 500 m to the High Himal above 5000m. The two physiographic zones covered by this profile are the High Mountains which lie to the north of the Midhills above 3000 m up to the 5000 m level. Above 5000 m is the High Himal. The five physiographic zones are the most meaningful for planning purposes and hence for the three profiles reports were taken as the defining units for describing Nepal's biodiversity.

**Table 1-1 Nepal's physiographic zones**

Physiographic zone	Altitude
Terai	< 500 m
Siwaliks	500 - 1000 m*
Midhills	1000 - 3000 m*
High Mountains	3000 - 5000 m
High Himalaya	> 5000 m

Source: LRMP, 1983; IUCN, 1994

Legend: \* denotes approx. altitudinal range; higher altitudes occur.

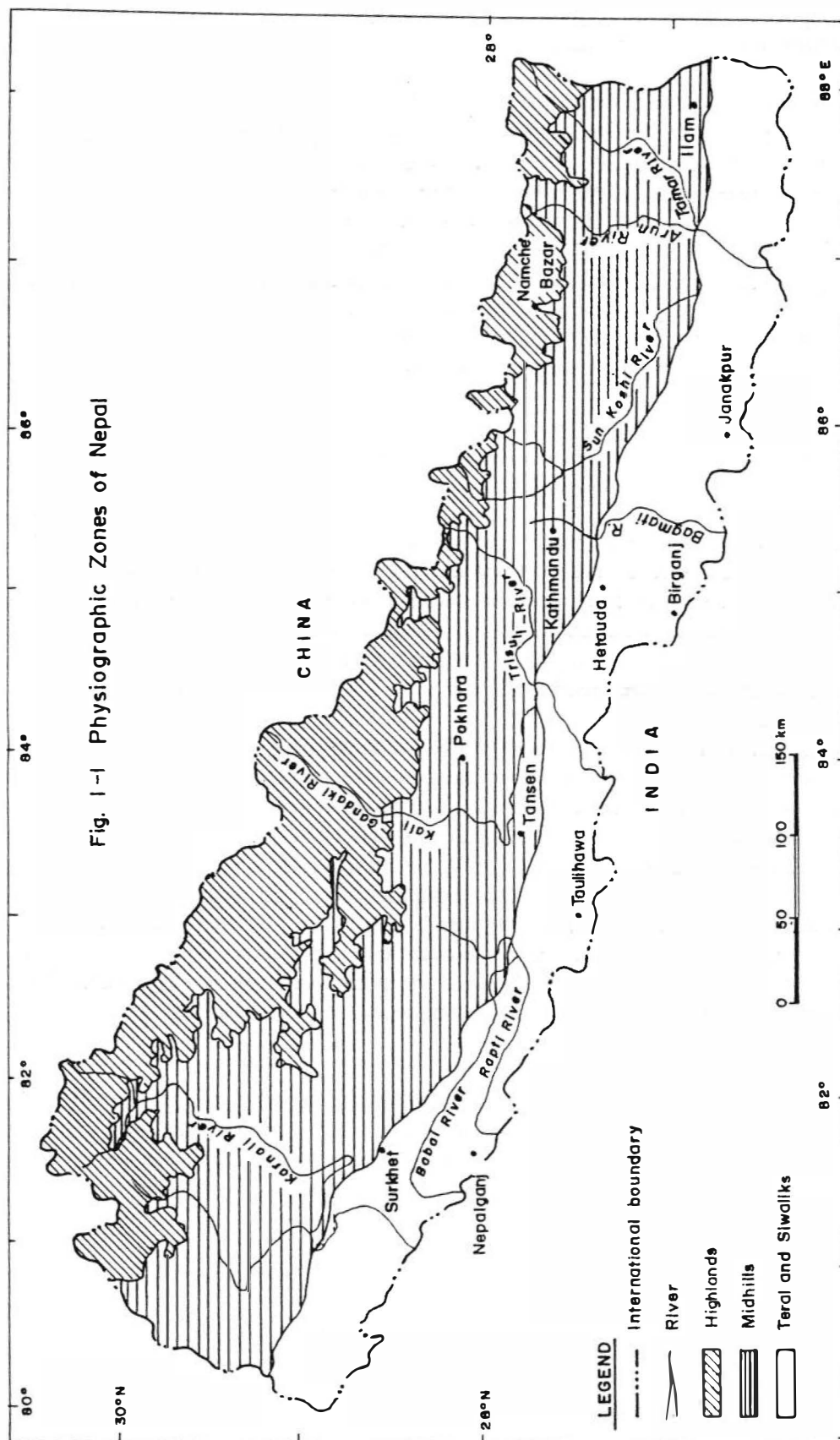
Nepal is covered by two biogeographical realms - the Indo-Malayan and the Palaearctic. This overall classification of faunal and floral distribution is central in understanding the distribution of Nepal's fauna and flora. The mammals for example are clearly divided between the Palaearctic (Corbet, 1978) and the Indo-Malayan species (Corbet and Hill, 1992) with only a few transitional species. In-depth discussion of the biogeographical classification is given in section 3.2.

Nepal's vegetation has been categorised by phytogeographical zones that describe the distribution of plants. Stainton (1972), Dobremez (1975) and Hara *et al.* (1978, 1979 and 1982), identified three floristic zones in their enumerations of Nepal's flowering plants:

- western Nepal (up to 83° E)
- central Nepal
- eastern Nepal (east of 86° 30' E).

These categories were adopted with one minor difference by BPP to describe not only the flora but also the faunal distribution. They largely correspond with Nepal's three main river systems which have a strong influence on the distribution of Nepal's fauna. The phyto- and zoogeographic classification is covered in section 3.2.





### **1.2.2 Biodiversity studies in Nepal**

The status of knowledge of Nepal's biodiversity was reviewed at the initial stage to assess the coverage to date and to identify the Nepali and international biodiversity specialists. Table 1-2 presents the state of the knowledge by phyla and sub-phyla at species level as it stood towards the end of 1994; and after the completion of a year's work by BPP. This review, when carried out in 1994, showed a patchy level of understanding. No information was available for one kingdom - the algae (since collated by BPP) and many other phyla were under-recorded, including supposedly well known sub-phyla like mammals, amphibians and reptiles. The work of the BPP has seen a considerable improvement in the overall picture of the distribution and status of Nepal's fauna and flora (section 1.2.3). This is clear from comparing the columns in Table 1-2 showing the number of species described from Nepal up to 1994 and the number described after the completion of BPP's enumeration work.

### **1.2.3 Enumeration of flora and fauna**

These profiles have been compiled with the contributions of many Nepali biologists and natural resource specialists who are named on the colophon and acknowledgement pages. The foundation needed to produce the biodiversity profiles was records of the occurrence, distribution and status of Nepal's myriad species of fauna and flora. A review was therefore undertaken of the state and accessibility of the knowledge on the various faunal and floral groups (Table 1-2). The Nepalese and foreign authorities on each group were identified.

Nepal's biodiversity has not been comprehensively studied in terms of areal coverage across Nepal and taxonomic investigation within taxa. Detailed investigations remain to be carried out for most of the lower plants and animals; and across many groups for the western Nepal and Terai areas. The distribution of some species and groups reflect more the distribution of studies carried out than the actual distribution. The known distribution of algae for example reflects more the propensity of foreign scientists - who have carried out most work in this field - to work amongst the spectacular scenery and equitable climate of the Midhills and Highlands areas, this in the more accessible central and eastern parts of the country. The butterflies have been less well studied in western Nepal (C. Smith, pers. comm.) for the same reasons. As Nepalis are trained and take over the mantle from foreign scientists, the coverage should become more comprehensive, provided that further funding is made available for biodiversity inventories.

At the start of the BPP project it was recognised that comprehensive enumerations had been produced for only a few of the faunal and floral groups. Amongst these the vascular plants had been well covered. The following works on the flora of Nepal, carried out by British, Japanese and Nepalese botanists, provided the basis for the information used to compile these biodiversity profiles:

- Hara, H. (1966). The Flora of Eastern Himalaya.
- Hara, H., Stern, W.T. and Williams L.H.J. (1978). An Enumeration of the Flowering Plants of Nepal. Vol. I.
- Hara, H. and Williams, L.H.J. (1979). An Enumeration of the Flowering Plants of Nepal. Vol. II.
- Hara, H., Chatter, O. and Williams L.H.J. (1982). An Enumeration of the Flowering Plants of Nepal. Vol. III.

Amongst the lower plants the following comprehensive enumerations were available:

- Higuchi and Z. Iwatsuki. (1994). Enumeration of Bryophytes.
- Kattel, L.P. and Adhikari, M.K. (1992). Mosses of Nepal.
- Iwatsuki, K. (1988). An enumeration of the Pteridophytes of Nepal.

A comprehensive bibliography is available detailing all published works relating to Nepal's plant science (Rajbhandari, 1994).

Amongst the fauna of Nepal only the birds (Inskipp and Inskipp, 1985 and 1991) and butterflies (Smith, 1994) had been enumerated in detail. Surprisingly, an overall picture of Nepal's mammals had not been compiled. Species (and other taxa) accounts of faunal and floral groups not covered to date were spread far and wide throughout the scientific literature with many in foreign languages and not available in Nepal. With most groups not covered to date BPP aimed to bring together all of the scattered information on each group by facilitating the production of enumeration reports by Nepali scientists.

To reach consensus on the faunal elements found in the physiographic zones, enumeration reports of Nepal's mammals (BPP, 1995c); reptiles and amphibians (BPP, 1995d); fish (BPP, 1995e); and spider species (BPP, 1995f) were produced. Enumeration reports on Nepals' lichen and algae species were also composed (BPP, 1995g and h). Drafts of these enumeration reports were reviewed by Nepalese and international specialists and their suggestions incorporated. Most of the lower animal groups, principally the insects are not persecuted by man or threatened by trade and this factor together with the lack of studies carried out left enumerations of these for future studies.

Table 1-3 shows number of species per major group for which the overall occurrence and distribution has been enumerated for the biodiversity profiles including BPP commissioned enumeration reports and information from the Biodiversity Database System (as explained in section 1.4).

The compilation of the information on species' occurrence and distribution allowed for the enumeration of Nepal's threatened species. This information had already been compiled for the plants of Nepal in draft form (Shrestha and Joshi, 1992). Nepal's threatened fauna were detailed in the National Red Data Book of Nepal Fauna (BPP, 1995i).

Table 1-2 Overview of biodiversity studies in Nepal

Groups of organism		Common names	Globally	Nepal	Species described	
					Up to 1994	1995
<b><u>KINGDOM MONERA</u></b>						
Phylum:	Bacteria	Bacteria	> 3,000	?	?	?
	Myxoplasma	Bacteria	> 60	?	?	?
	Cyanophycota	Blue-green algae	> 1,700	?	?	?
<b><u>KINGDOM FUNGI</u></b>						
Phylum:	Zygomycota	Zygomycete fungi	665	?	?	?
	Ascomycota	Cup fungi	28,650	330	465	465
	(incl. lichen fungi)					
	Basidiomycota	Basidiomycete fungi	> 16,000	?	?	?
	Deutormycota	Deutormycete fungi	?	?	?	?
	Mycophycota	Plasmodial slime molds	> 500	?	?	?
<b><u>KINGDOM ALGAE</u></b>						
Phylum:	Chlorophyta	Green algae	> 7,000	?	306	306
	Rhodophyta	Red algae	> 4,000	?	1	1
	Chrysophyta	Chrysophyte algae	> 12,500	?	201	201
	Pyrrophyta	Dinoflagellates	> 1,100	?	0	0
	Euglenophyta	Euglenoids	> 800	?	38	38
<b><u>KINGDOM PLANTAE</u></b>						
Phylum:	Bryophyta	Mosses/Liverworts	> 16,000	?	740	740
	Lycopodiophyta	Lycophytes	> 1,275	?	?	?
	Equisetophyta	Horsetails	15	?	?	?
	Filicophyta	Ferns	> 10,000	380	450	450
	Gymnosperma	Gymnosperms	529	23	23	23
	Angiosperma	Angiosperms	> 220,000	5,160	5,160	5,160
<b><u>KINGDOM ANIMALIA</u></b>						
Phylum:	Platyhelminthes	Flatworms	> 12,200	?	?	?
	Nematodia	Roundworms	> 12,000	?	?	?
	Annelida	Earthworms	> 12,000	?	?	?
	Mollusca	Mollusks	> 50,000	?	?	?
	Arthropoda	Arthropods				
Sub-phylum:	Chelicerata					
	Class: Arachnida	Spiders	?	?	144	144
Sub-phylum:	Crustacea					
	Class: Crustacea	Crabs	?	?	?	?
Sub-phylum:	Uniramia					
	Class: Insecta	Insects	> 750,000	> 4,500	-	-
Phylum:	Chordata					
Sub-phylum:	Tunicata	Tunicates	> 1,250	?	?	?
Sub-phylum:	Cephalochordata	Acorn worms	23	?	?	?
Sub-phylum:	Vertebrata					
	Class: Osteichthyes	Bony fishes	> 18,150	182	185	185
	Class: Amphibia	Amphibians	4,184	37	43	43
	Class: Reptilia	Reptiles	6,300	87	100	100
	Class: Aves	Birds	9,881	850	844	844
	Class: Mammalia	Mammals	4,327	175	181	181

Legend: - = not processed

\* various sources including IUCN, 1994; HMSO, 1994; Schleich, 1993

**Table 1-3 Species per faunal group for which Nepalese occurrence and distribution is known**

Fauna			Floral		
Group	Spp.no.	Enumeration	Group	Spp.no.	Enumeration
Mammals	181	BPP, 1995c	Gymnosperms	28	BDP/BPP
Birds	844	BDS/BPP	Angiosperms	5160	BDP/BPP
Amphibians & reptiles	143	BPP, 1995d	Ferns and fern allies	380	BDP/BPP
Fish	185	BPP, 1995e	Mosses	463	BDP/BPP
Butterflies	641	BDS/BPP	Lichens	465	BPP, 1995g
Spiders	144	BPP, 1995f	Algae	687	BPP, 1995h

BDP Biodiversity Database Project

BPP Biodiversity Profiles Project

### 1.3 Scope and limitations of the profiles

These profiles review the biodiversity of wild species found within each physiographic zone on the basis of the enumerations described in section 1.2.4. Extensive surveys of the Highland's biodiversity was outside of the resources and time frame of the BPP. The project relied on existing literature and the analysis of data collected by other projects to compile this report.

This project did not investigate the biodiversity of domesticated species - agricultural crops and animal breeds; nor did it address policy requirements dealing with the wild progenitors of agricultural crops. These important aspects are addressed elsewhere in studies carried out by NARC (Baniya, 1994), and NAA (1995). They require further investigation to ensure that valuable local, crop genotypes are not lost.

A number of recommendations are given in Chapter 12 to enable and improve the conservation of Nepal's biological diversity. The recommendations of this report are not however a comprehensive human resources plan as this fell outside of the mandate and resources of the BPP. Broad recommendations have however been made for strengthening the institutional capacity of the DNPWC in particular and also the Department of Forests (DoF) and the Department of Plant Resources (DPR) in general to enable them to carry out their work in conserving Nepal's biodiversity more effectively. These include training needs, new financial mechanisms and stronger mandates.

### 1.4 Biodiversity database

The systematic storage of data on the distribution and status of Nepal's floral and faunal species was central for the enumeration of Nepal's biodiversity and the preparation of these profiles. A computer database system - Biodiversity Database System for Nepal (BDS) - was developed to provide an easy



storage and retrieval system for general and specific information on Nepal's flora and fauna. The system was designed and developed by national scientists in the Applied Database for Integrated Biodiversity Conservation Project in Nepal - the Biodiversity Database Project (BDP). This project of the Woodlands Mountain Institute ran two years (1993-95) and worked in collaboration with IUCN/Nepal, Ornis Consult Denmark and DNPWC Nepal. Funding was provided by DANIDA. During this time data was first entered on the biodiversity of Kosi Tappu Wildlife Reserve (KTWR) and Makalu-Barun National Park and Conservation Area (MBNPAC). From the beginning of 1995, BPP funded the Biodiversity Database Project to input species information on all higher faunal and floral groups, and Pteridophytes and Bryophytes (Table 1-3). BPP and BDP have worked in tandem both benefiting from each other's activities.

The species information is the backbone of the BDS. This was gathered together and then for each species the available information on the taxonomy, distribution and status was entered into the database. Location information included occurrence by protected area, altitude range and district. The status information was derived from CITES and IUCN classifications and the National Red Data Books produced for Nepal's flora (Shrestha and Joshi, 1992) and fauna (BPP, 1995i). Socio-economic factors relating to a species' use were also included.

By manipulation of these species-wise records the BDS system can sort and output data by any category at different resolutions; for example, lists of all flowering plants found in Nepal, or in the High Mountains physiographic zone or in Langtang National Park or in Rasuwa District can be easily produced on the computer screen or as a print out. The database records, either by species or sorted into categories or location are easily fed into a linked Geographical Information System (GIS), using the *Mapinfo* software to show the distribution on maps.

The BDS allowed BPP to manage the massive volume of species information collected. The system proved particularly valuable for producing the species distribution maps included in the various enumeration reports and the National Red Data Book (BPP, 1995i). Known distributions can be seen at a glance.

The system has been developed and is an invaluable resource and user-friendly tool for conserving Nepal's biodiversity. For its potential to be realised and the investment to date justified and realised a framework needs to be established to allow for the continuing updating of the data as discussed in section 12.1. It needs to be promoted amongst all concerned agencies as the master database of Nepal's species of fauna and flora. The system can easily be updated with the BPP enumeration reports providing an excellent basis for this. New records can be pencilled in on photocopies of the species distribution maps and sent in to the database manager for updating.

## **1.5 Digitization of ecological maps**

J.F. Dobremez and a team of Nepalese and French botanists working with the Centre National de la Recherche Scientifique (CNRS) prepared ecological maps for Nepal (Dobremez - alone and with others, 1970-1985). These maps are at 1:250 000 - with two areas covered in detail at 1:50 000, and cover nearly all of Nepal except for an area in the north of Humla (Table 1-4). Fieldwork started in the late 1960s and the last maps were produced in 1985. According to this work Nepal is covered by and divided into 118 ecosystems - distinct biological communities - each with their associated flora and fauna.

These maps provide a very detailed classification of Nepal's ecosystem diversity. As a further aid towards completing the picture of Nepal's phytogeography BPP digitised the information in Dobremez's maps into a GIS system using ARC/INFO software to analyse the distribution of these ecosystems by physiographic zones and within Nepal's PAS. The large task of digitizing the ecological maps was carried out with the assistance of ICIMOD, IUCN, The Mountain Institute's Biodiversity Database Project (BDP), Resources Nepal, FRISP and FRSC. The digitised ecological maps and the Biodiversity Database System, although separate undertakings are linked in so far as the associated vegetation followed Dobremez's categories where the information source allowed. Dobremez's original 118 ecosystems were reduced to 96 by grouping closely allied types together to allow for easier data input and clearer, less cluttered mapping of the data.

**Table 1-4 Ecological maps of Nepal prepared by CNRS**

Map area	Sheet	Published	Scale
Annapurna-Dhaulagiri	1	Dobremez & Jest, 1970	1:250 000
Jiri-Thodung	2	Dobremez, 1971	1:50 000
Kathmandu-Everest	3	Dobremez, 1972	1:250 000
Central Terai	4	Dobremez, 1973	1:250 000
Ankhu Khola-Trisuli	5	Dobremez <i>et al.</i> , 1974	1:50 000
Biratnagar-Kanchenjunga	6	Dobremez & Shakya, 1975	1:250 000
Jumla-Saipal	7	Dobremez & Shrestha, 1978	1:250 000
Api-Dhangadhi	8	Dobremez, 1984	1:250 000
Butwal-Mustang	9	Dobremez, Bottner, Jest & Vigny, 1984	1:250 000
Nepalgunj-Dailekh	10	Dobremez, Shrestha & Vigny, 1985	1:250 000

## 1.6 Layout of report

This report presents the biodiversity profile of the High Mountains and High Himal physiographic zones. The layout and the general text are however common to all three biodiversity profiles reports. The first chapter outlines the purpose and objectives of the study. Chapter 2 presents a general description of the physiographic unit in terms of extent, population and land use. Chapter 3 describes the approach taken in evaluating biodiversity importance by discussing the systems of biogeographic classification and zoogeographic and phytogeographic categories found in the Highlands.

Chapter 4 discusses the faunal and floral species richness of the Highlands and the distribution pattern of the taxa. The level of endemism is also discussed. Chapter 5 presents an overview of existing protected areas, forest cover and trans-boundary protected areas. An assessment is given in Chapter 6 of the representation of species and ecosystems in the PAS of the Highlands and of threatened species and ecosystems outside the PAS. An important aspect of these biodiversity profiles is to discuss the economic importance of the various floral and faunal elements. A number of the economic benefits of conserving biodiversity are highlighted in Chapter 7. Chapter 8 presents an overview of HMGN policies and practices relating to biodiversity; in particular forest, buffer-zone, and wildlife

management; whilst Chapter 9 reviews various management policies related to biodiversity conservation and studies the mandates of the various institutions engaged with biodiversity in Nepal.

Chapter 10 is a review of ongoing conservation projects. Chapter 11 gives the conclusions whilst Chapter 12 presents recommendations on priority areas for designation as protected areas and other measures that need to be taken to improve the conservation of Nepal's threatened species and habitats.

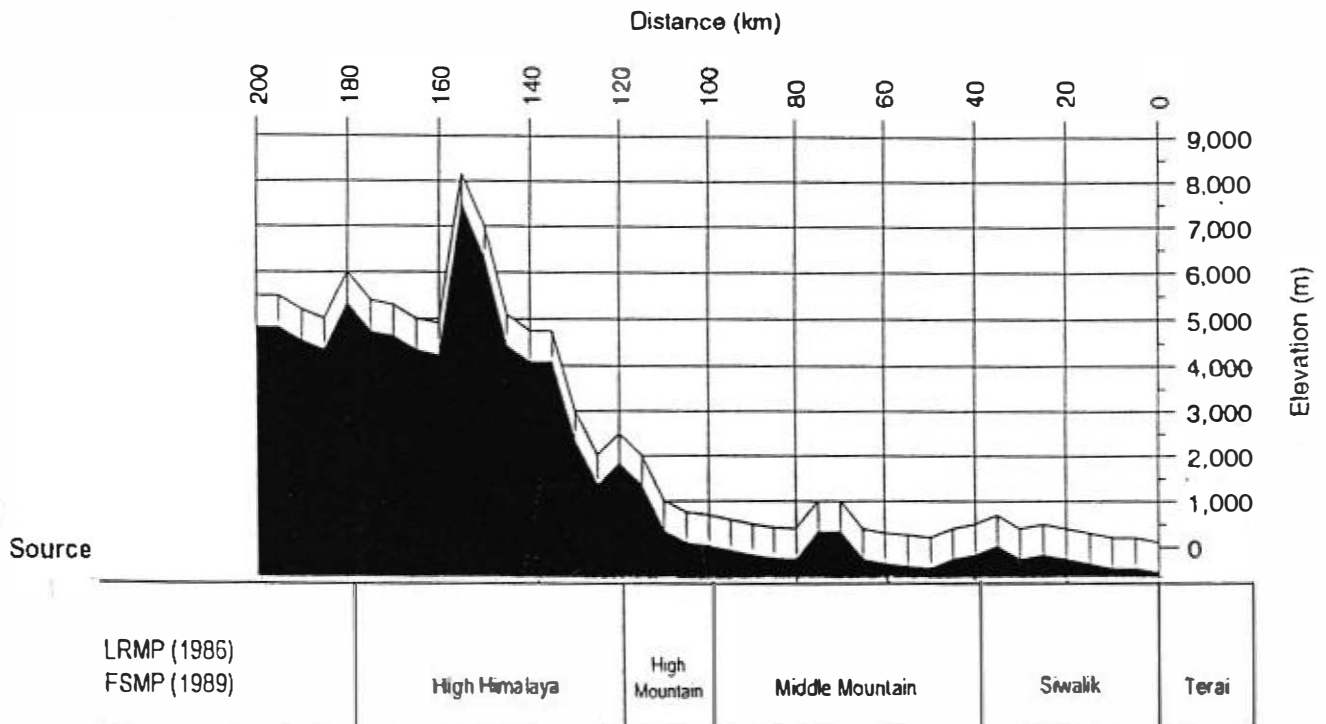
## 2. GENERAL DESCRIPTION OF THE PHYSIOGRAPHIC UNIT

### 2.1 Area description of Nepal's Highlands

Nepal's High Mountains and High Himal are separate physiographic zones that cover the high altitude northern parts of the country (Figure 1-1). Included within this grouping are the Trans-Himalayan Valleys and Mountains. The High Mountains cover about 20% of Nepal whilst the High Himal (including the Trans-Himalaya) cover around 23% (HMGN/ADB/FINNIDA, 1988a). Figure 5-1 shows a schematic profile from north to south Nepal with the Highlands clearly a distinct altitudinal region.

The High Mountains are the foothills of the main Himalayan Range. They are bounded by the Midhills to the south with the separating point at around 3000 m. The division between the Midhills and the High Mountains is not a definite one being a zone of transition around 3000 m (Figure 2-1). The High Himal are a landscape of rock, snow and ice and areas of sparse alpine vegetation. It includes the highest point in the world - Sagarmatha at 8848 m - and many peaks over 7000 m. The Himalaya are bisected by a number of rivers which have cut deep gorges dividing the Himalaya into a number of separate massifs. The Kali Gandaki gorge is one of the deepest gorges in the world with altitudes of only 1200 m below the 8000+ m high Annapurna and Dhaulagiri peaks.

Figure 2-1 Altitudinal profile of Nepal from north to south



Source: Shrestha, 1994

Nepal's Highlands cover significant portions of the western and central parts of the country but less of eastern Nepal (Figure 1-1). In the East the 3000 m contour line reaches up to the border with China at the Arun River. In eastern Nepal the northern frontier of the country follows the Himalayan peaks (Jackson, 1994) whereas in the west the Himalayan Range lies well to the south of the border, and large areas of Nepal lie to the north of the Himalaya. These areas are the Trans-Himalayan Valleys and Mountains which include the upper tributaries of the Kali Gandaki in Mustang, the Bheri in Dolpo and the Karnali in Humla. Due to the rain shadow effect of the Himalayas, these are areas of cold desert - geographically part of the Tibetan Plateau. They have distinctive ecosystems.

## 2.2 Population

Although the Highlands cover 43 % of Nepal, only around 6% of the population is settled there. These areas are largely inhospitable for human settlement with steep slopes and low winter temperatures. The High Himal population identified in the Master Plan for the Forestry Sector - MPFS, (HMG/ADB/FINNIDA, 1988a) - the data used in Table 2-1 - are those people living in the Trans-Himalaya areas. Human activity and settlement above 3000 m is mostly restricted to the summer months. In this period temporary huts (*goths*) are set up by people mainly from the upper Midhills to oversee the grazing of their livestock. During this time these people also collect medicinal herbs and carry out trade with Tibet and the secluded valleys of Highland Nepal to bring in basic supplies to the region.

Table 2-1 gives data on the projected population for the Highlands for 1995 and 2005 as compared to the year 1985. The most striking feature of the data given in Table 2-1 is that populations for Nepal's Highlands are projected to decrease from around the year 2000. Migration of people from this region to lower altitudes has been occurring over the last several decades but the population has shown slight increases since the 1960s due to the high birth rate and an influx of Tibetan refugees. The projected decrease reflects a projected lowering of the birth rate; increased availability of medical services; and continued out-migration to the easier conditions found in the Midhills and Terai. Some Highlands districts are already recording declining populations. Between 1981 and 1991 the Highland districts of Mugu and Manangs' population declined by 1.8% and 2.8% per year respectively (CBS, 1994b).

**Table 2-1 Population projections for the Highlands**

	1985/86	1995/96	2005/06
High Himal	30 000	30 000	28 000
High Mountains	1 275 000	1 306 000	1 188 000
Nepal	16 909 000	21 285 000	25 302 000

Source: HMG/ADB/FINNIDA, 1988a

### 2.3 Land use pattern of the Highlands

The land use pattern of Nepal's highlands is determined by its terrain and geographical position. The area is characterised by steep slopes and difficult communications. The High Himal are very sparsely populated with only a very small area cultivated in sheltered valley bottoms. The majority of the High Himal lies under permanent snow and ice (Table 2-2). The land use is mainly seasonal avoiding the harsh winter conditions.

**Table 2-2 Land use pattern in Nepal's High Himal**

Land use category	Area (ha '000)	Percentage
Forests and forest plantations	155	4
Cultivated land	8	-
Fallow-land (non-cultivated included)	1	-
Shrubland and degraded forest	67	2
Grasslands (alpine meadows)	885	26
Other lands (mostly snow, ice and rock)	2234	68
<b>Total</b>	<b>3350</b>	<b>100</b>

Source: HMG/ADB/FINNIDA (1988a), using 1985-86 data

Fifty six per cent of the High Mountains are still forested (Table 2-3). Although the area of forest (16 283 km<sup>2</sup>) is similar to that found in the Midhills (17 911 km<sup>2</sup>) the High Mountains forests are much less disturbed due to the lower population density (Table 2-4). The crown cover of a forest is a good indicator of forest condition. Ten to forty per cent crown cover represents high levels of human exploitation except in the High Himal where a sparse crown cover is naturally occurring. Forty to seventy per cent levels represent relatively undisturbed forests with 70% to 100% the undisturbed areas. The High Mountains have 12 210 km<sup>2</sup> of forest with 40% plus crown cover whereas the Midhills have only 9850 km<sup>2</sup> (Table 2-4). Harkonen *et al.* (1995), have shown that the most densely forested part of the Central Development Region is in the 2500 to 3500 m altitudinal range (Figure 2-2). This corresponds with the upper Midhills and lower High Mountains. Significant areas of the High Himal and High Mountains are alpine meadows above the tree-line grasslands. Some of these areas are alpine meadows (Nepali: *patans* or *kharkha*) which provide valuable grazing. Only 8% of the High Mountains are cultivated mostly restricted to favourable micro-climates in valley bottoms.



**Table 2-3 Land use pattern in Nepal's High Mountains**

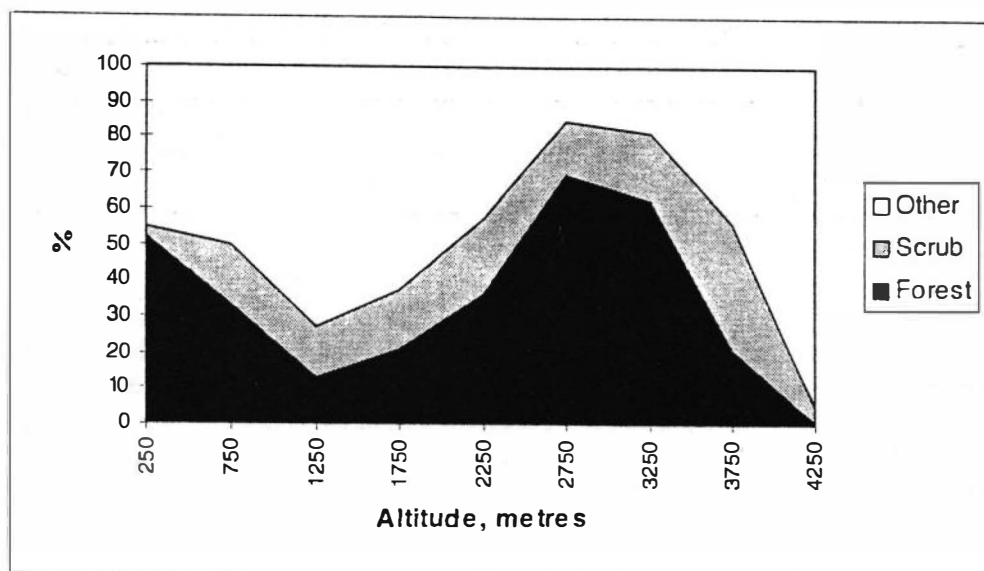
Land use category	Area (ha '000)	Percentage
Forests and forest plantations	1639	56
Cultivated land	244	8
Fallow-land (non-cultivated included)	148	5
Shrubland and degraded forest	176	6
Grasslands	508	17
Other areas	245	8
Total	2960	100

Source: HMG/ADB/FINNIDA (1988a), using 1985-86 data

**Table 2-4 Forest cover of Nepal by physiographic zone**

Zone	Forest cover (1000 ha)	Cover % within zone	Proportion of crown cover classes			Area with 40%+ crown cover
			10-40%	40-70%	70-100%	
Terai	586.5	28	7.1	56.4	36.5	545
Siwaliks	1445.0	76	11.2	77.1	11.7	1276
Midhills	1791.1	41	44.7	48.9	6.3	985
High Mountain	1628.3	56	25.0	55.0	20.0	1221
High Himal	154.3	4.5	39.7	45.6	14.5	132
<b>Total</b>	<b>5605.2</b>		<b>26.3%</b>	<b>58.6%</b>	<b>15.1%</b>	

Source: Kleinn, 1994

**Figure 2-2 Forest and scrub cover by altitude for Nepal's Central Development Region**

Source: Harkonen *et al.* 1995

### Livestock husbandry

In Nepal livestock husbandry is largely unaffected by advances in agricultural science with uncontrolled grazing, lopping and grass-collecting the common practice. The cow and the ox are sacred animals in the Hindu religion and the possession of large herds - many in poor condition and of poor genetic stock, are major status symbols. There are more than seven million cattle in Nepal (Table 2-5). Livestock encroachment is a serious problem not only in national forests but also inside the protected areas. The uncontrolled grazing and collection of fodder from the forests throughout the year has a serious impact on biodiversity.

**Table 2-5 Nepal's livestock population (1991/92)**

Livestock type	Population
Cattle	7 359 000
Chauri (yak)	59 000
Buffalo	3 111 000
Goats	5 516 000
Sheep	603 000

Source: Central Bureau of Statistics, 1994a.

Livestock husbandry is the mainstay of the Highlands' economy. Cattle, yaks, sheep and goats are grazed in the Highlands during the summer season and are kept at lower altitudes for the rest of the year. This livestock husbandry practises have considerable impact on the forests. The area of forests is reduced as the livestock herders burn and clear the forests to create more pasture (*kharkas*) for their livestock. Cattle including cows and yaks and various hybrids are kept for milk production - mainly for cheese and ghee making. Sheep and goats are kept for their wool and also along with mules and yaks as beasts of burden. Most of the Highlands still rely on sheep and mules for bringing in basic supplies. Increasing amounts are however brought in by air (by plane and helicopter) although the sheep and mules are still required for distribution from the airports.

In the past and still in some areas today local systems of pasture management operated relatively successfully in maintaining the quality of the grazing. Rotational grazing and indigenous institutions which prevented over-grazing have been recorded from a number of Highlands areas in Nepal (Rai and Thapa, 1993). In the Highlands of Sindhupalchok for example whereas forests are essentially regarded as common property with no territorial restrictions on use, the rights concerning grazing in the high country are clearly defined and delimited (Schmidt-Vogt, 1988). Many of these systems have however broken down due to the influx of the Tibetan refugees livestock in the 1960s and the extension of government control to these areas that did not recognise the value of indigenous management systems. The deterioration of upland pastures is of recent origin.

The livestock population in the Highlands is expected to stay about the same in the twenty year period 1985 - 2005 (Table 2-6). The impact of summer grazing of livestock is however likely to increase. In the highlands transhumant livestock husbandry predominates following the seasonal out-migration of population and the fact that children - who previously were sent with the livestock to the Highland pastures, are increasingly attending school.

**Table 2-6 Projected livestock population for Nepal's High Mountains ('000 LU\*)**

	1985-86	1995-96	2005-06
High Mountains	1048	1037	1119
Total	9221	10639	12750

\* An adult female buffalo counts as one Livestock Unit (LU)

Source: HMG/ADB/FINNIDA, 1988a.

## 2.4 Socio-economic conditions

The people of the Highlands are even more dependant on natural resources than those living in the Midhills. There are few employment and income earning opportunities and the high cost of goods brought in from outside necessitates the use of locally available materials. An illustration of this is that a bag of cement that costs less than 300 NR in a Terai town costs more than 2000 NR by the time it is transported to Mugu District Centre in western Nepal. Local people depend on the local forests for all their firewood and timber and most of their fodder needs. Although the population is sparse the per capita demands on the natural resources are greater. Metz (1991) by reviewing six studies of firewood use at different elevations in Nepal found that at lower and middle elevations a

person uses on average between 400 and 800 kg of air dried firewood per year. At upper elevations (> 2500 m) a person uses on average 2000 kg per year. The colder conditions and the lack of alternatives account for these higher use levels. Whilst atying in the goths during the monsoon fires are kept going all day consuming up to 50 kg of wood (Metz, 1987). Farmers of the highlands have a great reliance on the national forests as compared to Midhills farmers who provide large percentages of their fodder and firewood requirements from trees growing on their own land.

Until the 1950s and the Chinese annexation of Tibet the Highlands had very close links with Tibet both culturally and for trade. The passes over into China were major trade routes as Nepal looked north to China for many goods due to the lack of transport facilities into India through the untamed, Terai forests. Those items lacking in Tibet - chiefly grains were traded for salt, wool and even gold (Furer-Haimendorf, 1975). This trade continues today only on a small scale. The closing off of trade routes to China has had a serious effect on the economy of this region. Also yaks, yak crosses and sheep and goats were grazed freely between the two countries. Since China's annexation of Tibet an agreement has allowed the seasonal grazing of Nepali livestock in certain areas of Tibet and Chinese livestock in Nepal (Rai and Thapa, 1993). Increasingly, wealthy farmers buy properties and land in the Kathmandu and Pokhara Valleys.

Although the people of the Highlands rely largely on subsistence livestock husbandry considerable contributions are made to local economies by the collection and sale of medicinal herbs and - in parts of central and eastern Nepal - from tourism. People who have made money from trade and tourism will often buy land in the Terai with their extended families spread between the home in the Highlands and the farm in the Terai exploiting the different opportunities.

Communication difficulties are severe in many parts of the Highlands. Only one road in Nepal rises to over 3000 m - the road to the zinc mine in Rasuwa District. Road building has however had an impact as the nearest road-end trading post moves ever further north linking the Highlands to southern Nepal and the Indian cultural and trading influences and increasing the availability of outside goods. Aeroplane and helicopter services are very important for these areas. They allow the easy transportation of, for example, government subsidised rice in and medicinal herbs out. They also allow for the better implementation of government and non-government development programmes. Office and project staff can more easily move between head office (usually in Kathmandu) and the implementation area in the Highlands. The spread of the telephone network is another feature greatly facilitating development initiatives.

With the projected decreasing populations of these areas and the higher expectations of the now-educated younger generation it is a probability that the subsistence land use practises will decline and the higher permanent and temporary settlements be abandoned. However the increasing population densities and resulting land shortages in the Midhills and Terai suggest a continued, if not increased human presence in these areas. A relaxation of border controls with China would certainly lead to increases in human activity in Nepal's Highlands. These two trends will result in increasing poverty in the region as only those who cannot afford to move to the perceived better prospects further south, will remain behind.



### 3. BIOGEOGRAPHICAL ASSESSMENT

HMGN as a signatory to various global conventions is committed to maintaining the diversity of its flora and fauna and their communities and habitats (ecosystem) within a system of protected areas (PAS). In order to assess the representativeness of the existing protected areas in the Highlands it is vital to know the distribution of the floral and faunal elements, communities and ecosystems and their conservation status across the physiographic zones.

Biogeographical classification systems have been developed by conservation and biodiversity specialists categorising:

- the overall main associations by biogeographical realms
- the main geographical animal associations by sub-regions
- the main phytogeographical associations by biogeographical province.

These classification systems range from the overall continental scale systems such as Udvardy's biogeographical realms of which there are eight worldwide to Dobremez's ecosystems of which 114 were described for Nepal. Most authors also made classifications at different levels of resolution with for example the LRMP classifying vegetation types by broad physiographic zone and by detailed forest type. Nepal, is of major biodiversity importance both for its altitudinal range and its geographical position. This is reflected by the number of sub-divisions of the various classification systems that cover Nepal - a country with a geographic area of only 147 181 km<sup>2</sup>. A number of these biogeographical classification systems were used by BPP for a gap analysis to assess the coverage of Nepal's biodiversity within the 15 protected areas.

#### 3.1 Zoogeographic classification

Zoogeographic classifications seek to delineate areas in which animal populations have developed with some exclusiveness. Such classifications help to understand the distribution of wildlife. Dasmann's (1972) biogeographical cataloguing of populations, species and communities; and of functional ecological systems was formulated on a global scale according to the occurrence of vegetation types and floral and faunal elements. His preliminary classification was further refined by Udvardy (1975).

Udvardy classified the world into eight biogeographical realms. Nepal lies at the junction of two of these - the Palearctic and Indo-Malayan - which cover Nepal. The boundary between the Indo-Malayan and Palearctic Realm is the tree-line at about 3000 m (Corbet and Hill, 1992). Faunal elements above this altitude have Palearctic affinities, although some endemic Indo-Malayan elements such as the Ailuridae (1 species - Red Panda) are found up to 4800 m. This system recognizes 193 biogeographical provinces worldwide. However for a nationwide review such as this work the resolution was too coarse to account for the wide variation in conditions over small distances as found in Nepal with its very steep altitudinal incline from the Terai plains to the Himalayan mountains.



Three of Udvardy's biogeographical provinces cover Nepal:

- Himalayan Highlands within the Palearctic realm
- Indo-Ganges monsoon forest within the Indo-Malayan realm
- Bengalian rainforest within the Indo-Malayan realm.

Nepal's geographic, altitudinal and climatological variation taken together account for the country's species richness considering its small size. Not surprisingly Nepal encompasses a large number of biogeographical units, distinct zones, home to unique assemblages of plant and wildlife which have developed independently in partial isolation from neighbouring units.

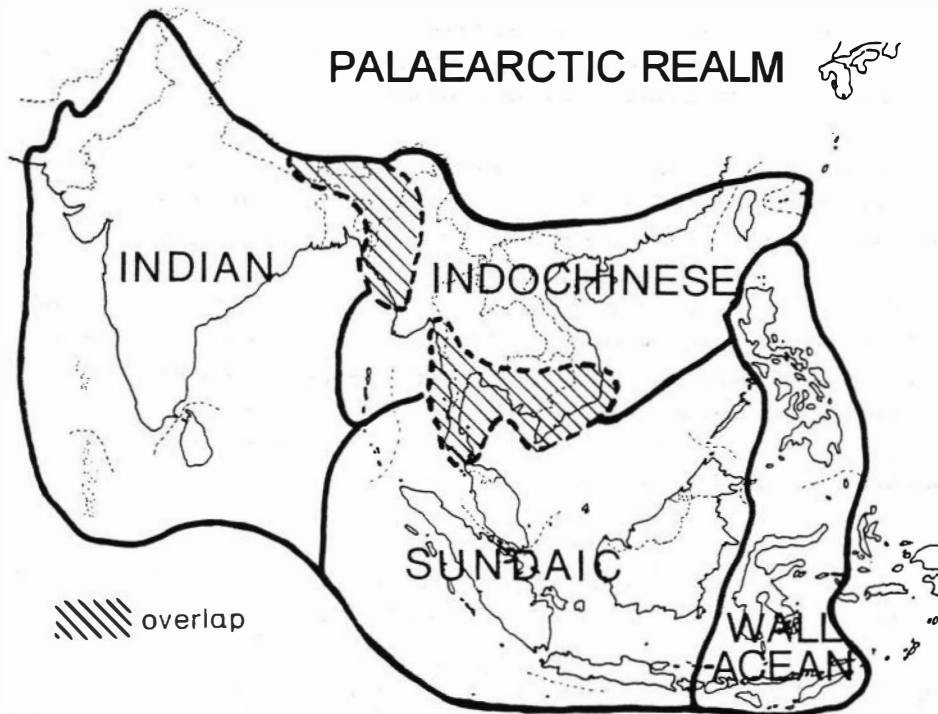
The Indo-Malayan and the Palearctic biological realms inter-digitate in Nepal. The Palearctic fauna of Nepal originated in central and northern Asia whilst the Indo-Malayan faunal elements are of southern origin. The Indo-Malayan Realm has four distinct zoogeographical sub-regions: the Wallacean, Sundaic, Indochinese and Indian with the latter covering the Indian sub-continent (MacKinnon and MacKinnon, 1986). Three of these regions overlap in two places. The Indian and Indo-Chinese sub-region's overlap in eastern Nepal (Figure 3-1).

Corbet and Hill (1992) in their publication on the mammals of the Indo-Malayan Region sub-divided the Indo-Malayan realm into six major sub-regions, of which two cover Nepal (Figure 3-2):

- A2 Peninsular Indian Division. This region includes a number of endemic faunal sub-genera: Nilgai (*Boselaphus*), Four-horned Antelope (*Tetracerus*), Black Buck (*Antelope*), squirrels (*Funambulus*), Bush Rat (*Golunda*). In addition it includes western taxa that have penetrated the peninsular: Hyena (*Hyaena*) and Gerbil (*Tatera*) - typical species of drier habitats
- B Himalayan Sub-region. This is a transitional sub-region with various Palearctic elements descending into the forests below 3000m. They include the genera: Chinese shrew-moles (*Uropsilus*), water shrews (*Nectogale*), shrews (*Soriculus*), Blanford's Fruit Bat (*Sphaerias*), Red Panda (*Ailurus*), Takin (*Budorcas*) and Woolly-Flying squirrel (*Eupetaurus*). In addition they include representatives of more widespread south-eastern groups such as plain long-nosed squirrels (*Dremomys*) and rats (*Niviventer*), many of which extend along the Himalayan forest zone but not into Peninsular India.

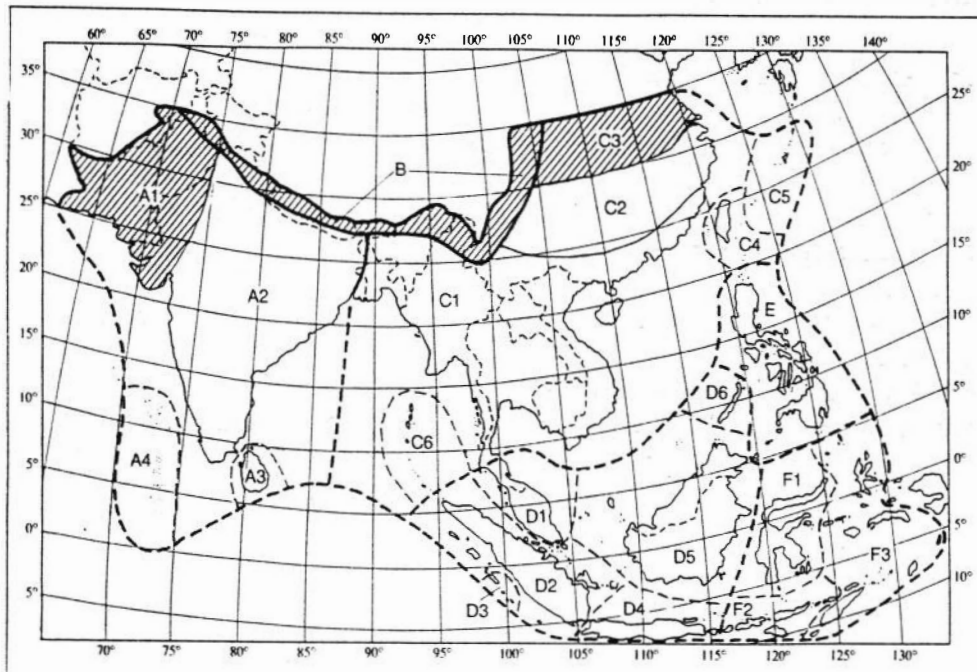
IUCN in its review of the protected areas system in the Indo-Malayan Realm (MacKinnon and MacKinnon, 1986) used the habitat classification system developed by Whitmore (1975) for South-east Asia, whilst for the Indian sub-continent IUCN adopted the system developed by Champion and Seth (1968) and Rodgers (1985). Rodgers distinguished 10 biogeographical zones for India in his review of the classification of protected areas in India, of which the Sino-Himalayan and North-east Indian zones border Nepal. MacKinnon and MacKinnon (1986) distinguished two units for Nepal - West and East Nepal. For the purpose of our national review of Nepal, both Rodgers' and the MacKinnons' reviews are not adequate as a more detailed approach is required to assess whether or not all elements of ecosystems are sufficiently covered by the current protected areas system.

**Figure 3-1 Indian and Indo-chinese sub-regions showing overlap in eastern Nepal**



Source: MacKinnon and MacKinnon, 1986

**Figure 3-2 Sub-divisions of Indo-Malayan Region**

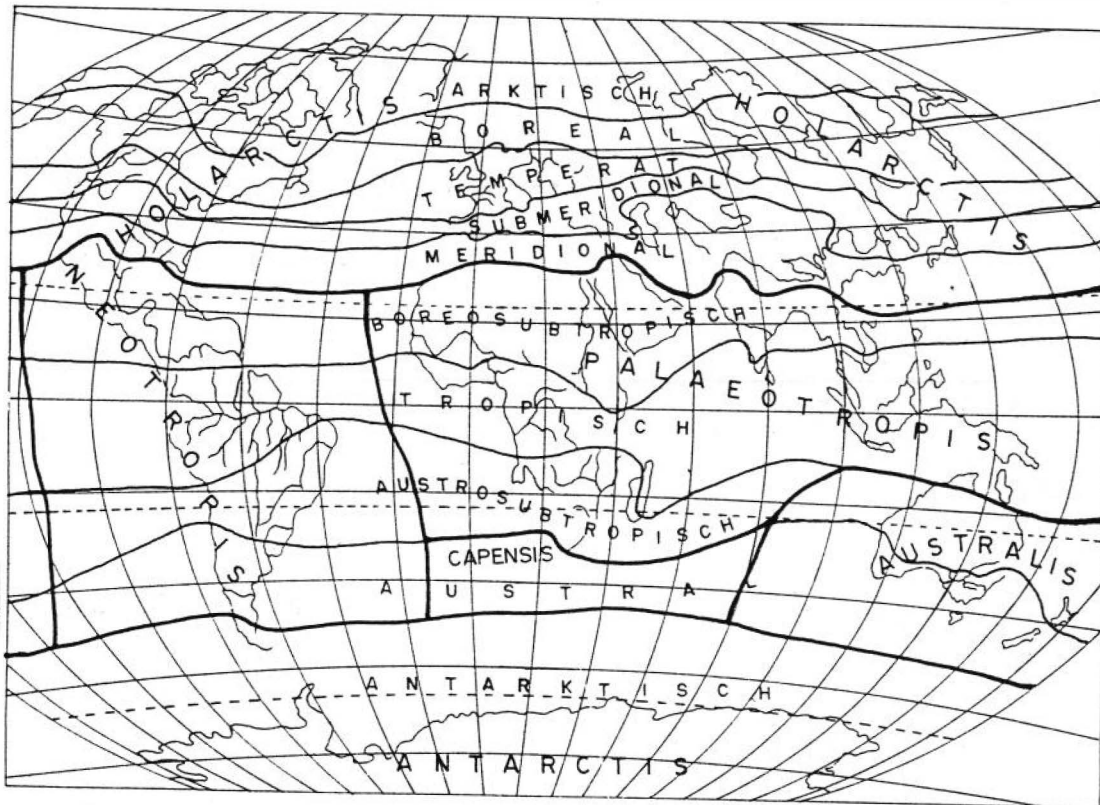


Source: Corbet and Hill, 1992

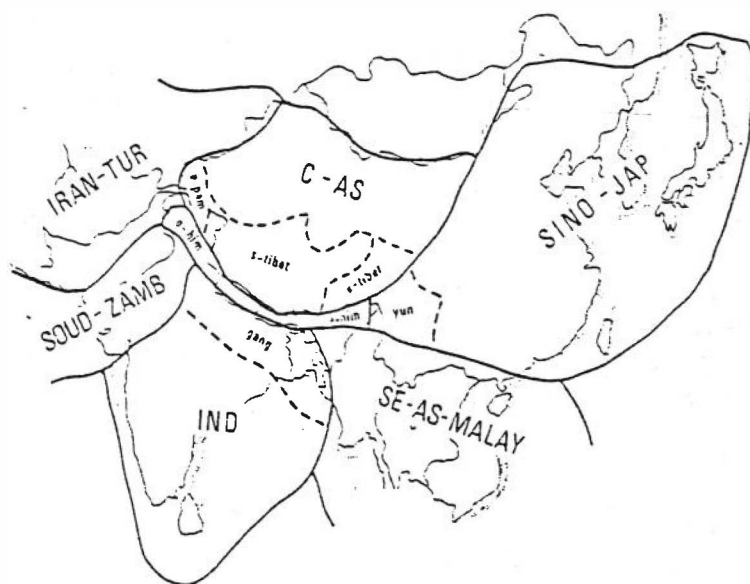
### 3.2 Phytogeographic classification

Phytogeographic classifications seek to delineate areas in which plant populations have developed with some exclusiveness. The Himalayan mountain system stands in between two major geographical (chorological) divisions of the world; the Holarctic in the north and the Palaeotropic in the south (Fig. 3-3). Nepal lies at the crossroads of a number of floristic sub-regions including the Sino-Japanese, Irano-Turanian, Central Asiatic and Indo-Malayan region. Dobremez and Shreshta (1990) noted that the east-west orientation of the Himalayas, with its wide range of bioclimatic zones facilitates plant migration in an east-west direction; whereas it acts as a barrier in a north-south direction. Stearn (1960) refers to the Himalayas as an area of inter-penetration and limitation. Ecological conditions may limit the capacity of plants suited to one region to compete with the plants of, and penetrate into another region within one bio-climatic zone. Meusel *et al.* (1965) regarded the Himalayan mountain system as a distinct floristic division. Kitamura (1955) considered it as an unique corridor for the migration of temperate plants between east and west Asia (Fig. 3-4).

Figure 3-3 Chorological divisions of the World



Source: Meusel *et al.* 1965

**Figure 3-4     Phytogeographic divisions of southern Asia**

Source: Dobremez, 1972 adapted from Meusel *et al.* 1965

Other authors including Good (1974), Kanai (1966) and Dobremez (1972) classify the Himalayan mountain range and its foothills as a narrow extension of the Sino-Japanese floristic region on the basis of the distribution of the plant species, many of which are closely related. This narrow extension of the Sino-Japanese floristic region is a meeting place of the floristic elements from the following surrounding floristic regions:

- South-east Asia - Malaysian floristic region to the south-east
- Indian floristic region in the south
- Sudano-Zambian floristic region to the south-west
- Irano-Turanian floristic region to the north-west
- Central Asiatic floristic region to the north.

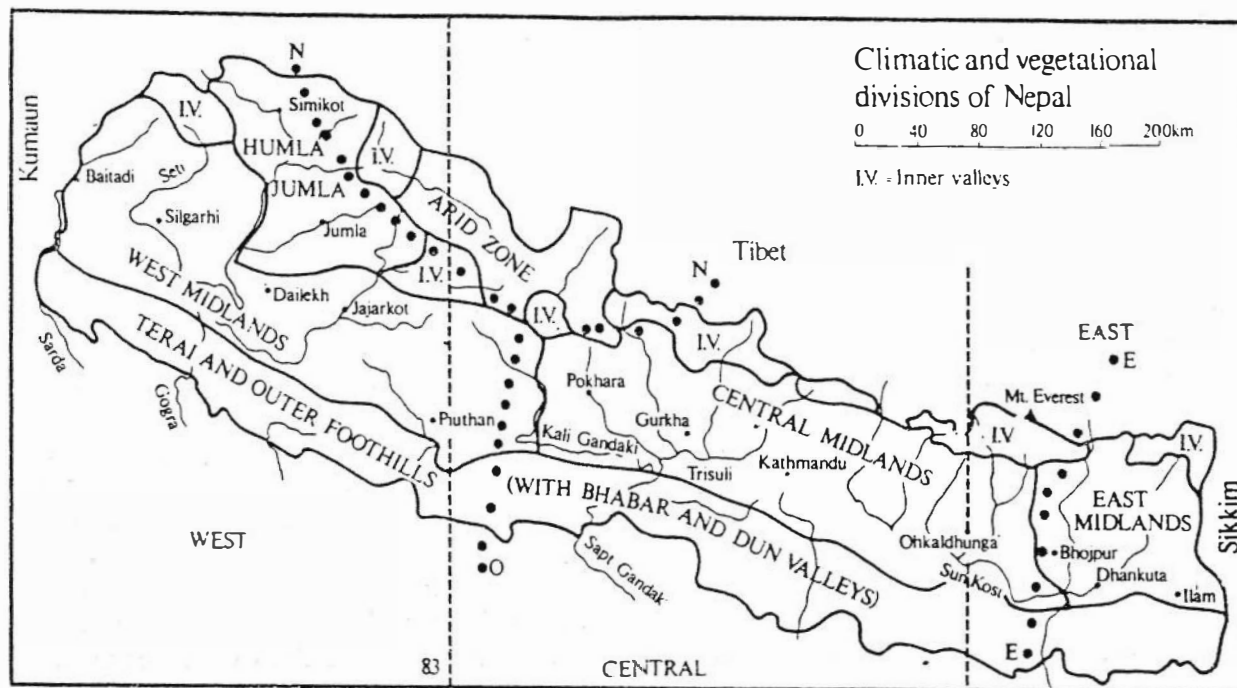
The biologists Turrill (1954), Stearn (1960), and Banerji (1963) at first divided the Himalayas phytogeographically into:

- Eastern Himalaya
- Western Himalaya.

Although the sharp limit between the two is difficult to establish, the meridian of 83° E longitude, is usually regarded as the dividing line on the basis of the distribution of eastern and the western himalayan floristic elements.

Following on from these interpretations the three botanists Stearn, Stainton and Dobremez have developed three differing ways of dividing Nepal into phytogeographical units on the basis of climate, vegetation types and species distribution. Their interpretations are shown graphically in (Figure 3-5) and described below.

Figure 3-5 Climatic and vegetational divisions of Nepal



Source: Hara *et al.*, 1978

Legend:

- boundary proposed by Stainton (1972)
- boundary proposed by Stearn (1960)
- boundary proposed by Dobremez (1972);

(west of line N-O; north-west, north of line N-N; centre, between lines N-O and E-E; and east of line E-E).

Stearn (1960) divided Nepal into three phytogeographic units:

- Western Nepal - from western frontier to 83° E longitude
- Central Nepal - from 83° E to 86° 30' E longitude
- Eastern Nepal - from 86° 30' E to the eastern frontier.

Dobremez (1972) divided Nepal into four phytogeographic units on the basis of the 118 ecosystems identified by him and his colleagues:

- West Nepal - from Kumaon frontier to the longitude of Dhaulagiri (c. 83° 28' E)
- North-west Nepal - the arid north-west region north of Dhaulagiri and Annapurna
- Central Nepal - from the longitude of Dhaulagiri to that of the Arun valley (about 87° 09' to 87° 17' E)
- East Nepal - from the Arun valley to the eastern border.

Stainton (1972) divided Nepal into six main phytogeographic divisions:

- Terai, dun valleys and outer foothills
- midland and southern sides of the main Himalayan ranges
- the Humla - Jumla area in north-west Nepal
- dry river valleys
- inner valleys
- arid zone.

### 3.3 Ecological classification

The Land Resource Mapping Projects maps produced from late 1970s aerial photographs are the most detailed ecological maps available for Nepal (Kenting, 1986). The LRMP's land utilisation maps show the actual vegetation. They are very detailed classifying by forest type, age and forest condition.

CNRS's ecological maps (Dobremez *et al.*, 1970-85) also provide a detailed typology classifying Nepal's vegetation mostly in terms of the expected vegetation. The whole of Nepal is divided up into naturally occurring vegetation associations ranging from the rocks and glaciers ecosystem of the High Himal to the *Shorea robusta* and *Dillenia pentagyna* lowland plains forest of the Terai. These maps mostly show only the potential vegetation. One hundred and eighteen separate ecosystem types were identified. The ecosystems as portrayed on these maps were digitised by BPP for inclusion into a GIS system. This was done to enable the analysis of the distribution and representativeness of ecosystems within Nepal's PAS (see Chapter 6). CNRS's classification clearly shows that the greatest biodiversity at the ecosystem level is found in Nepal in the Midhills. Thirty eight of Dobremez's ecosystems are found in the Highlands compared with 53 in the Highlands, 10 for the Terai and 13 for the Siwaliks.

Stainton (1972) classified Nepal's vegetation by forest type. He identified 35 broad forest ecosystems occurring in Nepal that are defined, according to altitude and aspect in the hills, and by soil type and moisture in the lowlands (Jackson and Ingles, 1994).

### 3.4 Altitudinal classification

The distribution of Nepal's vegetation is governed by both regional (horizontal) and altitudinal (vertical) factors. Dobremez produced an overall altitudinal classification of Nepal's vegetation. His six bioclimatic zones ranging from Nival through Alpine, Sub-alpine, Temperate and Sub-tropical to Tropical correspond with the LRMP's physiographic zones (Table 3-1). These altitudinal ranges are only general cut-off points and parts of the upper and lower limits of each type overlap with for example areas of the Siwalik rising to 1800 m. However these divisions do largely correspond with Dobremez's bioclimatic zones (Table 3-1).



**Table 3-1 Corresponding bioclimatic and physiographic zones**

<b>Bioclimatic zones</b> (Dobremez, 1972)		<b>Corresponding physiographic zones</b> (LRMP)
Nival	(above 5000 m) . . . . .	High Himal
Alpine	Upper (from 4501 to 5000 m)	. . . . . High Mountains
	Lower (from 4001 to 4500 m)	
Sub-alpine	Upper (from 3501 to 4000 m)	. . . . . Midhills
	Lower (from 3001 to 3500 m)	
Temperate	Upper (from 2501 to 3000 m)	. . . . . Siwaliks
	Lower (from 2001 to 2500 m)	
Sub-tropical	Upper (from 1501 to 2000 m)	. . . . . Terai
	Lower (from 1001 to 1500 m)	
Tropical	Upper (from 501 to 1000 m) . . . . .	. . . . . Terai
	Lower (below 500 m) . . . . .	

### 3.5 Biogeographical classification adopted by BPP

The BPP adopted and adapted the approaches of a number of the above classification systems to categorise the plant and animal diversity of the Highlands and to analyse the representativeness of the PAS.

The High Himal and High Mountains are classified as one biotic province; a distinct biogeographical sub-unit within the Palearctic Realm broadly encompassing the area above 3000 m. Most mammal species found above this level, such as the mouse hares (*Ochotona* spp.) and Great Tibetan Sheep (*Ovis ammon*) are distinctively Palearctic. Stearn's divisions were adopted for the sub-regional, horizontal classification (Table 3-2). These three sub-regions correspond with Nepal's major river systems - the Karnali, Gandaki and Kosi - defined by degrees of longitude. The one adaptation that BPP made to Stearn's classification was by using 83° 28' E rather than the 83° E longitude line as the bounding line between the western and central Highlands sub-regions. This is the longitude of the Kali Gandaki River - a significant biogeographic divide. These sub-regions provide a sufficient level of detail for describing the distribution of both flora and fauna elements. This classification system was applied throughout the processing of the flora and fauna elements as there was no reason to adopt separate systems. Ease of data processing and the comparison of the data also stipulated this approach.

**Table 3-2 Highlands sub-regions**

Sub-region	Longitude	Corresponding River system
Western Highlands	west of 83° 28' E	Karnali (+ Mahakali)
Central Highlands	between 83° 28' E and 86° E	Gandaki
Eastern Highlands	east of 86° E	Kosi (+ Mechi)

For the altitudinal distribution, the bioclimatic zonation on an altitudinal scale, as developed by Dobremez (1972) was followed (Table 3-1). Dobremez's detailed classification of Nepal's vegetation produced in map form were used to produce the vegetation maps of Nepal's 14 protected areas.



## 4. BIODIVERSITY

This chapter gives an overview of the species of fauna and flora found in the Highlands and compares their occurrence with that nationwide. The text is backed up by data and species lists given in the appendices. This chapter begins with a description of the ecosystems found across the Highlands. The biological diversity of the flora and fauna is detailed both at the order and species level. Current knowledge on the distribution pattern of the fauna and flora is followed by a review of Nepal's threatened species, focusing on the Highlands. Species extinction and levels of endemism complete the biodiversity overview.

### 4.1 Major ecosystems

Dobremez and his team of French and Nepali botanists mentioned 113 vegetation types in their ecological maps of Nepal. They distinguished 38 types in the highlands above 3000m altitude. The extent of these types within and outside PAS is given in chapter 6. The vegetation of the highlands is determined by the phytogeographical pattern of species distribution, altitude and the effect of the precipitation levels.

In general, the bioclimate throughout the length of the Himalaya above 3000m altitude is uniform as indicated by the pan-himalayan distribution pattern of many conspicuous species like *Abies spectabilis*, *Betula utilis*, *Quercus semecarpifolia*, *Juniperus recurva*, *J.indica*, *Rhododendron arboreum*, *R.barbatum*, *R.companulatum* etc. However there are notable east-west differences in extent of the distribution of equally conspicuous species. For example the east Himalayan silver fir, *Abies densa*, east Himalayan larch, *Larix griffithiana* do not occur westward from east Nepal. Similarly the west Himalayan spruce, *Picea smithiana*, the west-Himalayan Silver Fir, *Abies pindrow* do not occur eastward beyond central Nepal and western Nepal respectively. These examples show distinct ecological identities of the eastern and western highlands of the Himalaya in phytogeographical sense. Concentration of the highland species of *Rhododendron* in eastern Nepal is another example in this regard. The distribution of the number of *Rhododendron* species in Nepal Himalaya, in fact, attenuate from Eastern Nepal with 28 to five in Western Nepal.

The altitudinal distribution of Highlands ecosystem divides the Highlands into three zones: (i) alpine zone between 3000m and the tree-line; (ii) Alpine zone between the tree line and the snow-line and (iii) Nival zone above around 5000m with permanent snow cover. The sub-alpine zone occurs between 3000 and 4200 m in the west and between 3000 and 4000m in the east. This zone is heavily forested and due to the sparser population, its forests are still largely in good condition. Three main forest types are found. *Abies spectabilis* forest is associated in the west with *Quercus semecarpifolia* and occurs up to 3700m. In central and eastern Nepal *Quercus semecarpifolia* forest occurs only up to 3500m and *Abies spectabilis* forest with an understorey of *Rhododendron*, *Betula*, *Acer* spp., *Sorbus* spp. etc. occur up to the tree line. *Larix* (*L.griffithiana* in the east and *L.himalaica* in the centre) are found in pockets or in association with *Abies*. Over most of Nepal *Betula utilis* forest, usually in pure stands with an understorey of *Rhododendron* is the forest type that runs up to the tree-line. In wetter areas in the east, *Rhododendron* shrubberies that are composed of one or more *Rhododendron* species, are found around the tree-line. These species include *R.campanulatum*, *R.thomsonii*, *R.campylocarpum*, *R.wightii*, *R.cinnabarinum*, *R.fulgens*. The main human disturbance of these areas is due to seasonal grazing. Many of the grasslands found in the Highlands below the tree-line are the result of clearing of the forest by cattle herders to increase the extent of grazing areas.

The Alpine zone is the area between the tree-line and the region of perpetual snow line. The conditions here are too harsh for trees and the vegetation comprises low cushions of *Rhododendron* species like *R. anthopogon*, *R. setosum* in the comparatively wetter areas and juniper shrub in the drier sunny slopes. Above the snow-line a few algae and lichen species are found.

Considerable areas of the Highlands in western Nepal lie in the north of the Himalaya. The main influence on the vegetation of these areas are the strong winds and the low level of rainfall caused by the rain shadow effect of the Himalaya. These areas are characterized by steppic formations. The main species are low growing, drought resistant plants, principally *Caragana* spp. *Hippophae rhamnoides*, *Cotoneaster* spp. etc. In areas with 350 to 500mm of rainfall *Juniperus indica* steppe occurs. In areas with less than 250mm *Caragana* steppe vegetation with low cushion plant formations are found.

## **4.2 Flora**

### **4.2.1 Flowering plants**

To date 5160 species of flowering plants (angiosperms) have been recorded from Nepal (Hara, 1966; Hara *et al.*, 1978; Hara and Williams, 1979; Hara *et al.*, 1982, etc). The World Conservation Monitoring Centre (1992) however gives the higher estimated figure of 6500 species. This same study ranked Nepal as the country with the joint tenth highest flowering plant diversity in Asia out of 25 countries. All but Myanmar (ranked ninth), of those countries ranked above Nepal, have considerably larger areas, such as China and India. On a world scale Nepal lies 27th this reflecting not only the richness of Nepal's but also of Asia's flora.

The Highlands physiographic zones correspond to three bioclimatic zones: the sub-alpine, alpine and nival zones ranging from 3000m to 8000+m altitude.

Table 4-1 shows the distribution of flowering plants in Nepal by physiographic with corresponding bio-climatic zones in terms of their eastern, central and western occurrence. For the Highlands 1929 species accounting for over 37 % and 219 species (or 4 %) of the country's total flowering plant species from the High Mountain and High Himalaya physiographic zones respectively. The floral biodiversity at the species level for the Highlands is considerably lower than those of the Midhills. All flowering plants recorded for the Highlands are listed in Appendix 4-2.

Analysis on the horizontal distribution as given in Table 4-1 further illustrates that central Nepal being the floristically transitional area between the eastern and the western Himalayas, harbours the largest number of species evidence of a higher level of floral diversity than that of western or eastern Nepal.

### **4.2.2 Gymnosperms**

Amongst the vascular plants the gymnosperms have been comparatively well worked out. Altogether nineteen species are indigenous to Nepal, of which ten occur in the Highlands. The list of gymnosperms is given in Appendix 4-3.

**Table 4-1**      **Distribution of flowering plants in different physiographic (with corresponding bioclimatic) zones**

Physiographic (Bioclimatic) zone	Regions			Total	%
	West	Cent	East		
High Himalaya (Nival)	158	181	130	219	4.2
High Mountain (Alpine + Sub-Alpine)	1123	1602	1125	1929	37.4
Mid Hill (Temperate + Sub-Tropical)	1676	2727	2225	3364	65.2
Siwalik + Terai (Tropical)	766	1420	1444	1885	36.5
<b>Nepal</b>				<b>5160</b>	

Source: BDP/BPP

**4.2.3      Pteridophytes**

In comparison to the flowering plants, the non-flowering plants have been less studied. For the Pteridophytes (ferns and fern allies) an enumeration has been compiled by Iwatsuki (1988). Based on this enumeration the occurrence of individual species has been plotted on distribution maps (BPP 1995a, Appendix 4-4). Most species have been recorded in the eastern sub-region (258). No species are recorded for western Nepal which reflects the lack of studies rather than the actual distribution (Table 4-2). Western Nepal awaits investigation and overall more detailed information on distribution is required. In terms of regional distribution the temperate and sub-tropical bioclimatic zones (corresponding with the Midhills physiographic zone) are the most diverse with 272 (or 71.6%), followed by the tropical bioclimatic zone (81 species or 21.3%) (Table 4-3).

**4.2.4      Bryophytes**

The Bryophytes (mosses and liverworts) have also been little studied and nothing is known of the distribution of these plants in western Nepal - with no species recorded (Table 4-2). Eastern Nepal has the highest number of bryophytes with 627 species - 85% of all known bryophytes from the country (Table 4-2). Based on the present available information (Kattel and Adhikari, 1992) who give district-wise occurrence, each species' distribution are mapped individually (BPP 1995a, Appendix 4-5).

**Table 4-2 Regional distribution of Bryophytes and Pteridophytes of Nepal**

Region	Bryophytes	Pteridophytes
Western Nepal	0	0
Central Nepal	283	97
Eastern Nepal	627	258
Nepal	740	380

Source: BDP/BPP

**Table 4-3 Distribution of Bryophytes and Pteridophytes in different physiographic (with corresponding bioclimatic) zones**

Physiographic (Bioclimatic) zone	Bryophytes		Pteridophytes	
	No. of sp.	%	No. of sp.	%
High Himalaya (Nival)	0	0.00	1	0.26
High Mountain (Alpine + Sub-Alpine)	347	46.89	78	20.53
Mid Hill (Temperate + Sub-Tropical)	493	66.62	272	71.58
Siwalik + Terai (Tropical)	61	8.24	81	21.32
<b>Nepal</b>	<b>740</b>		<b>380</b>	

Source: BDP/BPP

#### 4.2.5 Other floral elements

Other floral elements include the algae, fungi and the lichens. The BPP produced enumerations of the lichens and algae (BPP, 1995 g and h). Of the 687 Nepalese algae species 499 have been recorded from the Highlands. One 160 of the 465 lichen species found in Nepal are recorded from the Highlands. These figures however reflect the bias in areas studied rather than the actual distribution. Although little is known of their distribution, 1500 species of fungi have been recorded in Nepal (HMG, 1993a).



### 4.3 Fauna

Although Nepal is a small country - stretching on average 855 km from east to west and 193 km from north to south - it holds a relatively high number of faunal species (Table 4-4). Six hundred and thirty five butterfly species have been recorded accounting for 4.2% globally known butterflies, 2.2 % of the globally known fresh-water species. Forty-three species of amphibians (1.1 % of global species) and 100 reptile species (1.5 %) have been recorded for Nepal. Nepal is home to 844 bird species representing 8.5% of the world's species and 181 mammal species - 4.2% of the global total. All of these figures will inevitably increase as science advances and new areas are studied. For example, Nepal's bats and rodents have been little studied. Further surveys on the occurrence and distribution of bats could easily yield 16 new species already reported from the Indian Terai. Even new large mammal species may await discovery as suggested by the recent (1994 and 1995) discovery in southeast Asia by MacKinnon of two species, including a new genus resembling a goat-deer cross.

For the fauna this work has covered only the higher faunal groups; the vertebrate groups including fishes, reptiles, amphibians, birds and mammals. The exception to this is that the butterflies have been included as much is known about their taxonomy and distribution.

**Table 4-4 Nepalese butterfly and vertebrate species in a global context**

Taxons	Global (1994) #1	Nepal (1995) #2	Nepalese spp. as % of global
Butterflies	15 000	635	4.2
Freshwater fishes	> 8 500	185	2.2
Amphibians	> 4 000	43	1.1
Reptiles	> 6 500	100	1.5
Birds	9 883	844	8.5
Mammals	4 327	181	4.2
<b>Total</b>	<b>48 210</b>	<b>1 988</b>	<b>4.1</b>

Source: #1 revised after HMSO, 1994

#2 enumeration reports produced by BPP (1995c,e,d)

#### 4.3.1 Butterflies

Six hundred and thirty five species of butterflies have been recorded from Nepal (Table 4-5). Of these 82 (13%) are found in the Highlands. Most of the country has been covered by studies and this data reflects the actual distribution.

Appendix 4-6 shows the status and distribution of butterflies found in the Highlands.

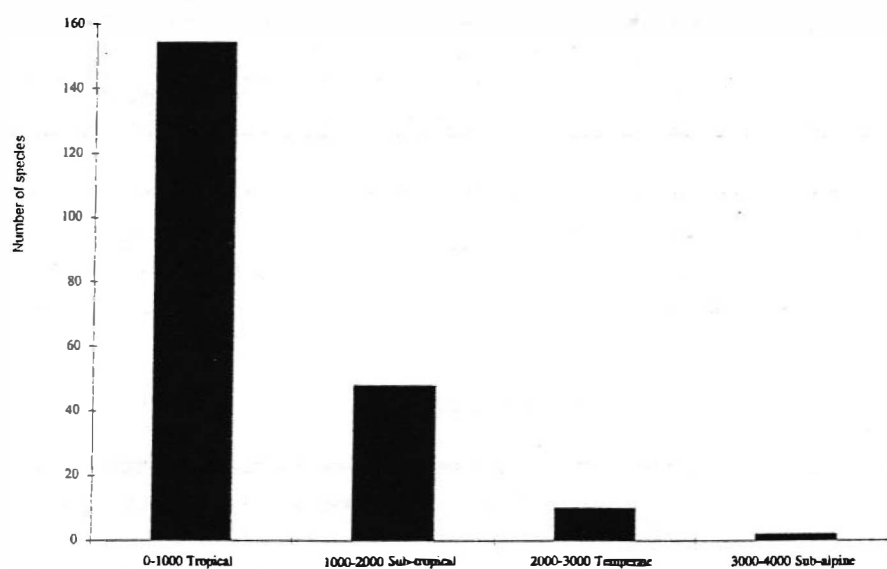
**Table 4-5 Distribution of butterflies by physiographic zone**

	Highlands	Midlands	Terai	Total
Palearctic	43	17	4	44
Himalayan	31	151	7	152
Oriental	8	389	314	439
<b>Total (100%)</b>	<b>82</b>	<b>557</b>	<b>325</b>	<b>635</b>

#### 4.3.2 Fish

One hundred and eighty five species of fish belonging to 11 orders have been recorded from Nepal. Eight endemic fish species are found in Nepal. Small populations of an exotic species Rato Macha (*Carrasius carrasius*) have become naturalized in the ponds of Nepal. The number of fish species found in river systems is related to the temperature and the rate of flow. The warmer the climate and the gentler the flow, the higher the number of fish species. All the 11 orders of fish reported from Nepal are found in Terai and Siwaliks, eight in the Midlands and only one in the Highlands. The highest number of fish species - 154 species (83%) are found in the Terai/Siwaliks followed by 76 (41%) of the species in the Midlands and only six (3%) of the species of fish have been recorded in the Highlands (Table 4-6 and Figure 4-1). The low number of fish occurring at high altitudes is due to the prevalent adverse ecological conditions such as steep gradient of the streams and the cold temperatures. The fish assemblage in Nepal's rivers are influenced by factors of geography (e.g. stream gradient, altitude), water quality (e.g., hardness, alkalinity) and stream hydraulics (e.g., current speed, substrate type), (Edds, 1989). Most of the country has been covered by studies and the data presented reflects the actual distribution.

Appendix 4-7 shows the status and distribution of fish species found in the Highlands.

**Figure 4-1 Occurrence of fish species by bioclimatic zone****Table 4-6 Occurrence of fish species by physiographic zone**

Order	Nepal	Terai/Siwaliks	Midhills	Highlands
Clupeiformes	5	5	0	0
Cypriniformes	150	130	67	6
Anguilliformes	1	1	1	0
Beloniformes	1	1	1	0
Cyprinodontiformes	2	1	1	0
Channiformes	6	6	3	0
Synbranchiformes	1	1	1	0
Perciformes	12	12	1	0
Mastacembeliformes	4	4	1	0
Muguliformes	2	2	0	0
Tetraodontiformes	1	1	0	0
<b>Total orders</b>	<b>11</b>	<b>11</b>	<b>8</b>	<b>1</b>
<b>Total species</b>	<b>(100%) 185</b>	<b>(83.2%) 154</b>	<b>76 (41.1%)</b>	<b>6 (3.2%)</b>
Number of confined species	(endemic) 8	103	15	3

Source: BPP, 1995e

### 4.3.3 Herpetofauna

One hundred and forty-three species of amphibians and reptiles belonging to six orders have been recorded for Nepal, of which 90 species of five orders are found in the Terai and Siwaliks. (Table 4-7). The greatest diversity of herpetofauna is found in the Terai and Siwalik (90 species) followed by Midhills (85 species), with only 22 species in the Highlands. This is as expected given the cold-blooded nature of the herpetofauna.

The order Anura represents the highest number of Highlands species (9 species); other major orders are Sauria (7 species), and Serpentes (6 species). Appendix 4-8 shows the status and distribution of herpetofauna species found in the Highlands.

**Table 4-7 Distribution of herpetofauna by physiographic zone**

Order	Nepal	Terai & Siwaliks	Midhills	Highlands
CAUDATA	1	0	1	0
ANURA	42	22	28	9
CROCODYLIA	2	2	0	0
TESTUDINES	14	13	2	0
SAURIA	24	11	17	7
SERPENTES	60	42	37	6
<b>Total orders</b>	<b>6</b>	<b>5 (1 confined)</b>	<b>(1 confined) 5</b>	<b>3</b>
<b>Total species</b>	<b>143</b>	<b>(63%) 90</b>	<b>(59%) 85</b>	<b>(15%) 22</b>
Confined species	Endemic species 10 and 1 endemic ssp.	43	26	5

Source: BPP, 1995d

### 4.3.4 Birds

Eleven bird species have become extinct in Nepal over the last century (BPP, 1995i) and hence these species have been excluded here. The order Passeriformes has the highest representation with 465 species (Table 4-8). Other major bird orders are Charadriiformes with 68 species, Falconiformes (59 species), Piciformes and Anseriformes (33 species each), Ciconiiformes (27 species), Galliformes (21 species) and Gruiformes, Columbiformes and Strigiformes with 20 species each and Coraciiformes (19 species).

**Table 4-8 Distribution of birds species by physiographic zone**

Order	Nepal	Terai & Siwaliks	Midhills	Highlands
GAVIFORMES	3	3	3	3
PELECANIFORMES	5	4	5	1
CICONIFORMES	27	27	21	4
ANSERIFORMES	33	26	26	18
FALCONIFORMES	59	52	56	48
GALLIFORMES	21	8	15	13
GRUIFORMES	20	20	15	4
CHARADRIIFORMES	68	64	56	29
COLUMBIFORMES	20	15	17	11
PSITTACIFORMES	6	6	5	1
CUCULIFORMES	18	17	18	7
STRIGIFORMES	20	13	18	9
CAPRIMULGIFORMES	4	4	3	1
APODIFORMES	10	10	8	5
TROGONIFORMES	1	1	1	0
CORACIIFORMES	19	18	14	5
PICIFORMES	33	28	25	8
PASSERIFORMES	465	333	386	246
<b>Total order</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>17</b>
<b>Total species</b>	<b>833</b>	<b>648</b>	<b>691</b>	<b>413</b>
Confined species	2 endemic species	111	29	24

Four hundred and thirteen bird species belonging to 17 orders are found in the Highlands physiographic zone (Table 4-8). The highest number of species (246) is represented by the order Passeriformes. Other major orders are Falconiformes with 48 species and Charadriiformes (29 species), Anseriformes (18 species), Galliformes (13 species) and Columbiformes (11 species). Orders represented by five to ten species are Strigiformes, Piciformes, Cuculiformes, Apodiformes and Coraciiformes. Orders represented by less than 5 species are Ciconiformes, Gruiformes, Gaviformes, Psittaciformes and Pelecaniformes, and Caprimulgiformes. Twenty four bird species, mainly Palearctic species, are confined to Nepal's Highlands. Appendix 4-9 shows those species confined to the Highlands and also those only found in one of the three sub-regions.

#### 4.3.5 Mammals

One hundred and eighty one species of mammals including three now considered extinct have been recorded in Nepal. The major mammalian orders represented in Nepal are Carnivora - carnivores - (including one species, now extinct) and Rodentia - the rodents - with 43 species each; Chiroptera - the bats - with 38 species; Artiodactyla - the even-toed ungulates - with 22 species (including 2 species now extinct); Insectivora - insectivores with 15 species and Lagomorpha - hares and pikas with 10 species. Primates are represented by three species; Pholidota (pangolin), Perissodactyla (odd-toed ungulates) and the Scandentia - the tree shrews - by two species each. The orders Proboscidea (elephants), and Cetacea (whales, porpoises and dolphins) are represented by one species each with the latter - the Ganges-Indus Dolphin being the one truly aquatic mammal species found in Nepal.

The highest number of mammal orders is found at the low altitudes of below 1000 m. In the Highlands 8 mammalian orders including 80 species are represented (Appendix 4-9). The Midhills are however, due to their large range of ecosystems and micro-habitats, home to the largest number of mammal species 110 in nine orders.

**Table 4-9 Distribution of mammal species by physiographic zones**

Order	Nepal	Terai & Siwaliks	Midhills	Highlands
PHOLIDOTA	2	1	1	0
INSECTIVORA	15	3	12	10
SCANDENTIA	2	1	2	0
CHIROPTERA	37	16	26	5
PRIMATES	3	3	3	2
CARNIVORA	(1 EXN) 43	(+1 EXN) 29	28	23
CETACEA	1	1	0	0
PROBOSCIDEA	1	1	0	0
PERISSODACTYLA	2	1	0	1
ARTIODACTYLA	(2 EXN) 22	(+2 EXN) 13	8	11
RODENTIA	43	20	28	20
LAGOMORPHA	10	2	2	8
<b>Total order</b>	<b>12</b>	<b>12</b>	<b>9</b>	<b>8</b>
<b>Total species</b>	<b>(3 EXN) 181</b>	<b>+3 EXN 91</b>	<b>110</b>	<b>80</b>
Confined order		2		
Confined species	1 endemic species	30	32	30

Source: BPP, 1995i  
EXN = extinct

In the Highlands the highest number of mammal species are in the order Carnivora (23 species), Rodentia (20 species), followed by the orders Artiodactyla (11 species), Insectivora (10 species), and Chiroptera (5 species). The Primates are represented by only two species.

In Nepal, the orders Cetacea and Proboscidea, occur only in the Terai and Siwaliks. Almost an equal number of mammal species have their ranges restricted to one of Nepal's three main physiographic zones with 30 species in the Terai-Siwaliks, 32 in the Midhills and 30 in the Highlands (Table 4-9) almost denoting equal diversity for restricted species in these three sub-regions.

#### 4.4 Distribution pattern in the Highlands

##### 4.4.1 Flora

Both the distribution of flora elements as well as forest formations of the Highlands are very complex. The general pattern of most dominant forest ecosystems is given in Figure 4-2.

**Figure 4-2** Distribution of major forest ecosystems by altitude and by horizontal orientation

Altitude m.	Bioclimatic Zone	Characteristic forest formation		
		Western Nepal	Central Nepal	Eastern Nepal
4000-5000	Alpine	Grasses & herbs <i>Juniper</i> , <i>Salix</i> scrubs	Grasses & herbs <i>Rhododendron</i> scrubs	Grasses & herbs <i>Rhododendron</i> scrubs
3700-4000	Subalpine (superior)	<i>Betula utilis</i> - <i>Rh. campanulatum</i>	<i>B. utilis</i> - <i>Rh. campanulatum</i>	<i>B. utilis</i> - <i>Rh. campanulatum</i>
3000-3700	Subalpine (inferior)	<i>Abies spectabilis</i> <i>Q. semecarpifolia</i> <i>Betula utilis</i>	<i>Abies spectabilis</i> <i>Betula utilis</i>	<i>Abies spectabilis</i> <i>Rhododendron</i> sps.

Source: Shrestha, 1982

The Highlands' sub-alpine and alpine bio-climatic zones show remarkable changes both within a sub-region and within a bioclimatic zone across Nepal as illustrated in Figure 4-3.

Nepal's physiographic ruggedness has led to strong isolation of a number of Himalayan valleys and high peaks, which in turn facilitated a high level of endemism. To date 246 plant species have been recorded as endemic (Shrestha and Joshi, 1992). The distribution of the *Aconitum* taxa within the Himalaya may serve as an example (Figure 4-4 refers). The figure also reveals pathways of migration and underlines the importance of Nepal as an area of "interpenetration and limitation" (Stearn 1960). Fourteen taxa (12 species and 2 varieties) of *Aconitum* species out of the 31 recorded for Nepal are endemic. Among the Nepalese species only six extend into Kumaon; 12 extend to Sikkim and 14 to Bhutan (Dobremez and Shrestha, 1980).



**Figure 4-3      Distribution of major forest ecosystems in Eastern Nepal**

Nival > 5000m			
Upper Alpine 4500-5000m			
Lower Alpine 4000-4500m	Moist Alpine scrub	Dry Alpine scrub	<i>Juniperus wallichiana</i> forest
Upper Sub-alpine 3500-4000m	<i>Rhododendron</i> forest	<i>Larix</i> forest	<i>Betula utilis</i> forest
Lower Sub-alpine 3000-3500m			

Source: Stainton 1962 op cit Dobremez and Shaikya 1975, page 14.

**Figure 4-4 Horizontal distribution of Aconitum species (Dobremez and Shrestha, 1980)**

	Alghanistan	Cachemire	Kumase	West Nepal	Central Nepal	East Nepal	Sikkim	Butan	Luzon	S.E. Tibet	N. Burma	W & C China
<i>Aconitum rotundifolium</i>												
<i>A. heterophyllum</i>												
<i>A. laeve</i>												
<i>A. violaceum</i>												
<i>A. halimii</i>												
<i>A. deionthizum</i>												
<i>A. halangense</i>												
<i>A. himm</i>												
<i>A. ferox</i>												
<i>A. naviculare</i>												
<i>A. naviculare</i> var. <i>leicarpum</i>												
<i>A. pohlii</i>												
<i>A. spiratum</i>												
<i>A. taurianum</i>												
<i>A. anplexicaule</i>												
<i>A. dhawjii</i>												
<i>A. gannici</i>												
<i>A. heterophylloides</i>												
<i>A. hookeri</i>												
<i>A. laciniatum</i>												
<i>A. nepalense</i>												
<i>A. orochryseum</i>												
<i>A. williamsii</i>												
<i>A. alpinonepalense</i>												
<i>A. angulatum</i>												
<i>A. bluedingense</i>												
<i>A. deltoideum</i>												
<i>A. elwesii</i>												
<i>A. jucundum</i>												
<i>A. laciniatum</i> var. <i>fraxiflexum</i>												
<i>A. novakuridum</i>												
<i>A. pulchellum</i>												
<i>A. stantonii</i>												
TOTAL	1	4	6	13	17	20	12	14	5	6	1	1

#### 4.4.2 Fauna

This section details the distribution pattern of the vertebrates for the Highlands as compared to the other physiographic zones. The occurrence of species whose Nepalese distribution is confined to the Highlands and the regional and altitudinal distribution within the Highlands are also delineated.

The number of vertebrate species found in the Terai/Siwaliks is 983, where as in the Midhills it is just 962. Only 521 vertebrate species are found in the Highlands (Table 4-10). Sixty two species of vertebrates are confined to the Highlands of which are 3 fish, 5 herpetofauna (3 amphibians and 2 lizards), 24 bird species and 30 mammal species (Table 4-11).

**Table 4-10 Distribution of butterfly and vertebrate species by physiographic zone**

Group	Nepal #1	Terai and Siwaliks		Midhills		Highlands	
		spp.	%	spp.	%	spp.	%
Butterflies	635	325	51.2	557	87.7	82	12.9
Freshwater fishes	185	154	83.2	76	41.1	6	3.2
Amphibians	43	22	51.2	29	67.4	9	20.9
Reptiles	100	68	68.0	56	56.0	13	13.0
Birds	844	648	*77.8	691	*83.0	413	*49.7
Mammals	181	91	*51.1	110	*61.5	80	*45.0
<b>Total*</b>	<b>1988</b>	<b>1308</b>	<b>*66.3</b>	<b>1519</b>	<b>*77.0</b>	<b>603</b>	<b>*30.5</b>

Source: #1 various enumeration reports produced by BPP (1995)

Note: \* excluding 11 extinct bird and 3 extinct mammal species

**Table 4-11 Distribution of butterfly and vertebrates in the Highlands**

Sub-regions	Groups						
	But	Fish	Amp	Sna	Liz	Bir	Mam
West	56	3	3	3	3	281	57
Centre	54	3	8	5	5	395	65
East	35	-	6	2	2	300	55
No. spp found in all 3 Highlands sub-regions	11	-	2	1	1	215	41
<b>Total species in Highlands</b>	<b>82</b>	<b>6</b>	<b>9</b>	<b>6*</b>	<b>7</b>	<b>413</b>	<b>80</b>
Number of Highlands confined spp.	28	3	3	-	2	24	30
Legend: But Butterflies Amp Amphibians Sna Snakes (including two subspecies of <i>T. albolabris</i> ) Liz Lizards Bir Birds Mam Mammals							

Source: Inskipp, 1991 and BPP, 1995c,d,e

**i) Butterflies**

Eighty two species of butterflies have been recorded in the Nepal Highlands. Of these 43 are of Palearctic origin (Table 4-12) representing seven families (Table 4-13). (Table 4-14).

**Table 4-12 Butterflies recorded in the Nepal Highlands**

Type	No. of species
Palearctic	43
Himalayan	31
Oriental	8

The important butterfly families occurring in the Highlands are Satyridae represented by 20 species, Lycaenidae and Nymphalidae each with 17 species and Pieridae with 15 species. (Table 4-13)

**Table 4-13 Number of Highland butterflies per families**

Family	No. of species
Papilioindae	7
Pieridae	15
Lycaenidae	17
Nymphalidae	17
Satyridae	20
Danaidae	1
Hesperiidae	5

Of the 82 butterfly species recorded for the Highlands 28 species (34 %) are Highlands confined species (Table 4-14). The central subregion of the Highlands supports the highest number of Highlands confined species (19).

**Table 4-14 Highlands confined butterfly species**

Region	Species found in Highlands	Species found in Highlands only
West	56	15
Central	44	19
East	35	10
<b>Total</b>	<b>82</b>	<b>28</b>

## ii) Fish

One-hundred and eighty five fish species have been recorded for Nepal of which four have been reported from the Highlands. The distribution of the following three fish species (Asla) is Highlands confined: *Schizothorax macropthalmus*, *S. nepalensis* and *S. raraensis*; these fish species are endemic to Nepal and were recorded from the Rara Lake.

## iii) Amphibians and reptiles

### Amphibians

Fourty-three species of amphibians have been reported from Nepal with 42 belonging to the order Anura and one to the order Caudata (Appendix 4-8). Nine species of Amphibians are found in the Highlands and three of these are found exclusively in the Highlands includes: *Scutiger alticola*, *Scutiger sikkimensis* and *Rana leibigii*.

### **Turtles**

Fourteen turtle species (order Testudines) have been reported for Nepal and none were recorded for the Highlands, which can be attributed to adverse ecological conditions (such as prevalent cold temperatures).

### **Lizards**

Twenty five species of lizards (order Sauria) have been recorded for Nepal with seven species found in the Highlands (Appendix 4-8). The distribution of two lizard species is confined to the Highlands physiographic zone: *Japalura major* and *Hemidactylus garnotti*.

### **Snakes**

Six species of snakes (order Serpentes) have been reported from the Highlands (Appendix 4-8). The largest number of snake species (five) are recorded from the central Highlands sub-region with three from the western and two from the eastern sub-region.

## **iv) Birds**

By far the richest areas for Nepal's birdlife is the lowland tropical forests below 300m in the Terai where over 500 species have been recorded (Inskipp and Inskipp, 1991). Four hundred and thirteen bird species have been recorded in the Highlands accounting for about 50 % of all species recorded for Nepal (Table 4-8). These species are listed in Appendix 4-10. The occurrence of bird species is highest in the central sub-region (395 species) with 300 species reported from the eastern and only 281 species from the western subregion of the Highlands. This probably reflects the fact that the west has been poorly recorded compared to the other regions.

The highest concentration of confined bird species to a physiographic zone is found in the Terai and Siwaliks (111), with only 29 species confined to the Midhills and 24 to the Highlands (Table 4-15). Some of the important confined Highlands bird species include: Golden Eagle (*Aquila chrysaetos*), Booted Eagle (*Hieraaetus pennatus*), Tibetan Partridge (*Perdix hodgsoniae*), Snow Partridge (*Lerwa lerwa*), Tibetan Snow Cock (*Tetraogallus tibetanus*), Himalayan Snow Cock (*Tetraogallus himalayensis*), Hume's Ground Pecker (*Pseudopodoces humilis*), Raven (*Corvus corax*), White breasted Dipper (*Cinclus cinclus*), Red-fronted Rosefinch (*Carpodacus puniceus*) and the bird species belonging to the genus *Prunella spp.*, *Montifringilla spp.*

Some of the important breeding species of the highlands include: Ibisbill (*Ibidorhyncha struthersii*), Horned lark (*Eremophila alpestris*), Red-billed Chough (*Pyrrhocorax pyrrhocorax*), Alpine Chough (*Pyrrhocorax graculus*), Grandala (*Grandala coelicolor*), Guldenstadt's Redstart (*Phoenicurus erythrogaster*), Eurasian Goldfinch (*Carduelis carduelis*), Lammergeir (*Gypaetus barbatus*), Himalayan Griffon (*Gyps himalayensis*),

A number of migratory birds cross the Himalaya range at an altitude of 7000 m - 8000 meters or even higher. The high altitude transhimalayan migrants include: Common Crane (*Grus grus*), Demoiselle Crane (*Anthropoides virgo*), Bar-headed Goose (*Anser indicus*) and Greylag Goose (*Anser anser*).

**Table 4-15      Physiographic zone confined bird species**

	Terai & Siwaliks	Midhills	Highlands
No. of bird species	111	29	24

**Altitudinal distribution**

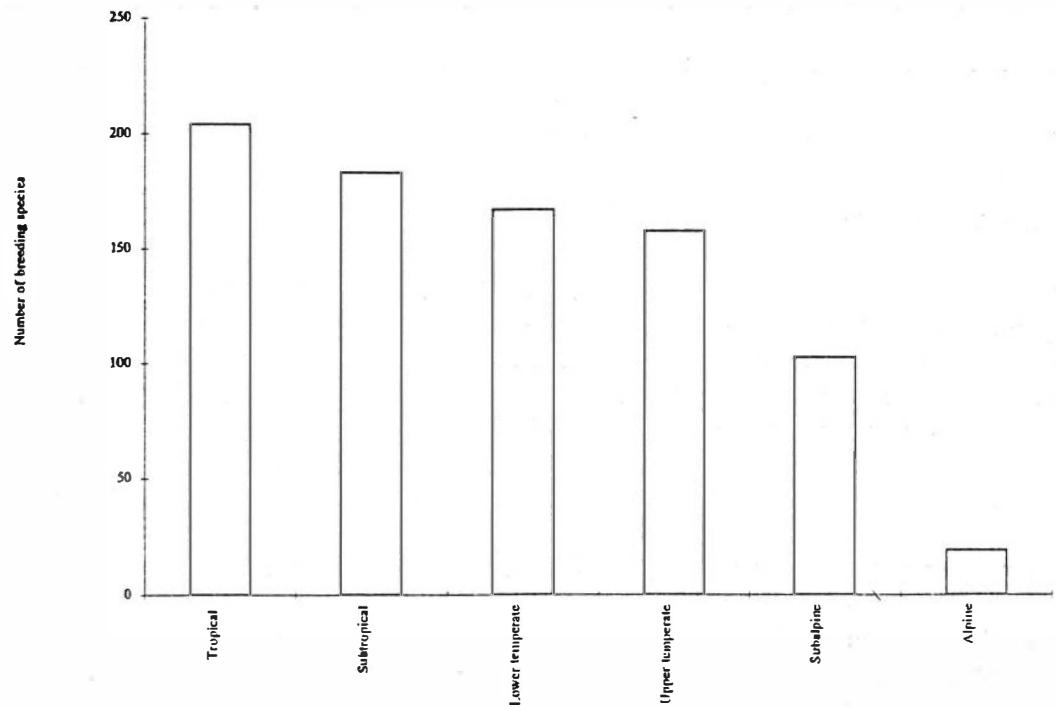
Altitudinal movement of the birds living in the Himalaya range is a common phenomenon. The north - south width of Nepal is 150 km. in average which is just an hour flight for the swift and other fast fliers. Within this distance there are six bio-climatic zones. Birds forage at one climatic zone and roost in another, this is especially common among the large scavengers and raptors. Altitudinal difference of a mountain may be between 1000 m to 3000m; a bird that breeds in between this altitude forage in the upper limits during summer months and descend in the winter or breed in the temperate and subtropical zone and perform post nuptial migration to the sub-tropical and tropical zones.

The number of breeding bird species in the Terai/Siwaliks and Midhills forest ecosystems is almost similar although the Terai/Siwaliks physiographic zone includes only one climatic zone (tropical, less than 1000 m), whereas the Midhills physiographic zone includes two climatic zones (subtropical 1000 - 2000 m, and temperate zone which could be subdivided in to; lower temperate 2000 - 2700 m and upper temperate zone 2700 - 3100 m). The highest number of breeding birds of the forest are found in the tropical climatic (204 species) zone of Nepal; the subtropical (183), lower temperate (167) and upper temperate (158) support similar number. The subalpine supports only 103 species while only 19 breeding birds are home to the alpine zone (Inskipp 1989). Figure 4-5 refers.

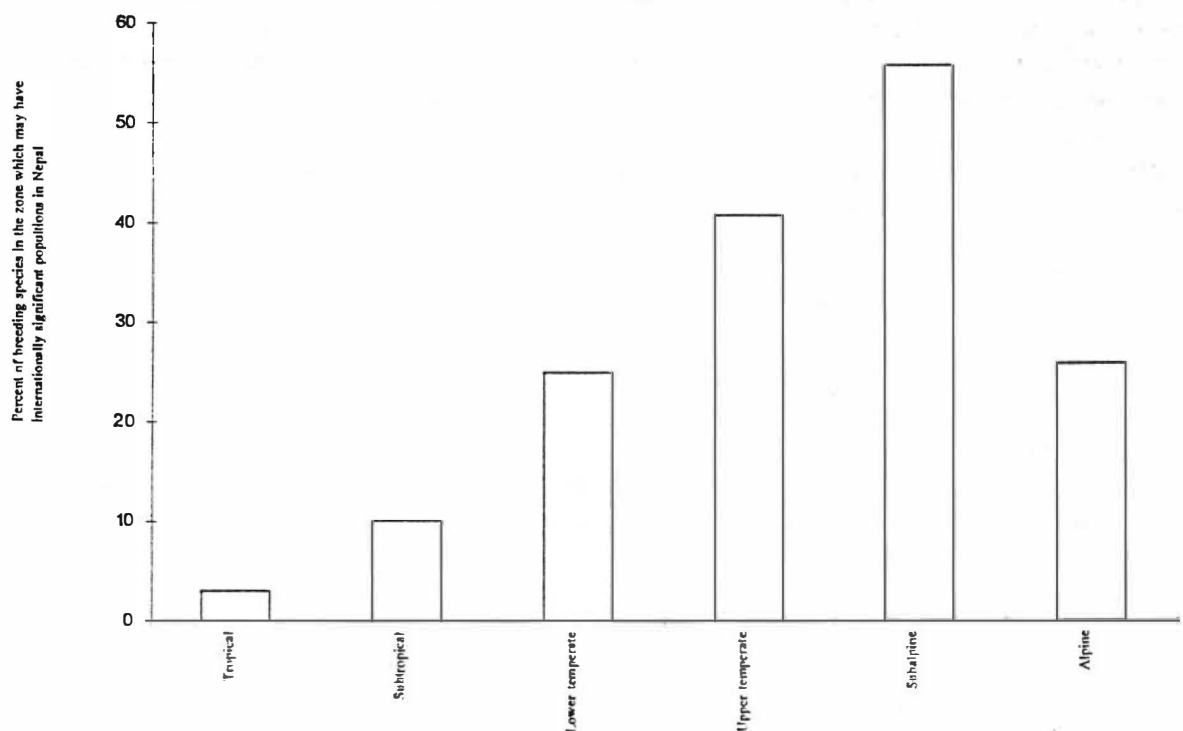
Sub-alpine and upper temperate supports the greater percentage of breeding birds (42 and 56) which are of international importance. Lower temperate and alpine both supports a similar percentage (25) with tropical zone only 3%. Figure 4-6 refers. The upper temperate and sub-alpine zone of the Himalaya provides the most important bird habitats, which has been recognized by Birdlife International as an important Endemic Bird Area (EBA) of international importance (ICBP 1992). In a national context the tropical zone has the highest number of breeding birds at risk, followed by subtropical, lower and upper temperate and only 6 in the sub-alpine. Figure 4-7 refers.

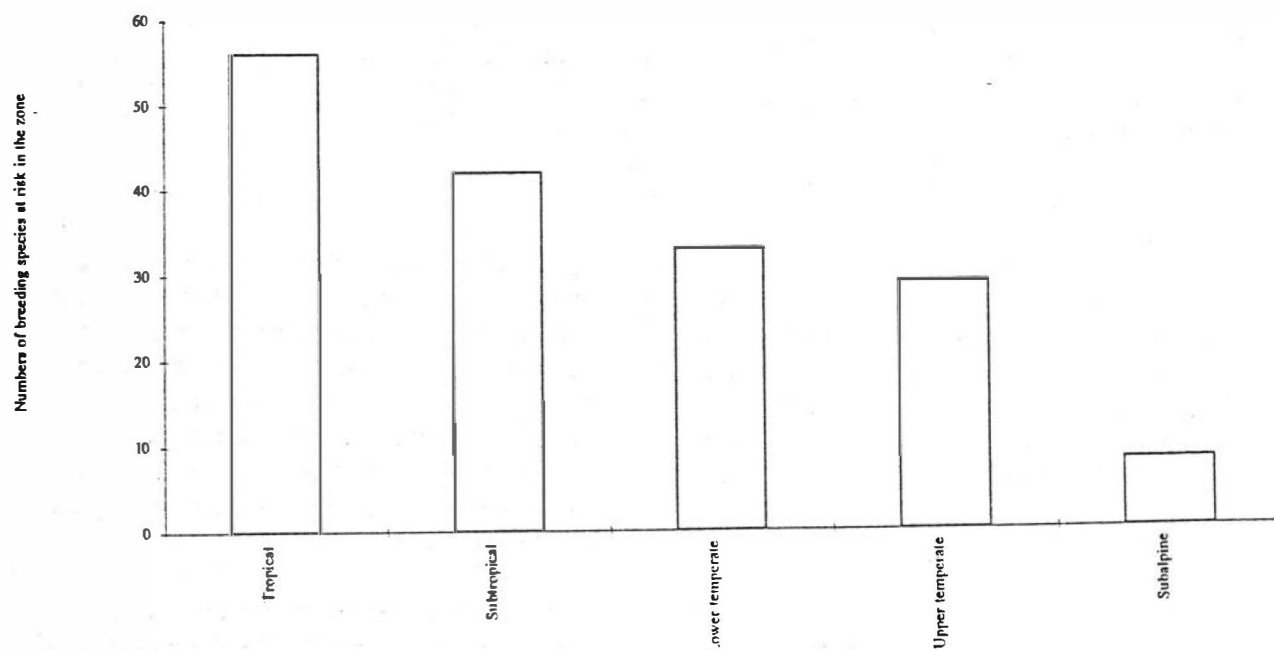


**Figure 4-5** Number of breeding birds in Nepal's climatic zones (Inskipp, 1989)



**Figure 4-6** Percentage of breeding birds in Nepal's climatic zones which may have internationally significant populations in the country (Inskipp, 1989)



**Figure 4-7** Number of breeding birds at risk in Nepal's climatic zones (Inskipp 1989)

#### v) Mammals

As altitude increases the number of mammalian orders decreases with all the 12 mammalian orders reported for Nepal present in the Terai and Siwaliks (Appendix 4-10), with nine orders in the Midhills and only eight in the Highlands. Within Nepal the highest number of species are of the order Carnivora and Rodentia with 43 species each (including one extinct carnivore species).

Of the 181 mammal species recorded for Nepal, 80 (45 %) occur in the Highlands. The highest number of species are reported from the central (65 species), followed by western (57 species); with the lowest number in the eastern Highlands subregion (55 species). The higher number of mammal species in the central Highlands could be attributed to it being at the junction of where the western (species related to the Palearctic region) and eastern (species related to the Indo-Chinese region) meet. Examples are Hanuman Langur (*Semnopithecus entellus*), Grey Wolf (*Canis lupus*), Brown Bear (*Ursus arctos*), Red Panda (*Ailurus fulgens*).

Eighty mammal species are recorded from the Highlands of which 30 species are confined to the Highlands. Two species restricted to the eastern sub-region of the Highlands are the Striped-backed Shrew (*Sorex bedfordiae*) and Vole (*Alticola stoliczkanus*) with two species confined in Nepal to the western subregion of the Highlands: Horsefields Shrew (*Crossidura horsefieldi*) and Hog Badger (*Arctonyx collaris*). Species confined to the central subregion of the Highlands include: Tibetan Sand Fox (*Vulpes ferrilata*), Ermine (*Mustela erminea*), Lynx (*Felis lynx*), Great Tibetan Sheep (*Ovis ammon*), Grey-headed Flying Squirrel (*Petaurista caniceps*), Royle's Vole (*Alticola roylei*), Vole (*Pitymus leucurus*), Moupin Pika (*Ochotona thibetanus*), Black-lipped Pika (*Ochotona curzoniae*),

and (*Ochotona daurica*). Fourteen species whose occurrence is confined Highlands to all the three subregion and also not to any one sub-region are: Brown Long-eared Bat (*Plectotus auritus*), Brown Bear (*Ursus arctos*), Siberian Weasel (*Mustela sibirica*), Mountain Weasel (*Mustela altaica*), Yellow-bellied Weasel (*Mustela kathia*), Snow Leopard (*Panthera uncia*), Wild Yak (*Bos mutus*), Tibetan Antelope (*Pantholops hodgsoni*), Bharal (*Pseudois nayaur*), Himalayan Marmot (*Marmota bobak*), Wood Rat (*Apodemus sylvaticus*), Woolly Hare (*Lepus oistolus*), Nubrica Pika (*Ochotona nubrica*), Himalayan Pika (*Ochotona himalaya*) and Pika (*Ochotona macrotis*).

### **Altitudinal distribution**

The Himalayan range has been considered by a number of authors as a zone of penetration and limitation (Stearn 1960, Dobremez 1980). Nepal's rich biodiversity is due in part by the occurrence of a large variety in altitude and climate over a short distance. The fauna assemblage is equally complex. Abe (1982) noted that differentiations in climatic adaptations leads smaller mammal species to separate altitudinal, or opt for adaptations in morphology, behaviour, or food habits (living terrestrial, arboreal, semi-fossorial or fossorial lifestyles). Sympatric species, species that occur together within the same geographical area must differ sufficiently to permit coexistence. Allopatric species, referring to species occupying different and disjunct geographical regions, have segregated altitudinally or geographically probably due to interaction between closely related species.

Abe (1960) recorded 23 small mammal species in the lower half of the temperate zone whilst 13 species were recorded in the upper half of the temperate zone, mainly within Rhododendron and coniferous forest zones. Figure 4-8 shows the altitudinal distribution of small mammals in Central Nepal.

**Figure 4-8**     **Altitudinal distribution of small mammals in Central Nepal**

	Bioclimatic zone				
	Tropical 0	Subtropical 1000	Temperate 2000	Subalpine 3000	4000
<i>Talpa micrura</i>			-----		
<i>Sorex minutus</i>				-----	
<i>Sorex cylindricauda</i>					-----
<i>Soriculus caudatus</i>			-----		
<i>Soriculus leucops</i>			-----		
<i>Soriculus baileyi</i>				-----	
<i>Soriculus nigrescens</i>			-----		
<i>Suncus etruscus</i>			-----		
<i>Suncus stoliczkanus</i>	-----				
<i>Suncus murinus</i>	-----				
<i>Crocidura attenuata</i>			-----		
<i>Chimarrogale platycephala</i>			-----		
<i>Ochotona roylei</i>				-----	
<i>Ochotona macrotis</i>					---
<i>Ochotona daurica</i>					-
<i>Ochotona lama</i>				-----	
<i>Callosciurus pygerythrus</i>	-----				
<i>Dryomys lokriah</i>			-----		
<i>Funambulus pennanti</i>	-----				
<i>Ratufa bicolor</i>	-----				
<i>Petaurista elegans</i>		-----			
<i>Petaurista magnificus</i>			-----		
<i>Petaurista petaurista</i>			-----		
<i>Hylopetes albinoger</i>			-----		
<i>Cannomys badius</i>	-----				
<i>Vandeleuria oleracea</i>	-----				
<i>Apodemus sylvaticus</i>				-----	
<i>Apodemus gorkha</i>			-----		
<i>Millardia melitade</i>	-----				
<i>Rattus eha</i>				-----	
<i>Rattus fulvescens</i>		-----			
<i>Rattus niviventer</i>			-----		
<i>Rattus ranoides</i>		-----			
<i>Rattus nitidus</i>		-----			
<i>Rattus rattus</i>	-----				
<i>Mus cervicolor</i>	-----				
<i>Mus musculus</i>			-----		
<i>Golunda elliotia</i>	-----				
<i>Nesokia indica</i>	-----				
<i>Bandicota bengalensis</i>	-----				
<i>Bandicota indica</i>	-----				
<i>Pitimus leucurus</i>				-----	
<i>Pitimus sikimensis</i>				-----	

Source: Abe, 1982

## 4.5 Protected and threatened species

### 4.5.1 Protected species

#### i) Flora

The only legal provision for protecting endangered plants in Nepal are restrictions imposed by HMGN on the export of a number of species as unprocessed herbs. The following species cannot be exported unprocessed: *Cinnamomum glaucescens*, *Cordyceps sinensis*, *Nardostichyhis grandiflora*, *Rauwolfia serpentina*, *Valeriana jatamansi* and all 360 species of orchid found in Nepal. Plants species included in the three CITES appendices are shown in Table 4-16. CITES Appendix 1 lists those species threatened with extinction which are, or may be, affected by trade. CITES Appendix 2 lists species, that although not threatened with extinction now, may become so unless their trade is strictly regulated. This includes look-alike species. CITES Appendix 3 includes those species recommended by any country or party for prevention or limitation of their exploitation.

**Table 4-16 CITES listed plant species occurring in Nepal**

Appendix I		Appendix II		Appendix III	
Species	Midhills	Species	Highlands	Species	Highlands
Saussurea lappa*	N	<i>Ceropegia spp</i> Cytheaceae Cycadaceae Orchidaceae <i>Podophyllum hexandrum</i> <i>Dioscorea deltoidea</i> <i>Rauwolfia serpentina</i>	   X X  	<i>Cycas pectinata</i> <i>Gnetum montanum</i> <i>Talauma hodgsonii</i> <i>Meconopsis regia</i> <i>Podocarpus neriifolius</i> <i>Tetracentron sinense</i>	   X  

Source: CITES Secretariat

Legend: \*This species never occurred in Nepal. In the 1930s, its cultivation in government farms was attempted

#### ii) Fauna

Twenty-seven mammal, nine bird and three reptile species were given legal protection under the National Parks and Wildlife Conservation Act 1973 lists (Appendix 4-13). No additions have since been made to this list.

Of the protected mammals, the following nine species occur in the Highlands: Brown Bear (*Ursus arctos*), Red Panda (*Ailurus fulgens*), Grey Wolf (*Canis lupus*), Lynx (*Felis lynx*), Snow Leopard (*Panthera uncia*), Musk Deer (*Moschus chrysogaster*), Wild Yak (*Bos mutus*), Tibetan Antelope (*Pantholops hodgsoni*) and Great Tibetan Sheep (*Ovis ammon*).

Of the nine protected bird species five species occur in the Highlands. These include the migratory species: Black Stork (*Ciconia nigra*), Common Crane (*Grus grus*) and the breeding species: Crimson Horned Pheasant (*Tragopan satyra*), Impeyan Pheasant (*Lophophorus impejanus*) and Cheer Pheasant

(*Catreus wallichii*).

None of the three protected reptiles species have been recorded from the Highlands, as they are restricted to the tropical climatic zone.

#### **4.5.2 Threatened species**

##### **i) Flora**

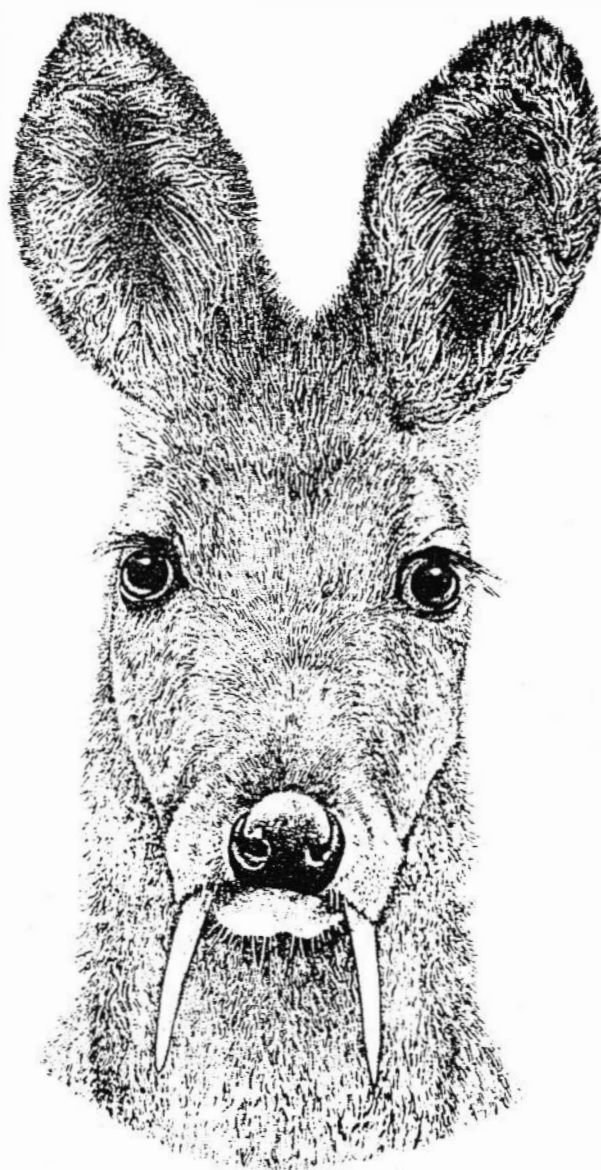
Using the IUCN categories Shrestha and Joshi (1992) list some 60 species of plants that have been designated as threatened in Nepal. Twenty threatened species are known to occur in the Highlands. Their distribution within the country and their IUCN threat category is shown in Appendix 4-12. Which of Nepal's plant species are threatened has not been fully studied and awaits further investigation.

One important aspect of biological diversity whose significance to date has largely been ignored and which is under threat is the local varieties (land-races) of plants useful to man. These include not only the agricultural crops but also timber and fodder trees and medicinal plants. Most of Nepal's population are largely dependant on the agricultural sector to sustain their livelihood and attention needs to be paid the wealth of local crop varieties. In crop breeding programmes germplasm brought in from outside of Nepal has been the focus of crop development. There has been serious genetic erosion in Nepal's major crops including medicinal, forage and timber tree species in Nepal. Farmers are increasingly using only a limited number of often exotic crop varieties encouraged by the government's agricultural development programme. Many local varieties of rice, wheat, maize, grain legumes, oilseeds, vegetables and fruits are on the verge of extinction. These local varieties have evolved and are highly suitable for the local conditions in which they occur. Many crop land-races are however being maintained by farmers to guard against the risk of over-dependence on introduced high yielding varieties which are often more susceptible to drought and lack of fertiliser (Baniya 1994). Many wild and weedy relatives of these food crops, that are also important for crop breeding programmes, are also under threat.

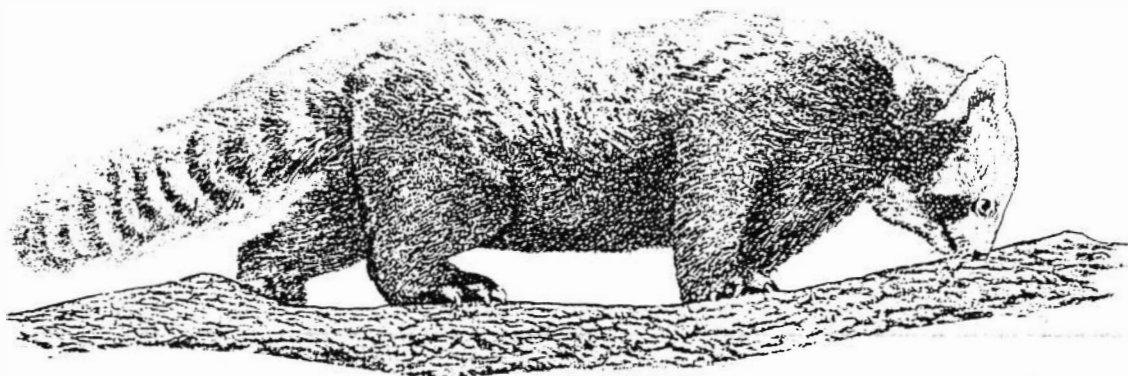
##### **ii) Fauna**

A comprehensive enumeration of Nepal's threatened fauna has been produced by BPP (1995i). The following information is based upon this Red Data Book of the Fauna of Nepal. The six threat categories adopted by BPP for categorising the status of Nepal's threatened animals are given in Table 4-17.

**Threatened mammal species of the Highlands**



Musk Deer (*Moschus chrysogaster*)



Red Panda (*Ailurus fulgens*)



THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

1960

THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

1960

THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

1960

THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

1960

THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

1960

THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

1960

THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

1960

THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILLINOIS

**Table 4-17 BPP's threat categories**

BPP's threat categories	Criteria
Extinct	no reasonable doubt that its last individual has died
Critically endangered	facing an extremely high probability of extinction in the wild in the immediate future
Endangered	not Critical but is facing a very high risk of extinction in the wild in the near future
Vulnerable	it is not Critical or Endangered but is facing a high risk of extinction in the wild in the medium-term, or if the animal is rare
Susceptible	does not qualify for any of the above categories but is of concern because its range is restricted (less than 100 km <sup>2</sup> ) and/or is found at only a few locations, rendering it prone to the effects of human activities, and/or they are important agricultural pest (rodents, passerines and insects) control species
Under-recorded	not enough known about the status but suspected to be threatened

### Butterflies

One hundred and forty-two butterfly species are considered as threatened, with 12 species recommended for legal protection. Highlands support 18 threatened butterfly species of which 11 are vulnerable and seven are of susceptible category.

**Table 4-18 Threatened butterfly species by physiographic zone**

NRDB threat category	Nepal	Terai & Siwaliks	Midhills	Highlands
Susceptible	88	31	63	7
Vulnerable	42	7	28	11
Endangered	12	-	12	-
<b>Total</b>	<b>142</b>	<b>38</b>	<b>103</b>	<b>18</b>

### Fishes

Thirty-five of Nepal's fish species are considered threatened with 10 species recommended for legal protection (BPP, 1995i). Altogether 23 species are considered Susceptible, 10 Vulnerable and only one Endangered Sahar *Tor tor*. The most threatened fish species (25) are found in the Terai and Siwaliks with one (Vulnerable) threatened species in the Highlands (Table 4-19).

**Table 4-19 Threatened fish species by physiographic zone**

NRDB threat category	Nepal	Terai & Siwaliks	Midhills	Highlands
Susceptible	23	17	9	0
Vulnerable	10	7	9	1
Endangered	1	1	1	0
<b>Total</b>	<b>34</b>	<b>25</b>	<b>19</b>	<b>1</b>

Source: BPP, 1995e

### Amphibians and reptiles

Three reptiles are already protected under the 1973 Act. A further thirty-four herpetofauna species are recommended for legal protection (Table 4-20) including nine amphibian species, 14 turtles, one crocodile, two lizards and five snake species (BPP, 1995i). Of these threatened herpetofauna 27 species occur in the Terai and Siwaliks, 14 in the Midhills and only two in the Highlands.

**Table 4-20 Threatened herpetofauna occurrence by physiographic zone**

Group	Status	Nepal	Terai & Siwaliks	Midhills	Highlands
Frogs and toads	Susceptible (all endemic)	9	3	6	2
Crocodiles	Vulnerable	1	1	-	-
	Endangered (HMG/P)	1	1	-	-
Turtles	Vulnerable	3	3	1	-
	Susceptible	11	11	1	-
Lizards and skinks	Susceptible (including one endemic and one HMG/P)	3	2 -	3	- -
Snakes	Vulnerable (one HMG/P)	3	3	2	-
	Susceptible	3	*3	1	-
<b>Total</b>		<b>34</b>	<b>27</b>	<b>14</b>	<b>2</b>

Source: BPP, 1995i

Note: \* includes one endemic sub-species

## Birds

In addition to the nine HMGN protected bird species a further 91 merit legal protection. Another 131 are categorised in the NRDB as Conservation Dependant - there being not sufficient evidence or they are not threatened enough to merit legal protection yet. A further 48 bird species are listed as Vagrant, and 36 are Under-recorded. The Terai and Siwaliks support 183 threatened bird species, whereas the Midhills and Highlands support 163 and 84 species respectively. There are 50 Susceptible, 21 Vulnerable, 13 Endangered, 18 Under-recorded and 9 Vagrant species occurring in the Highlands. (Table 4-21).

**Table 4-21 Threatened bird species by physiographic zone**

NRDB bird species categories	Nepal	Physiographic zones		
		Terai & Siwaliks	Midhills	Highlands
Critically endangered	4 (1 HMG/P)	(1 HMG/P) 4	(1 HMG/P) 4	-
Endangered	55 (7 HMG/P)	(4 HMG/P) 43	(5 HMG/P) 37	13
Vulnerable	571	53	48	21
Susceptible	101 (1HMG/P)	83	(1 HMG/P) 89	50
Under-recorded and Vagrant	84	58	51	27
<b>Total species*</b>	<b>231</b>	<b>183</b>	<b>163</b>	<b>84</b>

Source: BPP, 1995i  
 HMG/P: protected under 1973 NPWC Act  
 \* excluded Under-recorded and Vagrants

Thirteen endangered (including four HMG/P) and one susceptible species and the national bird of Nepal - Danfe or Impeyan Pheasant (*Lophophorus impejanus*) are found in the Highlands (Table 4-22).

**Table 4-22 Protected and endangered bird species found in the Highlands**

Scientific Name	Common Name
* <i>Ciconia nigra</i>	Black Stork
<i>Haliaeetus leucoryphus</i>	Palla's Fish Eagle
<i>Ichthyophaga humilis</i>	Lesser Fishing Eagle
<i>Aquila rapax</i>	Golden Eagle
<i>Falco chicquera</i>	Red-necked Falcon
<i>Falco severus</i>	Oriental Hobby
<i>Falco peregrinus</i>	Peregrine Falcon
<i>Falco pelegrinoides</i>	Barbary Falcon
<i>Tragopan satyra</i>	Satyr Tragopan
* <i>Lophophorus impejanus</i>	Impeyan Pheasant
* <i>Catreus wallichi</i>	Cheer Pheasant
* <i>Grus grus</i>	Common Crane
<i>Cochoa purpurea</i>	Purple Cochoa
<i>Ficedula subrubra</i>	Kashmir Flycatcher

Note: \* HMG protected species

### Mammals

As well as the 27 mammal species currently protected - of which one is extinct; a further thirty species are threatened and merit legal protection (BPP, 1995i). Forty nine of the threatened species occur in the Terai and Siwaliks. The Midhills supports a similar number of threatened species (47) whereas only 26 occur in the Highlands. Of the protected and threatened species 12 Susceptible, six Vulnerable (including one HMG/P), five Endangered (including three HMG/P) and three Critical Endangered species (all HMG/P) are present in the Highlands (Table 4-23 and Table 4-24).

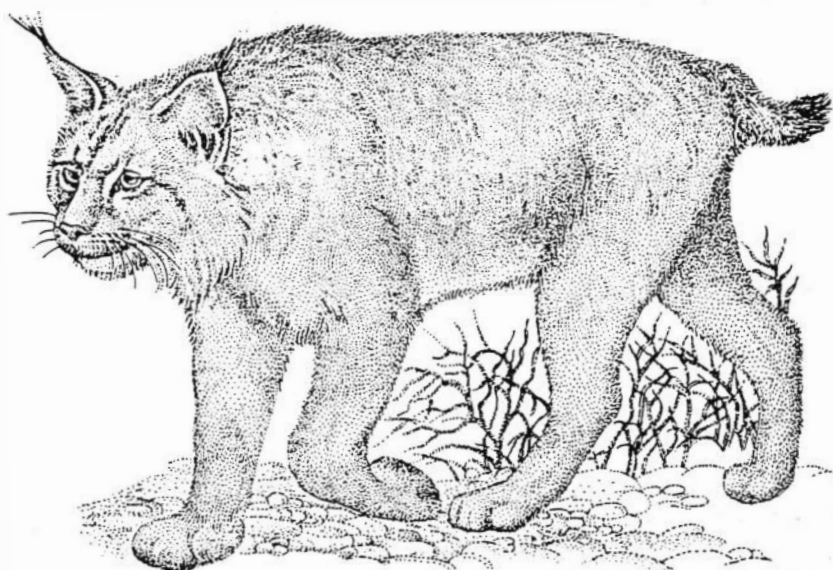
**Table 4-23 Threatened and protected mammals according to physiographic zones**

NRDB threat category	Nepal	Terai & Siwaliks	Midhills	Highlands
Critical species	5	2	0	3
Endangered	13	8	2	5
Vulnerable	16	23	29	6
Susceptible	22	16	16	12
<b>Total</b>	<b>56*</b>	<b>49</b>	<b>47</b>	<b>26</b>

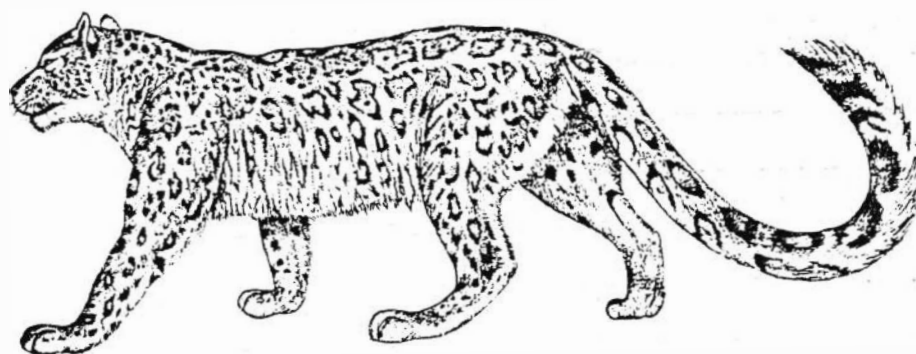
Source: BPP, 1995i

\* excluding one extinct species *Sus salvanicus*

## Threatened mammal species of the Highlands



Lynx (*Felis lynx*)



Snow Leopard (*Panthera uncia*)



Table 4-24 Protected and threatened mammals of the Highlands

NRDB threat Category	Scientific Name	Common Name
Susceptible	<i>Macaca mullata</i>	Rhesus Macaque
	<i>Semnopithecus entellus</i>	Hanuman Langur
	<i>Vulpes vulpes</i>	Red Fox
	# <i>Vulpes ferrilata</i>	Tibetan Sand Fox
	# <i>Arctonyx collaris</i>	Hog Badger
	<i>Lutra lutra</i>	Common Otter
	<i>Felis chaus</i>	Jungle Cat
	<i>Panthera pardus</i>	Common Leopard
	<i>Hemitragus jemlahicus</i>	Himalayan Thar
	<i>Naemorhedus goral</i>	Himalayan Goral
	<i>Naemorhedus sumatraensis</i>	Mainland Serow
	<i>Pseudois nayaur</i>	Blue Sheep (Bharal)
Vulnerable	<i>Canis lupus</i>	Grey Wolf
	<i>Canis aureus</i>	Asiatic Wild Dog
	<i>Ursus thibetanus</i>	Asiatic Black Bear
	## <i>Ursus arctos</i>	Brown Bear
	<i>Prionailurus bengalensis</i>	Leopard Cat
	<i>Ochotona nubrica</i>	Nubrica Pika
Endangered	* <i>Ailurus fulgens</i>	Red Panda
	## <i>Felis lynx</i>	Lynx
	## <i>Panthera uncia</i>	Snow Leopard
	## <i>Moschus chrysogaster</i>	Himalayan Forest Musk Deer
	<i>Moschus fuscus</i>	Alpine Musk Deer
Critical	## <i>Bos mutus</i>	Wild Yak
	## <i>Pantholpos hodgsoni</i>	Tibetan Antelope
	## <i>Ovis ammon</i>	Great Tibetan Sheep (Nayan)

Note:

# restricted to highlands only

\* HMG protected species



#### 4.5.3 Threatened and protected species confined to the Highlands

##### i) Flora

Fifty-nine non-endemic threatened plant species have been identified in Nepal (Shrestha and Joshi, 1992) on the basis of IUCN threat categories. They are listed in Appendix 4-12. Of these, 22 species occur in the Highlands with 6 species confined to this zone. Shrestha and Joshi, list 168 threatened endemic plant species occurring in the Highlands of which 149 species are confined to this zone and judged by this work to be threatened and listed in Appendix 4-11. Little is known about their status and Shrestha and Joshi say that of most of these species threat level is not known and with a conservative approach these have been included as threatened. From a biodiversity point of view it is these threatened endemics where greatest effort should be extended to protect them as if they disappear from Nepal they disappear altogether.

##### ii) Fauna

##### Butterflies

One hundred and forty butterfly species are considered as threatened and 12 species are recommended for legal protection. The distribution of 15 threatened butterfly species is restricted to the Highlands zone.

##### Fishes

Terai and Siwaliks supports 13 species of threatened and Terai and Siwaliks physiographic zone confined fish species followed by Midhills (six species) and none occurs in the Highlands (Table 4-25).

**Table 4-25 Physiographic zone confined threatened fish species**

NRDB threat category	Terai & Siwaliks	Midhills	Highlands
Suceptible	12	4	0
Vulnerable	1	2	0
<b>Total</b>	<b>13</b>	<b>6</b>	<b>0</b>

##### Herpetofauna

The majority of threatened herpetofauna inhabit the Terai and Siwaliks (20 species). The Midhills supports only five species with none in the Highlands (Table 4-26).

**Table 4-26 Physiographic zone confined threatened herpetofauna**

NRDB threat category	Group	Terai & Siwaliks	Midhills	Highlands
Susceptible	Frogs and toads	3	4	0
	Turtles	10	0	0
	Lizards	0	1	0
	Snakes	2	0	0
Vulnerable	Crocodile	1	0	0
	Turtle	2	0	0
	Snake	1	0	0
Endangered	Crocodile	1	0	0
<b>Total</b>		<b>20</b>	<b>5</b>	<b>0</b>

**Birds**

The Terai and Siwaliks with 48 species supports the highest number of physiographic zone confined threatened bird species. The Midhills has 16 species in this category, whilst only one threatened species (one Susceptible) are confined to the Highlands physiographic zone (Table 4-27).

**Table 4-27 Physiographic zone confined, threatened bird species**

NRDB threat category	Terai & Siwaliks	Midhills	Highlands
Susceptible	10	3	1
Vulnerable	21	6	0
Endangered	(2 HMG/P) 17	7	0
<b>Total species</b>	<b>48</b>	<b>16</b>	<b>1</b>

Source: BPP, 1995i

The Highlands confined threatened bird species comprises only one Susceptible species Tibetan Snow Cock (*Tetraogallus thibetanus*) (Table 4-28).

**Table 4-28 Threatened (Susceptible) and confined bird species to the Highlands**

NRDB threat Category	Scientific Name	Common Name
Susceptible (S)	<i>Tetraogallus thibetanus</i>	Tibetan Snow Cock

## Mammals

The Terai and Siwaliks supports the highest numbers of physiographic zone confined threatened mammals (17) with 10 species confined to the Highlands and only 5 in the Midhills (Table 4-29). Of the threatened and confined species of highlands only six are protected. The threatened mammal species confined to the Highlands are the Susceptible Tibetan Sand Fox (*Vulpes ferrilata*), Hog Badger (*Artonyx collaris*) and Blue Sheep (*Pseudois nayaur*); the Vulnerable Brown Bear (*Ursus arctos*) and Nubrica Pika (*Ochotona nubrica*).

**Table 4-29 Distribution of threatened mammal species confined to one physiographic zone**

Threat Category	Terai & Siwaliks	Midhills	Highlands
Susceptible	Indian Pangolin Honey Badger Oriental Small Clawed Otter Hog Deer	Chinese Pangolin Black Giant Squirrel Mainland Serow	Blue Sheep (Bharal) Tibetan Sand Fox Hog Badger
Vulnerable	Striped Hyena (P) Blue Bull Sloth Bear	Black Striped Weasel Golden Cat	Brown Bear (P) Nubrica Pika
Endangered	Bengal Tiger (P) Asiatic Elephant (P) One Horned Rhino (P) Swamp Deer (P) Gaur Bison (P) Four Horned Antelope (P) Black Buck (P) Hispid Hare (P)	-	Lynx (P) Snow Leopard (P)
Critical	Gangetic Dolphin (P) Wild Water Buffalo (P)	-	Wild Yak (P) Tibetan Antelope (P) Great Tibetan Sheep (P)
<b>Total species</b>	<b>17</b>	<b>5</b>	<b>10</b>

Source: BPP, 1995i

Legend: P = HMGN protected

The Endangered mammal species Lynx (*Felis lynx*), Snow Leopard (*Panthera uncia*), and the Critically Endangered species Wild Yak (*Bos mutus*) Tibetan Antelope (*Pantholops hodgsoni*) and Great Tibetan Sheep (*Ovis ammon*) occur only in the Highlands physiographic zones of Nepal.

Table 4-30      Endangered and Critically Endangered mammal species of the Highlands

Scientific Name	Common Name
<b>Endangered</b>	
<i>Ailurus fulgens</i>	Red Panda
<i>Felis lynx</i>	Lynx
<i>Panthera uncia</i>	Snow Leopard
<i>Moschus chrysogaster</i>	Himalayan Forest Musk Deer
<i>Moschus fuscus</i>	Alpine Musk Deer
<b>Critical</b>	
<i>Bos mutus</i>	Wild Yak
<i>Pantholops hodgsoni</i>	Tibetan Antelope
<i>Ovis ammon</i>	Great Tibetan Sheep (Nayan)

## 4.6 Extinction pattern

### 4.6.1 Global extinction pattern

Over the past 50 years at least 80% of global mammal, bird, reptile and amphibian extinctions have taken place on islands. Of the 109 bird species which have become extinct since 1600, 91 were island dwellers. Until 1844 - when the last Great Auk of North America was killed; all known bird extinctions had occurred on islands. Even this species had become confined to a few islands off Newfoundland towards the end. About 22 % of bird species became extinct as a result of the introduction of rats, cats, goats, pigs, sheep and cattle. The role of habitat destruction in species extinction is difficult to separate from influence of introduced predator species in devastating island bird populations. However, it is estimated that 20 % of bird extinctions can be traced to habitat destruction alone (Nilsson, 1983). Table 4-31 shows that more mainland species are now threatened with extinction than island species. Many mainland habitats are becoming effectively "islands" of natural and semi-natural habitat due to increasing human populations and the extension of cultivated land and settlements - as is happening in Nepal.

**Table 4-31 Number of species globally extinct and threatened with extinction since 1600's**

Status	Mainland		Island		Ocean		Total
Extinct	37	19%	155	80%	2	1%	194
Threatened with extinction	391	63%	202	33%	24	4%	617

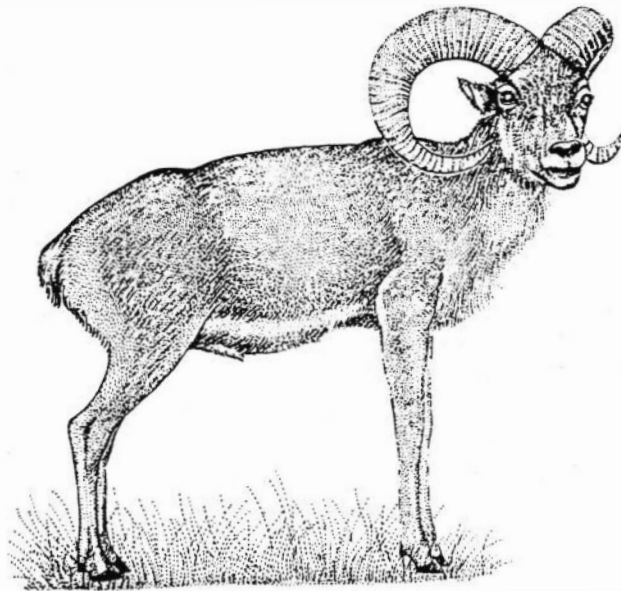
Source: Nilsson, 1983

### 4.6.2 Extinction pattern in Nepal

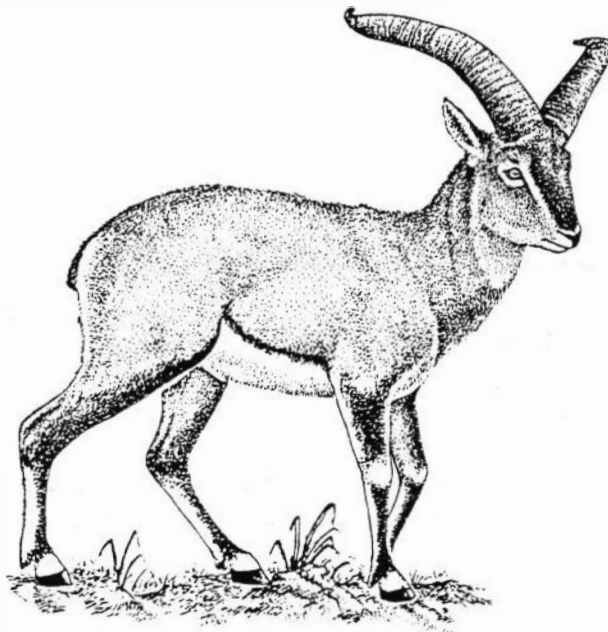
#### i) Flora

Many species including flowering and non-flowering plants that compose Nepal's flora, have very narrow spatial distribution, both on a horizontal and on a vertical scale, indicating their rare occurrence in nature itself. Many species are known only by type specimen from type locality and described quite early in the botanical history of the country. Such species are undoubtedly at a state of high risk of extinction, if not already extinct. The risk of extinction is still higher in case of endemic taxa. In this regard detail studies have to be carried out. However some examples that are apparently extinct, are given in the Table 4-32. This Table shows that nine out of the 5160 vascular plant species described for Nepal are considered extinct with eight of these endemic species.

## Threatened mammals species of the Highlands



Great Tibetan Sheep or Nayan (*Ovis ammon hodgsoni*)



Blue Sheep (*Pseudois nayaur*)



**Table 4-32 Extinct plant species of Nepal**

Species	Endemic	Distribution	Physiographic zone
<i>Tylophora belostemma</i>	N	Central Nepal	Terai/Siwaliks
<i>Liparis olivacea</i>	Y	Central Nepal	Midhills
<i>Cyperus trisulcus</i>	Y	Central Nepal	Midhills
<i>Cyperus wallichianus</i>	Y	Central Nepal	Midhills
<i>Aconitum dhwojii</i>	Y	Central Nepal	High Mountains
<i>Rhus dhuna</i>	Y	Central Nepal	Midhills
<i>Wendlandia appendiculata</i>	Y	Central Nepal	Midhills
<i>Strobilanthes tamburensis</i>	Y	Eastern Nepal	Midhills
<i>Persea blumei</i>	Y	Central Nepal	Midhills

Source: Shrestha and Joshi, 1992

**ii) Fauna**

No fish or herpetofauna are known to have become extinct from Nepal.

**Birds**

Eleven bird species are believed extinct from Nepal (Table 4-33). These birds were collected over a century ago and there have not been any recent records except for a sighting of a Hodgsons Hawk-cuckoo (*Hierococcyx fugax*) from KTWR area during the spring season of 1988 (Inskipp and Inskipp 1991). Pink-headed Duck is a globally extinct species.

**Table 4-33 Extinct bird species of Nepal**

Scientific name	Common Name	Recorded from (region, physiographic zones)
<i>Ardea imperialis</i>	Imperial Heron	Central Terai/Siwaliks
<i>Rhodonessa caryophyllacea</i> #	Pink-headed Duck	Central, Midhills
<i>Perdica asiatica</i>	Jungle Bush Quail	Unknown, Terai/Siwaliks
<i>Hierococcyx fugax</i> *	Hodgson's Hawk-Cuckoo	Eastern Terai/Siwaliks
<i>Aceros nipalensis</i>	Rufous-necked Hornbill	Eastern Terai/Siwaliks
<i>Serilophus lunatus</i>	Silver-breasted Broadbill	Eastern/Terai/Siwaliks and Midhills
<i>Brachypteryx hyperythra</i>	Rusty-bellied Shortwing	Unknown locality
<i>Cochoa viridis</i>	Green Cochoa	Unknown, Terai Siwaliks
<i>Paradoxornis flavirostris</i>	Black-breasted Parrotbill	Eastern, Terai Siwaliks and Midhills
<i>Liocichla phoenicea</i>	Red-faced Liocichla	Eastern, Terai Siwaliks and Midhills
<i>Heterophasia sibia</i>	Long-tailed Sibia	Central, Terai Siwaliks

Source: BPP, 1995i

# Globally extinct species

\* recent unconfirmed sighting in Nepal



## Mammals

Faunal collapse refers to the situation where the extent of relatively undisturbed habitat available to any population becomes insufficient to support a healthy breeding population. All the protected areas of Nepal have undergone some degree of faunal collapse and probably none is sufficiently large to support viable populations of large mammals such as Asiatic Black Bear (*Ursus thibetanus*) and mammals requiring large home ranges such as Asiatic Wild Dog - *Cuon alpinus* (J. Heinen, pers. comm.). Whereas the Terai habitats have seen the most rapid rate of decline in recent decades the impact of human disturbance on the Highlands habitats has been sustained and gradually increasing over the last century and beyond with steadily increasing pressure on natural areas.

Three mammals species have become extinct from Nepal (Table 4-34). All of Nepal's extinct mammal species were recorded from the Terai and Siwaliks physiographic zone.

**Table 4-34 Extinct mammal species of Nepal**

Scientific Name	Common Name	Recorded
<i>Acinonyx jubatus</i>	Cheetah	Probably Western Terai
<i>Sus salvanius</i>	Pygmy Hog	?, Terai
<i>Moschiola meminna</i>	Indian Chevrotain	Western Terai Siwaliks

Source: BPP, 1995i

As the area of intact forest decreases both outside and inside the PAS due to human encroachment so the available habitat contracts for forest dependent species in terms of both extent and continuous areas. The destruction of small areas of forest may have major consequences in eliminating wildlife corridors cutting off adjoining forest areas. Forest loss and fragmentation leads to increased edge effects leading in turn to less hospitable microclimatic conditions and the increased encroachment of alien and predator species. This seriously stresses small populations. In habitats limited in extent, external threats such as hunting or adverse environmental conditions become more severe.

Animals may also become extinct due to "secondary extinction". Larger species have a higher risk of local extinction because small areas cannot support viable populations. First, animals higher in the food chain will disappear and this often leads to the breakdown of ecosystem functioning and balance between species. The populations of animals which these higher mammals preyed on often then rapidly increase and can takeover and displace other less aggressive species which may disappear.

### Mammal species likely to go extinct

The status of many large species once common throughout the Highlands, but now endangered is not precisely known; even in the PAS. Limited funding for wildlife research means that most information is anecdotal. The Highlands of Nepal is among the most sparsely populated region of Nepal due to its extreme cold climatic and rugged topographic condition. Most of the existing natural habitats of the wildlife in the Highlands are not at easy reach to human settlements but they are at close proximity of the cattle herders. The cattle herdsman venture to the remote valleys and pastures

seasonally; to the higher altitudes during the summer months and descend in the winter season to graze their livestock and to collect fuelwood and timber. Harvesting of timber to build infrastructure (domestic and tourism) and heating has led to serious deforestation in some of the prime tourist area such as Namche Bazar (SNP) and Jomsom (ACAP). During 1960's and 70's the displaced Tibetan Army known as *Khampa's* took shelter in the trans-himalayan region of the central and western Nepal, these rebel soldiers equipped with automatic rifles has slaughtered many large mammals.

All of the animals listed in Table 4-35 are under serious threat of extinction from Nepal due to their limited distribution confined to the Highlands. Another compounding factor are the specialised habitats requirements for a number of species, of which few may be left undisturbed as a result of livestock grazing. If no concrete conservation action plan is formulated in the near future the existence of three highland species may become extinct in the next decade (Table 4-35). The existence of the Wild Yak at the present is doubtful. Frequently the custom officers in the Nepal Tibet border confiscate the wool known as *Satush* of Tibetan Antelope, which is prized item for making sweaters and shawl. Small numbers of Great Tibetan Sheep inhabit the remote rocky terrain of SPNP (K. Shah, pers. comm. 1995).

**Table 4-35 Mammals likely to go extinct in the Highlands**

<i>Bos mutus</i>	Wild Yak
<i>Pantholops hodgsoni</i>	Tibetan Antelope
<i>Ovis ammon</i>	Great Tibetan Sheep (Nayan)

#### 4.7 Level of endemism

##### 4.7.1 Endemic flora species

Some 246 species out of Nepal's 5160 recorded flowering plant species are endemic to Nepal (Shrestha and Joshi, 1992). The greatest plant endemism is found in the 3000 to 4000m altitude zone due to this band having climatic and edaphic conditions largely restricted to Nepal. Regionally, across all physiographic zones, the central region has the highest level of endemism as would be expected due to the central sub-regions' isolation from east and west physiographic region (Table 4-36).

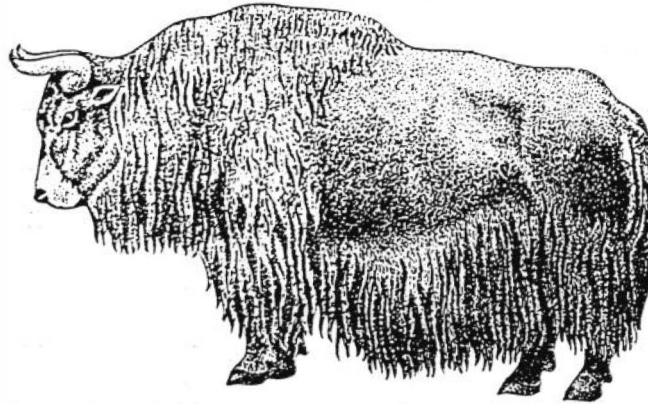
A considerable number of vascular plant species would be added to this list if endemism is defined by limited distribution within ecological types rather than by confinement within international boundaries. The only significance of international boundaries in considering biological diversity is at the level of government policy towards biodiversity protection. For example, many plants found in the mountains and enclosed valleys of the Sagarmatha Himalayan range also occur in the adjoining region of China but their distribution is limited to this small trans-boundary area. Biodiversity protection of many threatened species which may not be endemic to a single country can only be addressed through bilateral programmes.

**Table 4-36     Altitudinal and regional distribution of endemic plant species in Nepal**

Altitude	Distribution			Total species
	W	C	E	
> 5000	14	13	2	<b>29</b>
4000-5000	51	78	31	<b>160</b>
3000-4000	62	87	28	<b>177</b>
2000-3000	38	51	24	<b>113</b>
1000-2000	11	26	13	<b>50</b>
< 1000	4	15	10	<b>29</b>
<b>Total species</b>				<b>246</b>

Source: Shrestha and Joshi, 1992

## Threatened mammals species of the Highlands



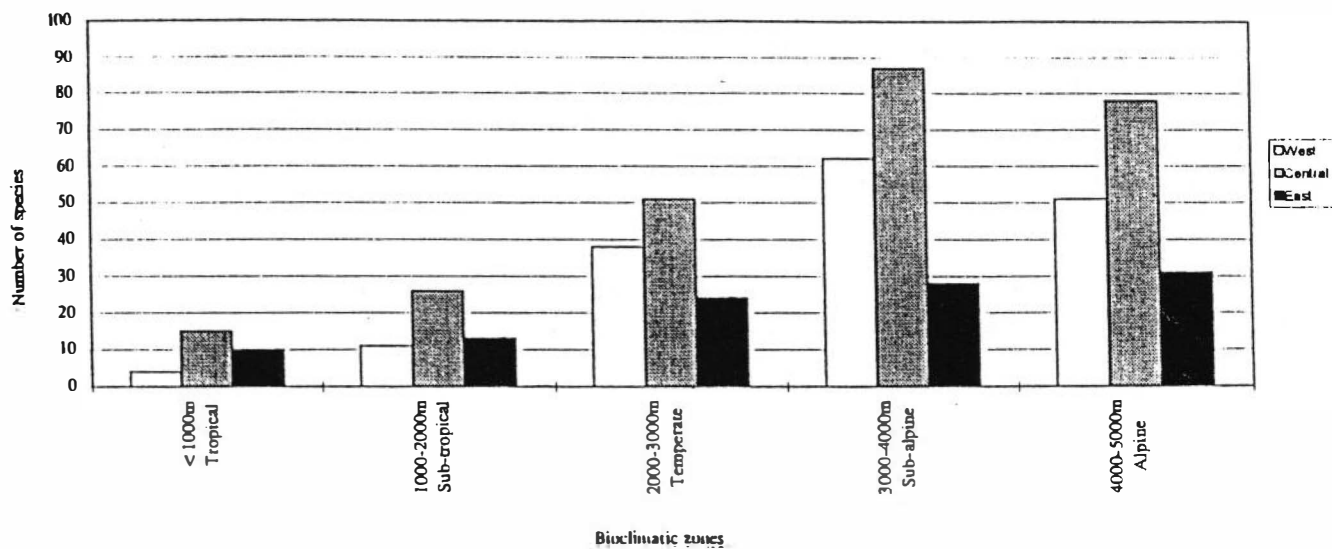
Wild Yak (*Bos grunniens*)



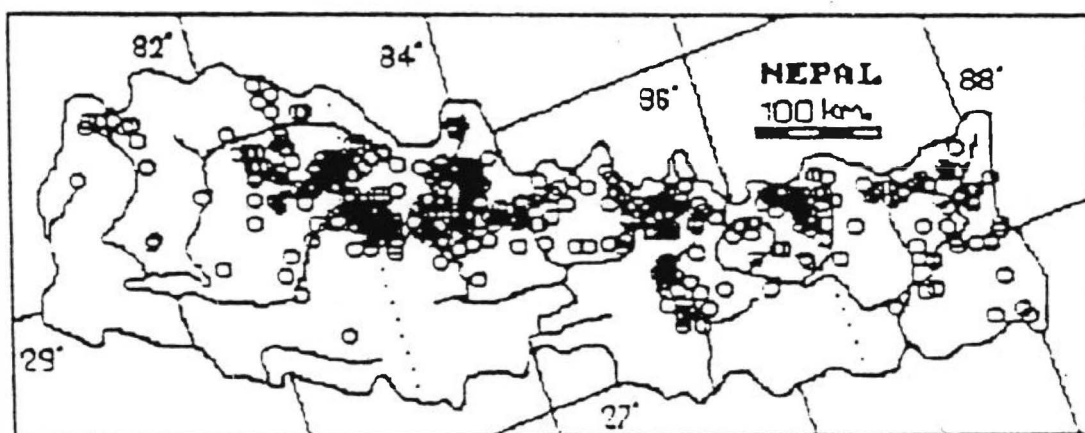
Tibetan Antelope (*Pantholops hodgsoni*)



**Figure 4-9** Distribution of endemic plant species by bioclimatic zone and sub-region

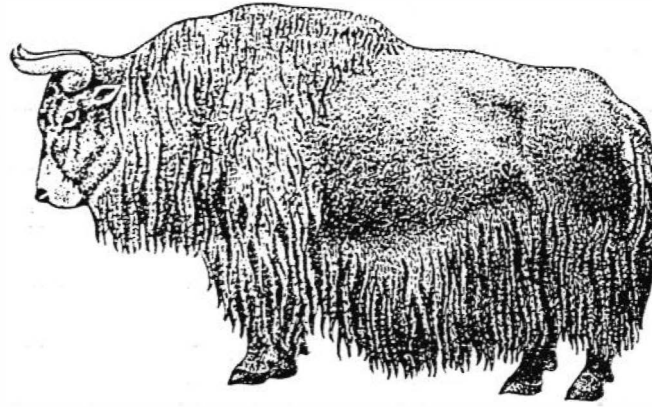


**Figure 4-10** Localities of endemic plant species in Nepal



Source: Shrestha and Joshi, 1992

## Threatened mammals species of the Highlands



Wild Yak (*Bos grunniens*)



Tibetan Antelope (*Pantholops hodgsoni*)





#### 4.7.2 Endemic fauna species

Globally the majority of endemic species or restricted range species are found on islands. Nepal has a rich species representation due to the country covering different zoogeographic zones and due to its dramatic altitudinal incline from 60m above sea level in the Terai to the highest mountains in the world over a distance of about 150 km. It also has some unique microhabitats in the Highlands - the transition zone between the Indo-Malayan and Palaearctic realms. The Himalayan Range, - divided into western and eastern portions, is considered by the International Council for Bird Preservation (ICBP - now operating under the name Birdlife International) as constituting two of the world's 221 Endemic Bird Areas (ICBP, 1992).

Eight species of fish, nine amphibian species, one lizard species, one sub-species of snake, two species of birds and one species of mammal are endemic to Nepal.

##### i) Endemic fish

The four species of the genus *Schizothorax* are endemic to Nepal (Table 4-37). Three of them have only been recorded from Rara Lake within RNP in Nepal's north-western Highlands (BPP, 1995i).

**Table 4-37 Endemic fish of Nepal**

Scientific name	Common name	Occurrence in physiographic zone
<i>Schizothorax macrophthalmus</i>	Asala	Western Highlands
<i>Schizothorax nepalensis</i>	Asala	"
<i>Schizothorax raraensis</i>	Asala	"
<i>Schizothorax annandalei</i>	Chuche Asala	Central Midhills
<i>Psilorhynchus pseudechecheneis</i>	Tite macha	Midhills
<i>Barilius jalkapoori</i>	Jalkapoor	Terai and Midhills
<i>Lepidocephalichthys nepalensis</i>	Latani	Eastern Terai
<i>Pseudeutropis murius batraensis</i>	Jalkapur	Western Siwaliks

Source: BPP, 1995i

##### ii) Endemic herpetofauna of Nepal

Nepal has nine endemic species of amphibians and two endemic taxons of reptiles (including a sub species of snake) (Table 4-38). Little is known about their distribution and local status. The distribution of *Scutiger nipalensis*, *Rana ercepeae*, *R. minica* and *R. nepalensis* is confined to the Midhills whereas *Rana rara* and *R. rostandi* occur in the Highlands as well as in the Midhills.

Table 4-38 Endemic species of herpetofauna of Nepal

Scientific name	Distribution
<b>Amphibians</b>	
<i>Scutiger nepalensis</i>	Western and Central Midhills
<i>Rana ercepeae</i>	Western Midhills
<i>R. minica</i>	Western Midhills
<i>R. nepalensis</i>	Western and Eastern Midhills
<i>R. pierrei</i>	Central and Eastern Terai and Siwaliks
<i>R. rara</i>	Central Midhills and Western High Himal
<i>R. rostandi</i>	Central Midhills and Central/Eastern High Himal
<i>R. teraiensis</i>	Eastern Terai and Siwaliks
<i>Tomopterna swani</i>	Eastern Siwaliks
<b>Lizard</b>	
<i>Scincella capitanea</i>	Central Midhills
<b>Snake</b>	
<i>Xenochrophis flavipunctatus</i>	Western Terai and Siwaliks
<i>schnurenbergerii</i>	

Source: BPP, 1995i

## iii) Endemic birds and mammals

Two bird species are endemic to Nepal (Table 4-39). Nepal Wren Babbler (*Pnoepyga immaculata*) is found in the central and eastern Midhills (BPP, 1995i). Spiny Babbler (*Turdoides nipalensis*) is found from the eastern to the western border of Nepal between 915 and 2135 m, migrating between the Terai/Siwaliks and the Midhills (Inskipp and Inskipp, 1991). Their distribution is widespread near to the Indian border across the country and this species may well occur in India.

Nepal's only endemic mammal species, the Himalayan Field Mouse (*Apodemus gorkha*) is found in the central Midhills and Highlands (Table 4-39).

Table 4-39 Endemic birds and mammals of Nepal

Scientific name	Common name	Distribution according to region and physiographic zones
<b>Birds</b>		
<i>Pnoepyga immaculata</i>	Nepal Wren Babbler	Central and Eastern Midhills
<i>Turdoides nipalensis</i>	Spiny Babbler	All regions of Terai/Siwaliks and Midhills
<b>Mammals</b>		
<i>Apodemus gorkha</i>	Himalayan Field Mouse	Central Midhills and Highlands

Source: BPP, 1995i

## **4.8 Biodiversity significance**

### **4.8.1 Flora**

In the Highlands of Nepal Himalaya, as revealed by Table 4-36, the sub-alpine (3000-4000m) and Alpine (4000-5000m) zones are the areas of highest endemism of all the bioclimatic zones. The former harbors 177 and the later 160 species accounting 72 % and 65 % of the country's total endemic angiosperms respectively. In other words, the Highlands, more precisely the area lying between 3000 and 5000m altitude represents the zone of active speciation. It is therefore, a highly and global significant reservoir of the diverse genetic resources of Nepal Himalayan identity.

### **4.8.2 Fauna**

The Highlands physiographic zone is a mosaic of three physiographic zones which includes the High Mountains, High-Himal and the Trans-Himalayan physiographic zones. These units includes the High mountains above 3000 meters in average, the High Himal (above 5000 meters) and the Trans-Himalayan region (the marginal Tibetan plateau) of Nepal. The Highlands are the meeting place of two major zoo-geographical regions of the world: the Palaearctic region to the north and the Indo-Malayan region to the south. The Highlands are the penetration zone and also a limitation factor between the two regions. Although the climate is cold and harsh, and the terrain is rugged, many large vertebrates inhabit the Highlands, with the exception of cold blooded species such as fish, amphibians and reptiles. The upper altitudinal range of the two important Endemic Bird Areas (EBA) fall within the Himalayan range of Nepal; the endemic species rich Eastern Himalaya (between 900 4000 meters) and the Western Himalaya (between 1600 - 3600m) (ICBP 1992). The political border of Nepal touches the Eastern Himalaya EBA and most of the Nepal Himalaya falls within the Western Himalaya EBA.

The Highlands supports 39 % of vertebrates (521 species) found in Nepal, considerably lower than the vertebrates found in the Midhills and Terai and Siwaliks (73.5 % or 983 species and 72 % or 962 species respectively). Over 25% of the threatened vertebrates of Nepal are found in the Highlands (Table 4-40).

Thirteen percent of the Nepal's butterfly species (82 species) have been recorded from the Highlands of Nepal. Of these 43 species are of Palaearctic origin. The distribution of twenty eight species are confined to the Highlands physiographic zones. One hundred and fifty nine butterfly species are considered as threatened for their survival (BPP 1995i).

Three percent of Nepal's fishes (6 species) are found in the Highlands. Three fish species (all endemic) are confined to this physiographic zone. They have been recorded from Rara Lake.

Nine amphibian species are recorded from Nepal's Highlands which accounts for 21 % of Nepalese species. Two of these (both endemic) are threatened species which are also endemic. The distribution of three species is Highlands confined.

Thirteen species of reptiles have been recorded from the Highlands which accounts to 13 % of Nepalese species. The majority of them are terrestrial species principally lizards and snakes; with none of the NRDB category occurring in this zone. The distribution of two lizard species is confined

to the Highlands.

Four hundred and thirteen bird species have been recorded from the Highlands, accounting for nearly half of all bird species found in Nepal. There are 76 threatened species and the distribution of 24 species is confined to the Highlands only.

Eighty mammal species have been recorded from the Highlands, accounting for 45 % of the total for Nepal. Twenty six species are considered threatened and the distribution of thirty species is confined to this zone.

Overall the highest mammal biodiversity - as measured by the number of orders - is found in the Terai and Siwaliks with representatives from 12 mammalian orders as compared to only eight in the Highlands. The number of orders is as important an indicator of biodiversity as the number of species. Species from different orders will occupy different ecological niches whereas species of the same order are likely to rely on similar habitat conditions. Ten threatened mammal species are confined to the Highlands, of those six species are legally protected.

**Table 4-40 Occurrence of butterfly and vertebrate species and number of threatened species by physiographic zone**

Group	Nepal		Terai & Siwaliks		Midhills		Highlands	
	Spp.	Threatened spp.	Spp.	Threatened spp.	Spp.	Threatened spp.	Spp.	Threatened spp.
Butterflies	635	142	325	37	557	103	82	18
Fish	185	35	154	25	76	19	6	1
Herpetofauna	143	34	90	25	85	14	22	2
Birds	844	226	648	183	691	161	413	76
Mammals	181	56	91	49	110	47	80	26
Total	1988	493	1308	321	1520	344	603	123



## 5. PROTECTED AREAS AND FOREST AREAS

The natural and semi-natural habitats of Nepal's Highlands including the High Mountains, High Himal and Trans-Himalayan zones fall within a number of management systems. Nine of Nepal's protected areas under the jurisdiction of DNPWC lie partly within the Midhills and partly in the Highlands physiographic zones. Most of the Highland's natural and semi-natural habitats are however national forests lying under the jurisdiction of the Department of Forests. Proposed and existing management schemes for the management of Highlands forests and grasslands and especially those concerned with the protection of biodiversity are reviewed below.

### 5.1 Highlands protected areas

Whereas the division between the Siwaliks and the Midhills is well marked on the ground by changes in vegetation and topography, the cut-off point between the Midhills and the High Mountains zones is not definite but is a zone of transition around 3000 m (see Figure 2-1). Five of the national parks and the one hunting reserve lie predominantly above 3000 m (Table 5-2). Only the southern fringes and river valleys of these areas lie below this level. Twenty per cent of the Midhills Khaptad National Park (KNP) lies above 3000 m. Of the two conservation areas over half of Annapurna Conservation Area (ACA) and 70% of Makalu-Barun Conservation Area (MBCA) lie below 3000 m. They are included in this Highlands biodiversity profile as MBCA is effectively a buffer-zone of MBNP and, ACA was gazetted as a conservation area because of the attraction of tourists to its high altitude areas for trekking.

The total area of the Highlands is 63 090 km<sup>2</sup> of which 12 405 km<sup>2</sup> falls above 3000 m within 9 of HMG's protected areas (Table 5.2). Nepal's Highlands are well represented in the PAS with 19.6% of their area covered. The Midhills has 12.9% of its area within the PAS whereas the Terai/Siwaliks have only 7.2% (Table 5-1).

**Table 5-1 Percentage of physiographic zone within the protected area system**

Zone	Total area (km <sup>2</sup> ) *	% of Nepal's area *	Area within PAS km <sup>2</sup> #	% of Area within PAS #
Terai/Siwaliks	39 960	27	2 879	7.2
Midhills	44 420	30	1 037	12.9
Highlands	63 090	43	12 405	19.6
<b>Nepal</b>	<b>147 470</b>	<b>100</b>	<b>21 023</b>	<b>14.3</b>

\* HMGN/ADB/FINNIDA, 1988 data

# PAS: protected area system

Many of the figures stated in reports for the area of protected areas and the percentage lying below 3000 m were found to be inaccurate. BPP has made great efforts to ensure that the figures quoted here are accurate. Table 3-2 in HMG/ADB/FINNIDA (1988b) for example, quotes the mistaken figure of 51.68 km<sup>2</sup> or 39% of Dhorpatan's area as lying within the Midhills (>3000m) when around 15% is the true figure. The figures in Green (1993) for the areas of ACA and SWWR were also either wrong or out of date.

**Table 5-2 Area of Nepal's Highlands (3000 m + altitude) lying within protected areas**

Protected area	Area (km <sup>2</sup> )	Area (km <sup>2</sup> ) within Highlands	% within Highlands	Data source
Langtang NP	1 710	1 420	83%	Green
Dhorpatan HR	1 325	1 125	85%	BPP
Sagarmatha NP	1 148	1 137	99%	BPP
Rara NP	106	93	88%	BPP
Makalu-Barun NP	1 500	1 380	92%	BPP
Shey-Phoksundo NP	3 555	3 448	97%	BPP
Makalu Barun CA	830	249	30%	BPP
Annapurna CA	7 629	3 508	46%	S.Thakali pers.comm.
Khaptad NP	225	45	20%	BPP
<b>Total Highlands</b>	<b>63 090 Highlands total area</b>	<b>12 405</b>	<b>19.6%</b>	

Legend: \* % of protected area above 3000 m

WWR - wildlife and watershed reserve; RP - royal park; NP - national park; CA - conservation area; HR - hunting reserve

Source of data: BPP - BPP's estimates from DNPWC maps; Green - Green, 1993.

A short characterisation follows for each of the eight Highland protected areas summarising their situation, vegetation, fauna and flora, functioning as a protected area, and the main threats to their biodiversity. The number of species per faunal group and the number of these that are threatened (BPP 1995i) are also included. Included in these figures are the Midhills restricted species that occur in areas below 3000 m in several of the predominantly Highlands protected areas. Only one or two species of reptiles and/or amphibians are reported from most of the Highland's protected areas. Revenue and budget figures are given in dollars at the exchange rate of 54 NR to the dollar. Biodiversity profiles, giving the status of fish, amphibians, reptiles, birds and mammals are given in Appendix 5-1.

### 5.1.1 Rara National Park

Rara National Park covers 10 600 ha and was gazetted as a protected area in 1977. During the establishment of the Park 600 people were resettled in the Terai from the two lake-side villages. Locally known as Mahendra Tal, Rara lake is the largest lake in Nepal and is very deep (167 m) and does not freeze over in winter. It is surrounded by hills that rise to 4000 m.

**Table 5-3 Key features Rara National Park**

Surface Area	10 600 ha
IUCN Management Category	II (National Park)
Management plan	1976-81 (Bolton, 1976)
Number of visitors 1994/95	206
Revenues 1994/95	US\$ 323
Budget 1994/95	US\$ 47 204 including \$13 093 grant from ADB (#)
Altitude range	2800 - 4048 m
Number of wildlife and NRDB species	51 mammals    24 NRDB species 212 birds       21 NRDB species 1 reptiles       0 NRDB species 3 fish            0 NRDB species
Number of donor-assisted projects	None
Scientific research and facilities	Ecological, socio-economic and tourism surveys (1988-1990) No scientific facilities
Staff (1994/95)	28 (3 admin and 25 technical). A company of the Royal Nepalese Army is stationed here
Visitor facilities	None but a visitor centre is planned

54 NRs to \$1

# ADB = Asian Development Bank

BPP's GIS analysis of the relative cover of CRNS's ecosystems types shows that the predominant ecosystem in RNP is open and dry montane Blue Pine, covering 23% of the area. The second most common type is lower sub-alpine *Abies spectabilis* forest (18%) with Deciduous broadleaved forest (*Alnus*, *Juglans*, *Acer*) third covering 15% (Table 6-9). Blue Pine (*Pinus wallichiana*) is the predominant forest type above 3150 m and in places is mixed with oak, rhododendron, juniper and spruce. Above 3350 m *Abies spectabilis* is dominant occurring in association with oak and *Betula utilis* and scrub juniper. The highest altitudes around 4000 m are covered with birch-rhododendron scrub.



Mammals reported (Bolton, 1976) include Leopard (*Panthera pardus*), Himalayan Black Bear (*Selenarctos thibetanus*), Hanuman Langur (*Semnopithecus entellus*), Musk Deer (*Moschus chrysogaster*) and Red Panda (*Ailurens fulgens*). Two hundred twelve species of birds have been recorded from RNP of which 39 are breeding species for which Nepal may hold internationally important populations (Barber, 1990). Cheer Pheasant (*Catreus wallichii*), White-throated Tit (*Aegithalos nievogularis*) and Rusty Flanked Tree-creeper (*Certhia nipalensis*) are the most notable. This area although small provides a wide diversity of habitats for birds. The lake attracts many species of migrant waterfowl who visit during their spring and fall migrations across the Himalayas being an important staging post. Thirty-six species of wintering birds have been recorded (Inskipp, 1989). Healthy populations of the Dragonfly (*Epiophlebia laidlawi*) are found in Rara; noteworthy because its distribution is thought to be restricted to the eastern Himalaya (Wells *et al.*, 1983).

There are no facilities for tourists except for several low standard lodges outside the Park. Equally on the approaches from Jumla only low standard lodges are available. Most tourists make their way to RNP by flying to Jumla and then walking the two days from there. Two hundred and six tourists purchased an entry permit to visit Rara in FY 1994/95. An airstrip was under construction at Talchha above Mugu district centre but is not operational yet. Improved facilities for tourists especially the provision of good standard lodges at the park and on the approach would see a considerable increase in the number of visitors. The lake has no inflow and is replenished by runoff from the adjoining hills (Barber, 1990). This makes the lake very susceptible to pollution and any developments on the lake side should be strictly controlled.

A management plan was written for RNP covering the period 1976-81 (Bolton, 1976). Since this time no new management plan has been composed. The cutting of grass and the collection of leaf litter by local people is allowed during October as is the limited grazing of cattle. One major issue is the management of the park's grasslands. These have a valuable floral composition and are important wildlife habitats. However with the resettlement of the people who inhabited the northern shores of the lake the grasslands are no longer heavily grazed and cut and these areas are reverting to forest as Blue Pine invades. Barber (1990) reports that local people's main grievance against the designation of the park is the limitations placed on grazing and firewood collection. Local people also suffer from crop raiding by the park's protected wildlife - especially Wild Boar.

### 5.1.2 Shey-Phoksundo National Park

Gazetted as a national park in 1984, Shey Phoksundo covers 355 500 ha. It is the second largest protected area in Nepal and is the largest for which the main objective is nature conservation. The Park ranges in altitude from 2000 to 6883 m (at Kanjiroba Himal). It is bordered to the north by the Tibetan Autonomous Region of China. It lies at the southern edge of the Trans-Himalayan region of the Tibetan Plateau, with most of the park's area north of Kajiroba Himal. The north-east of SPNP is drained by the Langu River, the southern part by the Jagdula and Suli rivers.

The majority of SPNP covers cold desert, Trans-Himalayan steppe lands and the barren areas of the upper Himalaya. Less than 5% of the Park is covered by forests. The park however covers a diverse range of vegetation types over its large area. In the south the vegetation comprises temperate and sub-alpine forests with oaks (*Quercus semecarpifolia* and *Q. incana*), Blue Pine, juniper, rhododendron, fir and bamboo (*Thamnacalamus* sp.). Birch is predominant on the northern Himalayan slopes. The Trans-Himalayan areas have a sparse scrub cover with the main species being *Rhododendron nivale*,

*R. lepidotum*, *Caragena* spp. and Honeysuckle (*Lonicera* sp.). BPP's GIS analysis show that the predominant ecosystem in SPNP is north-west steppic, high altitude cushion plant formations covering 23% of the area. The second most common type is xerophytic mat patches (20%) with glaciers, snow and rock third covering 17% (Table 6-9).

**Table 5-4 Key features Shey-Phoksundo National Park**

Surface Area	355 500 ha
IUCN Management Category	II (National Park)
Management plan	Under preparation (WWF, Nov. 1995)
Number of visitors 1994/95	555
Revenues 1994/95	US\$ 825
Budget 1994/95	US\$ 64 018 including \$ 16 574 grant from ADB
Altitude range	2000 - 6883 m
Number of wildlife and NRDB species	26 mammals    16 NRDB species 176 birds      17 NRDB species 1 reptiles      0 NRDB species
Number of donor-assisted projects	1
Scientific research and facilities	Surveys of the vegetation, Blue Sheep, Snow Leopard, and Himalayan Tahr (1974-1990) have been carried out
Staff (1994/95)	45 (2 admin/43 technical). One company Royal Nepalese Army.
Visitor facilities	None

One hundred and seventy six bird species have been recorded (Inskipp, 1989). Only 29 species of butterfly were recorded in a study by Yonzon (1990). Nine of these are however threatened species including the Himalaya's rarest butterfly.

Twenty-six mammals have been recorded. Yonzon (1990) has made a study of the mammals found in SPNP. Many species characteristic of the Tibetan Plateau including Yak, Great Tibetan Sheep, Wild Ass (*Equus hemionus kiang*), and Tibetan Antelope (*Pantholops hodgsonii*) have been reported from SPNP. These species have however not been confirmed in recent years. Shey-Phoksundo is important for a number of threatened mammal species including Blue Sheep (*Pseudois nayaur*), Snow Leopard (*Panthera uncia*), Grey Wolf (*Canis lupus*) and Red Panda (*Ailurus fulgens*). Himalayan Black Bear (*Selenarctos thibetanus*) is common in oak and spruce forests. Studies have calculated that the density of Snow Leopard (*Panthera uncia*) in the Langu Valley area of the Park is about 5-10

animals per 100 km<sup>2</sup> (Jackson and Ahlborn, 1986), whilst around the Shey and Phoksundo lake area it is between one and two animals per 100 km<sup>2</sup> (Schaller, 1977). The high numbers in the Langu Valley may reflect the area's ruggedness and remoteness. It is almost untouched by man.

The area is not only important for its biological diversity but also for its cultural heritage. About 2,000 people inhabit nineteen villages scattered around the park (Prieme and Oksebjerg, 1994). The settlement at Shey (4480 m) is one of the highest, populated areas in the world. A number of sacred sites lie within the park. In 1994/95, 555 tourists visited Shey-Phoksundo. Large areas of the park fall within restricted areas upto the Chinese border and are closed to foreigners.

Local people suffer from crop raiding by Hanuman Langur, but do they not attempt to kill them as they are considered sacred. Wolves are the main threat to livestock. Wolves rely so much on livestock due to the scarcity of wild prey species (Yonzon, 1990). The chief threats to wildlife are over-grazing by livestock in a number of localities and poaching. Poaching is mainly targeted at Musk Deer, the musk glands of which are very valuable. Prieme and Oksnebjerg (1994) also reported trapping of Himalayan Monal and Goral. The same authors reported that hunters are paid in advance by Tibetan traders for valuable products such as gall bladders from Himalayan Black Bear, musk glands from Musk Deer and Snow Leopard pelts.

A management plan is being written by WWF. Likely recommendations include designating the Shey area as a Strict Nature Reserve, and taking measures to prevent poaching - especially of Musk Deer in the western part of the Park. The management of the Wolf population is another pressing issue. Also the benefits to local people of the increasing tourism is almost non-existent. Negative impacts of tourism include the depletion of the forests by the tourists and their porters. DNPWC/WWF plans for integrated conservation and rural development programs will focus on improving the living conditions of approximately 2500 villagers within and around the park (WWF 1994).

### 5.1.3 Dhorpatan Hunting Reserve

Dhorpatan Hunting Reserve was gazetted in 1987 as the first, and to date only hunting reserve in Nepal. The Reserve lies in Myagdi and Rasuwa districts. Hunters come mainly from overseas flown in by helicopter to this remote area (Wegge, 1976; FAO, 1980). The main game species is the endangered Blue Sheep (*Pseudois nayaur*) of which between 20 and 30 could be harvested each year on a sustainable basis (Wegge, 1976). The Hunting Reserve is 132 500 ha in size and lies on an important trading route from Tarakot and Dolpo to the north. During the summer months many Hindu pilgrims visit this area.

The Reserve is located on the southern flanks of the Dhaulagiri Himalayan Range. It has many plant species of both drier and more humid conditions. In moister habitats mixed broadleaves occur. Birch (*Betula utilis*) and rhododendron (*Rhododendron campanulatum*) are found at higher altitudes on northern slopes. On dry sites, mainly oak and Blue Pine predominate. On rich soil at elevations up to 4420 m, a mixed forb type (herbs) has been identified, which is an important winter and spring food for the Blue Sheep (*Pseudois nayaur*).

**Table 5-5 Key features Dhorpatan Hunting Reserve**

Surface Area	132 500 ha
IUCN Management Category	VIII (Multiple Use Management Area)
Management plan	None, but Wegge (1976) divided DHR into hunting blocks
Number of visitors 1994/95	172
Revenues 1994/95	US\$ 1070
Budget 1994/95	US\$ 51 537 including \$ 12 444 grant from ADB
Altitude range	2850 - 5500 m
Number of wildlife and NRDB species	18 mammals    13 NRDB species 137 birds      15 NRDB species 1 reptiles      0 NRDB species
Number of donor-assisted projects	None
Scientific research and facilities	Ecology and population of Blue Sheep (Upreti, 1977). No research facilities
Staff (1994/95)	35 (4 admin/31 technical)
Visitor facilities	None developed

BPP's GIS analysis of the relative cover of CRNS's ecosystems types shows that the predominant ecosystem in DHR is, lower sub-alpine *Abies spectabilis* forest - covering 19% of the area. The second most common type is upper sub-alpine rhododendron-birch (18%) with lower alpine rhododendron mesohygrophytic scrublands third, also covering 18% (Table 6-9).

Dhorpatan is particularly important for its Blue Sheep (*Pseudois nayaur*) population, estimated to number between 700 and 740 animals within a 96 000 ha surveyed area (Wilson, 1981). Large game species are Goral (*Naemorhedus goral*), Serow (*Naemorhedus sumatraensis*), Himalayan Tahr (*Hemitragus jemlahicus*), Barking Deer (*Muntiacus muntjak*), and Wild Boar (*Sus scrofa*). Other large animals found in the Reserve are Lynx (*Felis lynx*), Red Panda (*Ailurus fulgens*), Snow Leopard (*Panthera uncia*), and Wild Dog (*Cuon alpinus*).

Although no management plan has been produced the feasibility study prior to gazetting, divided the area into five hunting blocks. Management prescriptions were given by block and for the reserve as a whole. Wegge (1976) recommended that Blue Sheep be the focus of hunting with Wild Boar, Goral and Himalayan Tahr as secondary trophy animals. Recommendations were also detailed under the headings of Professional guiding and block permits, Staffing, Reserve regulations, Livestock grazing, Tourism and Forestry. Himalayan Black Bear, Serow and Barking Deer should not be hunted regularly. Quotas are set annually by DNPWC.

The major management problems in the reserve are grass-burning, firewood cutting, deforestation, uncontrolled grazing by domestic livestock and Musk Deer poaching (Wegge, 1976; Heinen *et al.*, 1988). Around 1300 families with some 80 000 head of livestock move into Dhorpatan's alpine pastures in the summer season (Heinen and Kattel, 1992b). Also, the hunting is not well managed with little monitoring taking place on the impact of hunting on those species hunted. It is not known if other species could be hunted without negative impacts on their populations.

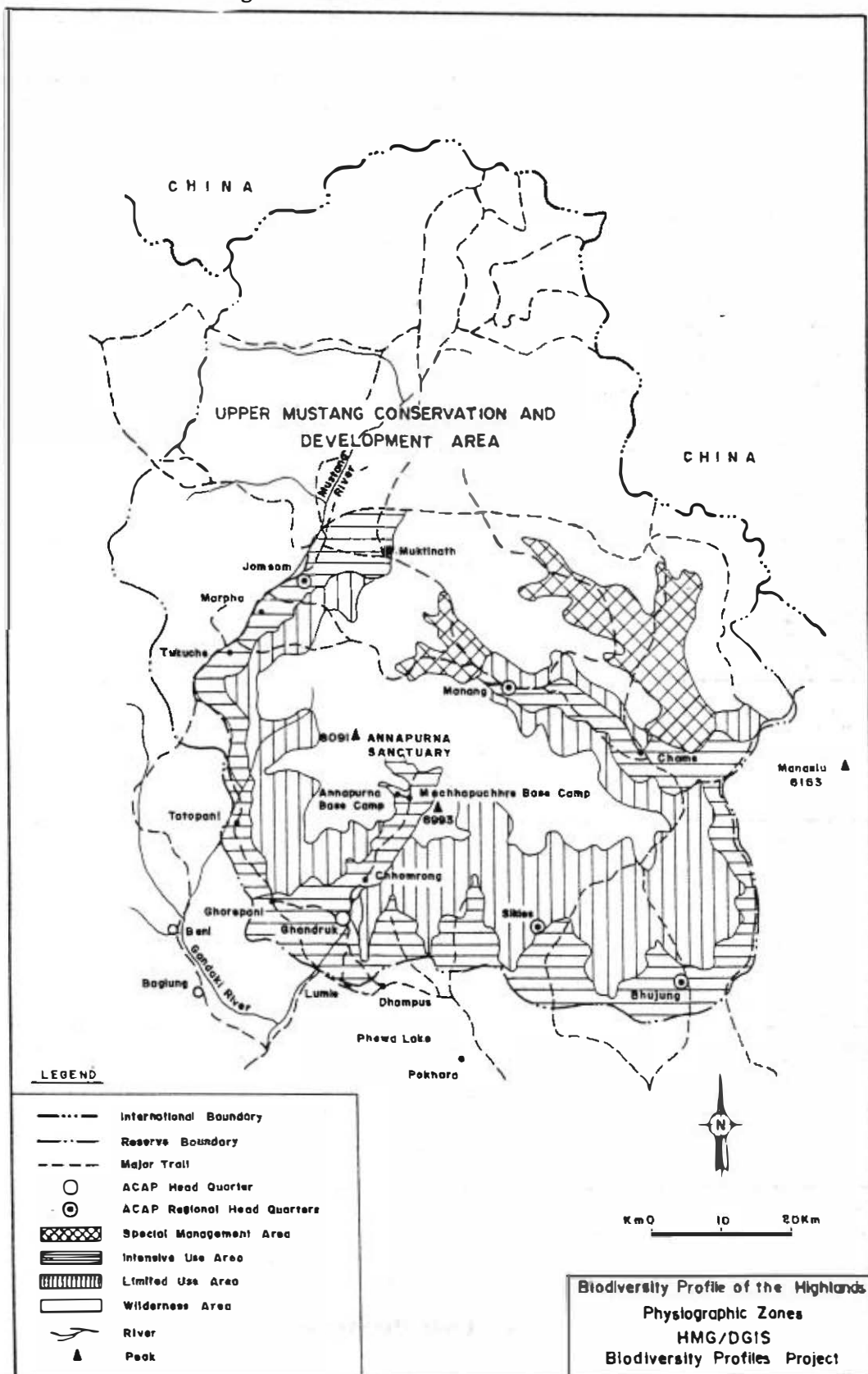
#### 5.1.4 Annapurna Conservation Area

Annapurna Conservation covers an area of 762 900 ha including the recently added upper Mustang area. It is Nepal's largest protected area. ACA is known worldwide for its spectacular mountains and its unique management scheme - the Annapurna Conservation Area Project (ACAP). Prior to designation as a conservation area the Annapurna region was proposed as a recreation area (Shakya, 1982) and a national park (Bunting and Wright, 1985). Table 5-6 refers.

**Table 5-6 Key features Annapurna Conservation Area**

Surface Area	762 900 ha
IUCN Management Category	VI (proposed)
Management plan	Operational plan (Sherpa <i>et al.</i> , 1986)
number of visitors 1994/95	45 700
Revenues in US\$ 1994/95	US\$ 540 000
Budget 1994/95	US\$ 648 150 (expenditure)
Altitude range	1151 - 8091m
Number of wildlife and NRDB species	92 mammals    33 NRDB species 474 birds      90 NRDB species 34 reptiles    4 NRDB species 22 amphibians 2 NRDB species 2 fishes      2 NRDB species
Number of donor-assisted projects	Several
Scientific research and facilities	Surveys of vegetation; Bharal population in Manang District; birds research at Pipar and a Snow Leopard study. No scientific facilities, but a research centre is planned at Kuldi Ghar.
Staff (1994/95)	240+
Visitor facilities	Visitor centre at Ghandruk

Figure 5-1 Initial zoning of Annapurna Conservation Area



ACA covers a very large area running from 1151 m to the north of Pokhara to the 8000 m high Annapurna Himalayan Range and north to the Chinese border in Mustang and Manang districts. The southern slopes of Annapurna have some of the highest levels of rainfall in Nepal whereas in the north, at high altitudes, dry sub-alpine steppe is found. The altitudes range from 1151 to 8091 m in the space of only 120 km. Because of the resultant climatic diversity, a rich diversity of flora and fauna is found. The vegetation ranges from Sal forest in the lowest reaches (1200 m); *Quercus lamellosa* around 2000 m, to upper temperate mixed broadleaved or *Rhododendron arboreum* around 3000 m. Birch forest (*Betula utilis*) dominates between 3200 m and 4000 m, with alpine scrub and grasslands above this. Eight species of bamboo (*Arundinaria* and *Bambusa* spp.) have been recorded in the Pipar area - more than from any other locality in Nepal (Green, 1993). BPP's GIS analysis shows that the predominant ecosystem in ACA is glaciers, snow and ice covering 26% of the area. The second most common type is north west steppic, high altitude cushion plant formations (16%) with upper sub-alpine north Himalayan alpine vegetation third, covering 10% (Table 6-9).

The range of vegetation provides a large variety of wildlife habitats. Mammal species recorded or probably present include Snow Leopard (*Panthera uncia*), Leopard (*Panthera pardus*), Himalayan Black Bear (*Selenarctos thibetanus*), Common Langur (*Semnopithecus entellus*), Red Panda (*Ailurus fulgens*), Jungle Cat (*Felis chaus*), Indian Muntjac (*Muntiacus muntjak*), Serow (*Naemorhedus sumatraensis*), Himalayan Tahr (*Hemitragus jemlahicus*), Goral (*Naemorhedus goral*), Royle's Pika (*Ochotona roylei*) and Blue Sheep (*Pseudois nayaur*) (Forster and Lelliott, 1982; Sherpa *et al.*, 1986; Green, 1993; Biodiversity Conservation Data Project Team, 1994).

Four hundred and seventy-four bird species have been recorded in ACA (Inskipp, 1989a, 1989b). Three hundred and twenty-nine of these are breeding birds of which 38 are considered threatened in Nepal. All six Nepalese pheasant species are found in ACA, namely: Blood Pheasant (*Ithaginis cruentus*), Satyr Tragopan (*Tragopan satyra*), Kalij Pheasant (*Lophura leucomelana*), Koklass Pheasant (*Pucrasia macrolopha*), Himalayan Monal (*Lophorus impejanus*) and Cheer Pheasant (*Cartreus wallichii*).

ACA is the most visited protected area in Nepal with 45 700 visitors in 1994/95 more than three times the number of tourists visiting the other popular highland park SNP. These visitors have a high impact on the area's natural resources. Prior to the arrival of large numbers of tourists from the late 1970s the environment of the area was already under pressure from the subsistence needs of the local people. Over 40 000 people who live within and 60 000 people outside of the protected area rely on the natural resources of this area for their subsistence (Gurung and De Coursey, 1994). The inhabitants of the remoter parts of ACA suffer from food deficits. Whereas twenty years ago there were no tourist lodges in the Annapurna Sanctuary there were 29 lodges in the Sanctuary by 1989. Between 1980 and 1994 the number of trekkers more than tripled. There are now more than 2500 lodges around the Annapurna circuit. The development of trekking tourism in this area, although bringing economic benefits, has had many negative impacts on the environment. The rhododendron forests along the main trekking routes especially near Gorapani have been destroyed to cater for the needs of the trekkers (Gurung, 1989). The more than 45 000 visitors and the lodges cause considerable pollution with very few lodges having proper toilet facilities.

It was to address the problems caused by the number of tourists visiting the area and the subsistence needs of the local people that the Annapurna region was the first to be designated as a conservation area in Nepal. ACA is managed by the King Mahendra Trust for Nature Conservation (KMTNC) and is run according to the management plan formulated by KMTNC (Sherpa *et al.*, 1986). ACAP has

opted for an integrated approach to overcome the negative impacts of tourism and provide for the development of the 40 000 people who live within the Conservation Area. One of the key strategies is to educate local people on the benefits of, and reasons for conserving biodiversity as well as the visitors to the area on how to reduce their impact on the areas they visit. Community development initiatives are carried out through local user groups, with local people having a large say in planning and implementation. Its management focuses on the five areas of forestry and wildlife; alternative energy development; community health; conservation education; and tourism. The aim of the area's management is to link biodiversity conservation to community development (Gurung, 1994). ACAP introduced alternative energy sources such as solar power and small-scale hydroelectric facilities, harnessing some of the regions fast running streams.

ACAP has taken a phased approach targeting first the areas hardest hit by the negative impacts of tourism. The project now works throughout the whole of the conservation area. ACA was zoned into Special Management, Intensive use, Limited Use, and Wilderness areas (Figure 5-1). The project recently assumed management responsibility for the Upper Mustang Conservation and Development Area. This is an area of Trans-Himalayan vegetation with very few trees. The local people cook with dried yak dung and goat pellets. The area has restricted access with only 1000 tourists allowed in each year on the payment of \$700 for a ten day trek. Sixty per cent of the revenue generated is ploughed back into the an endowment fund for the conservation and development programmes of this area.

#### 5.1.5 Langtang National Park

Langtang National Park was established in 1976, having been first proposed in 1969 under the HMG/FAO/UNDP Trisuli Watershed Development Project (Caughley, 1969). With its 1710 km<sup>2</sup> size it is Nepal's third largest protected area. It is bordered to the north-east by Xixibangma Core Protected Area part, of the huge Qolomongma Nature Reserve in Tibet. Key features of the park are given in Table 5-7.

Although Langtang is considered a Himalayan Park a full complement of Midhill's fauna and flora are found in the southern and river valley parts lying below 3000 m (Heinen and Kattel, 1992b). The park has a great variety of vegetation with 25% of the area under forest. Eight of Dobremez *et al's* (1975) vegetation zones are represented in LNP. A small area lies in the tropical zone below 1000 m covered by Sal forest (*Shorea robusta*). Between 1000 and 2000 m lies the sub-tropical zone with *Schima wallichii*-*Castanopsis indica* forests. The hill zone vegetation, (2000-2600 m) is mainly *Quercus lamellosa*, *Q. lanata*, *Rhododendron arboreum*, *Lyonia ovalifolia*, *Pinus wallichiana* and *Picea smithiana*. A recent study has been carried out of *Quercus lamellosa* and *Q. semecarpifolia* forests in LNP (Lokna, 1995). The montane zone (2600 - 3000 m) is covered mainly with *Quercus semecarpifolia* forest with some *Tsuga dumosa*. The lower sub-alpine zone is dominated mainly by the conifers, Hemlock (*Tsuga dumosa*), Fir (*Abies spectabilis*), Larch (*Larix nepalensis*), and *Juniperus* spp., with *Rhododendron barbatum* and *R. lepidotum* also occurring. In the upper sub-alpine zone (3600-4000 m), Birch (*Betula utilis*) and *Rhododendron campanulatum* are dominant. In the lower alpine zone (4000-4500 m) *Rhododendron* and *Juniperus* shrub are the main vegetation type. Upper alpine pastures lie upto the snowline above 4500 m. BPP's GIS analysis of the relative cover of CRNS's ecosystems types shows that the predominant ecosystem in LNP is glaciers, snow and rock covering 20% of the area. The second most common type is Mountain Oak (*Quercus semecarpifolia* - 18%) with alpine meadows and mat patches third with 10%.



**Table 5-7 Key features Langtang National Park**

Surface Area	171 000 ha
IUCN Management Category	II (National Park)
Management plan	Management plan - Borradaile <i>et al.</i> , 1977
Number of visitors 1994/95	8491
Revenues 1994/95	US\$ 12 863
Budget 1994/95	US\$ 79 722 including \$ 17 092 grant from ADB
Altitude range	792 - 7245 m
Number of wildlife and NRDB species	45 mammals      14 NRDB species 289 birds        47 NRDB species 2 reptiles        0 NRDB species 2 amphibians     1 NRDB species
Number of donor-assisted projects	None
Scientific research and facilities	Many studies have been carried out. No scientific facilities
Staff (1994/95)	76 (6 admin/70 technical) and one battalion of the Royal Nepal Army.
Visitor facilities	Many lodges; and a plane landing strip.

Important mammal species reported from Langtang include Leopard (*Panthera pardus*), Himalayan Black Bear (*Selenarctos thibetanus*), Rhesus Macaque (*Macaca mulatta*), Common Langur (*Semnopithecus entellus*), Indian muntjak (*Muntiacus muntjak*), Goral (*Naemorhedus goral*), Himalayan Tahr (*Hemitragus jemlahicus*), Himalayan Musk Deer (*Moschus chrysogaster*), Fox (*Vulpes vulpes*), Wild Dog (*Cuon alpinus*) and Red Panda (*Ailurens fulgens*). Snow Leopard (*Panthera uncia*), Wild Yak (*Bos grunniens*) and Great Tibetan Sheep (*Ovis ammon*) may also be present but need confirmation. Snow Leopard may occasionally cross over one of the high passes from Tibet into Langtang.

Two hundred and eighty-nine bird species have been reported of which 246 breed in the park. Langtang is the only place in Nepal where Dark-Rumped Rosefinch (*Carpodacus edwardsii*) has been recorded in the breeding season. For about 84 of the breeding species Nepal may hold internationally significant populations.

The Park has a management plan (Sherpa *et al.*, 1986) which designated five inaccessible areas of the Park as strict nature reserves (Heinen and Kattel, 1992b). It is important for tourism, being easily accessible from Kathmandu with many trails and lodges in the National Park. More than 8000 visitors were recorded in 1994/95.

A number of developments are threatening biodiversity conservation in Langtang. The number of trekkers visiting Langtang has doubled from 4113 in 1980 to 8491 in 1994/95. HMG/N operates two cheese factories in Langtang at Kyangjin (3840 m) and Chandan Bari (3254 m). These factories rely on the local forests directly for the collection of firewood for processing milk and indirectly as pasture and fodder for the cows and yaks that produce the milk for cheese making. The factories require considerable amounts of firewood - causing a decline in the forests of the area. It is estimated that the demand from local people for firewood in the park is 169 tonnes per year whilst the tourists and their porters use another 44 tonnes. The two cheese factories alone consume 100 tonnes per year. In all 313 tonnes of firewood per year is used, 100 tonnes more than the sustainable annual increment of Langtang's forests (Yonzon and Hunter, 1991). A study on the effects of firewood collection at Kyangjin showed that firewood collection has led to a deterioration in the *Abies spectabilis* forests and the reduction in the number of young age class *Sorbus* and *Betula* trees (Timmerman and Platje, 1987). These latter species do not regenerate well by coppicing at higher altitudes. Grazing by cattle disturbs the local wildlife and especially the endangered Red Panda (*Ailurens fulgens*). The firewood demands of the more than 4000 people who live within the Park and the tourist lodges are also leading to forest degradation.

#### 5.1.6 Sagarmatha National Park

Sagarmatha National Park was proposed in 1971 (Blower, 1972), gazetted as a national park in 1976, and declared a World Heritage Natural Site in 1984 (IUCN, 1990). The Park is 114 800 ha in area with an altitude range between 2845 and 8848 m. The park has seven peaks over 7000 m including the world's highest mountain (Sagarmatha - 8848 m).

Only 3 % of the park is forest, with 28 % grazing land and 69% "barren" land above the tree-line. Six of the eleven vegetation zones described by Dobremez (1975) for the Nepal Himalaya are represented in the park: lower sub-alpine, upper sub-alpine, lower alpine, upper alpine, sub-nival, and permanent snow zones. Below 5500 m the main vegetation is alpine meadows with dwarf shrubs of *Juniperus* spp., and *Rhododendron anthopogon* and *Rhododendron lepidotum*. BPP's GIS analysis of the relative cover of CRNS's ecosystems types shows that the predominant ecosystem in SNP is glaciers, rock, and snow covering 62% of the area. The second most common type is alpine meadows and mat patches (23%) and mesohygrophytic juniper scrublands third covering 8%.

Compared to the rest of the Nepal Himalaya, the park has a low number of mammal species. This is due largely to the low area of forest cover within the Park. A number of threatened species including Musk Deer, and the pheasant species - Himalayan Monal and Blood Pheasant receive protection from the local people whereas in the rest of Nepal and previously in this area they are hunted. Previously they were poached heavily in this area also (Inskipp and Inskipp, 1994). In the 1980s some 200 Musk Deer were poached within a few months (Bauer and Paudyal, 1988). An extensive study of mammals of the Khumbu region, including SNP area, was made in the 1960s (Hellmich, 1969). Mammal species reported include Himalayan Black Bear (*Selenarctos thibetanus*), Common Langur (*Semnopithecus entellus*), Himalayan Musk Deer (*Moschus chrysogaster*), Wolf (*Canis Lupus*), Jackal (*Canis aureus*), Red Panda (*Ailurens fulgens*), Indian Muntjac (*Muntiacus muntjak*), Serow (*Naemohedus sumatraensis*), Goral (*Naemohedus goral*) and Himalayan Tahr (*Hemitragus jemlahicus*). Red Panda has not however been reported since 1989 (Thagunna, 1995). Only a few Goral and Serow occur in the park (Lovari, 1990). Recent surveys showed that populations of Tahr (*Hemitragus jemlahicus*) and Musk Deer (*Moschus chrysogaster*) have increased

since the park was gazetted. Upto 10 Thar per 100 ha occur (Bauer and Paudyal, 1988). The mountain ungulates such as Tahr are particularly important for maintaining the alpine meadow ecosystems. Snow Leopard (*Panthera uncia*) may occur in the park, but there are no recent sightings. Signs of a recovering Snow Leopard population have been noted from the Gokyo Valley (Ahlborn and Jackson, n.d.). The ample prey for these cats and the protected status of the area make it likely that the occasional reported sightings by tourists are factual.

One hundred and ninety-nine species of bird have been recorded in the park. For a number of species which breed at high altitudes, including the Blood Pheasant (*Ithaginis cruentus*), Robin Accentor (*Prunella rubeculoides*), White-Throated Redstart (*Phoenicurus schisticeps*), Grandala (*Grandala coelicolor*), and several rosefinches the park is very important. Inskipp and Inskipp in their study of the birds of Sagarmatha (1994) noted that the areas of Birch-Rhododendron forest and the remaining patches of *Quercus semecarpifolia* forest are the most important bird habitats in SNP and need better protection. They also found a decline in the population of Blood Pheasant since 1982 which may be attributed to a depletion of the under-story of the Birch-Rhododendron forests.

About 3500 people live within the park. Tourism is the major source of income for the residents of Sagarmatha (Heinen and Kattel, 1992b). Sagarmatha National Park is the second most visited Highlands protected area after ACA, with 14 082 visitors recorded in 1994/95, a figure that is increasing every year (Figure 7-2). This figure excludes the number of climbers part taking in various mountaineering expeditions. In 1971 only 642 visitors were recorded increasing to 5836 by 1980. A high proportion of the visitors to SNP come in organised groups. In these groups, every client is accompanied by on average two trekking company staff. Visitors have had a high, largely negative impact on the natural resources of Sagarmatha. Basnet (1992) noted that deforestation in SNP is due largely to firewood consumption as opposed to most areas of Nepal where agricultural land expansion is the main cause of deforestation. This study quoted figures that showed that an average six member family resident in SNP, would consume 20 kg of firewood per day whereas, if the same family used their house as a hotel for trekkers then this figure would rise to 50 kg per day. Stricter controls on firewood cutting within the park has however shifted the pressure onto the areas outside the Park causing serious deforestation there. The issue of the degradation of the forests outside SNP and outside protected areas across Nepal are discussed under section 5.4.

A number of projects have been and are being implemented to ameliorate the human pressures on SNP's natural environment. These projects work in close co-operation with the local people. The majority of the park's residents are of one ethnic group - Sherpas. This has allowed for local solidarity in demanding that local people get full benefits from the area's National park status. The WWF led Sagarmatha Pollution Control Project (SPCP) has been tackling the waste disposal problem with the active support of the local Sherpas and DNPWC. The project started in 1991 by organising disposal points (pits) and employing several local people to manage the waste. Since November 1993, the SPCP has also received funding from the Ministry of Tourism and Civil Aviation. The Himalayan Trust has worked in a number of community development projects. It has facilitated forest protection and tree plantation initiatives both within and at the periphery outside the park. One important initiative to relieve the pressure on forests is the provision of alternative energy sources. Recently a 600 kilowatt hydro plant was inaugurated to serve the Namche area - the area of SNP that attracts the most tourist traffic. The people of eight villages are provided with electricity for cooking and heating.

**Table 5-8 Key features Sagarmatha National Park**

Surface Area	114 800 ha
IUCN Management Category	II (National Park) X (World Heritage Site; Criteria: i,ii,iii, plus cultural)
Management plan	Garrat, 1981
Number of visitors 1994/95	14 082
Revenues 1994/95	US\$ 15 229
Budget 1994/95	US\$ 57 944 including \$11 574 grant from ADB
Altitude range	2845 - 8848 m
Number of wildlife and NRDB species	34 mammals    14 NRDB species 199 birds    33 NRDB species 5 reptiles    0 NRDB species
Number of donor-assisted projects	SPCP (WWF), Oko Himal/Austrian Federal Development Cooperation
Scientific research and facilities	Many studies have been carried out. Ev-K2-CNR "pyramid" laboratory at 5050 m
Staff (1994/95)	38 (3 admin/35 technical) and one company of the Royal Nepal Army.
Visitor facilities	Airstrip at Lukla and Namche Bazar. All grades of accommodation are available.

#### 5.1.7 Makalu-Barun National Park and Conservation Area

Makalu Barun National Park and Conservation Area (MBNP/CA) was gazetted as a protected area in 1991. The total protected area is 233 000 ha of which 150 000 ha is National Park (MBNP) and 83 000 ha Conservation Area (MBCA). MBNP/CA is contiguous to two other protected areas: in the north Makalu-Barun borders a core protected area of the huge 3 500 000 ha Qomolangma Nature Reserve (QNR) in the Tibet Autonomous Region. QNR is described in Section 5.3 and a full profile is presented in Appendix 5-2. On its western side Makalu-Barun borders Sagarmatha National Park. Makalu Himal - the fifth highest mountain in the world lies within this area.

This area has a very high diversity of flora and fauna. The area covers only 1.5% of Nepal's area but 60% of the country's flowering plants have been found here. There are a number of specific reasons for this. The uninhabited Barun Valley in the west of the National Park is biologically a very important area as it remains one of the few areas in Nepal largely void of human activity. From the

southern-most part of the Conservation Area to the north of the National Park an altitudinal range from 435 to 8463 m is covered, the largest of any of Nepal's protected areas (The Mountain Institute/IUCN, 1995). Having over 4000 mm of rain per year this area is the wettest in Nepal. The biodiversity of MBNP/CA has been surveyed in detail, surpassing the work carried out in the ACA and RCNP areas.

**Table 5-9 Key features of Makalu-Barun National Park and Conservation Area**

Surface Area	233 000 ha (150 000 ha in MBNP; 83 000 ha in MBCA)
IUCN Management Category	II (National Park) VII (Multiple Use Management Area)
Management plan	Shrestha <i>et al.</i> , 1990b Tourism management plan (Brewer and Sherpa, 1995)
Number of visitors 1994/95	660
Revenues 1994/95	US\$ 7944
Budget 1994/95	NA
Altitude range	435 - 8463 m
Number of wildlife and NRDB species	81 mammals    26 NRDB species 400 birds      73 NRDB species 12 reptiles     1 NRDB species 2 amphibians   0 NRDB species
Number of donor-assisted projects	one - MBCP
Scientific research and facilities	Research is being undertaken that will form the basis of a management plan. No scientific facilities.
Staff	Proposed staffing levels: three wardens, four assistant wardens, eight rangers and a number of scouts (Shrestha <i>et al.</i> , 1990).
Visitor facilities	No visitor facilities, but visitor centre is planned for Khandbari (Shrestha <i>et al.</i> , 1990)

Twenty-seven types of forests and over 3000 species of flowering plants have been recorded from MBNP/CA. The area is rich in many Himalayan plant groups including 25 of Nepal's 30 Rhododendrons, 48 primrose species, 47 orchid species, 19 bamboo species, and the in-Nepal previously unrecorded *Lithocarpus fenestratus*. The Sankhuwa valley in MBNP/CA is the western most point in the distribution of *Tetracentron sinense* - a primitive tree characteristic of eastern Himalayan humid forests. BPP's GIS analysis of the relative cover of CRNS's ecosystems types shows that the

predominant ecosystem in MBNP is glaciers, snow and rock covering 28% of the area. The second most common type is mesohygrophile rhododendrons (15%) with mesophytic juniper scrublands third covering 9% (Table 6-9).

Records indicate that 75 species of mammals occur in MBNP (Jackson *et al.* 1990). Larger mammals found include Assamese Monkey (*Macaca assamensis*), Leopard (*Panthera pardus*), Himalayan Black Bear (*Selenarctos thibetanus*), Himalayan Musk Deer (*Moschus chrysogaster*), Red Panda (*Ailurus fulgens*), Goral (*Naemorhedus goral*), Himalayan Tahr (*Hemitragus jemlahicus*), Indian Muntjac (*Muntiacus muntjak*), and Serow (*Naemorhedus sumatraensis*). Research carried out in the Hongu Valley in 1986 failed to confirm the occurrence of the Snow Leopard (*Panthera uncia*) or its large prey species.

Four hundred and eighty one bird species have been reported from the adjoining Makalu-Barun and Sagarmatha protected areas (Jackson *et al.*, 1994). It is highly likely that all but several of these 440 occur in only MBNP. Due to the great variety of ecosystems found in MBNP many species found there do not occur in SNP. MBNP is important as the only breeding place in Nepal for Dark-Side Thrush (*Zoothera marginata*), Slaty-Bellied Tesia (*Tesia olivea*), Broad-Billed Warbler (*Abroscopus hodgsoni*), Spotted Wren-Babbler (*Spelaeornis formosus*), and Coral-Billed Scimitar-Babbler (*Pomatorhinus ferruginosus*) (Inskipp, 1989). The reserve is important for wintering birds, 36 species having been recorded (Inskipp, 1989). The areas of upper temperate forest (2400-2800 m) are the most important areas for those species for which Nepal has internationally significant populations. Three hundred and fifteen species of butterflies have been recorded from the Arun Basin.

MBNP has no permanent settlements. Around 32 000 people inhabit the Conservation Area (Green, 1993). The economic condition of many people living within the conservation area is poor. It is estimated that 75% of the people of the Tamku valley experience chronic food shortages each year (Gurung, 1995).

The Mountain Institute's (TMI) Makalu-Barun Conservation Area Project was established in 1988 to make recommendations for the conservation of biodiversity and the promotion of community development in the Makalu-Barun area. In the planning and field phase of the project (1988-1990), numerous studies and surveys were carried out and reports published to inform the content of the management plan. An integrated management plan was produced on the basis of these studies (Shrestha *et al.*, 1990). The plan covers the four subject areas of Park management, Tourism management, Community resource management and Scientific research. The national park has been zoned into two Strict Nature Reserves with the area between the two to be included as a strict nature reserve in phase two (Figure 5-2). Three areas are designated as Special Sites and Trails for tourists. A comprehensive tourism management plan has also been written (Brewer and Sherpa, 1995) which is discussed in Section 7-1.

The plan specifies a participatory model of land management and resource utilisation. Community development and specifically the improvement of natural resource management is being initiated through local user groups and the carrying out of extension programmes. A number of studies are ongoing into the traditional utilisation of the area's natural resources and the indigenous knowledge of the local people on utilisation and management aspects (Gurung, 1995). The TMI is working with the NGO - Social Action for Grassroot Organisation (SAGON) to carry out the participatory studies on the basis of which a management plan will be made. The indigenous knowledge of the local people provides an excellent foundation for making a management plan as many of the practises of the local

people have evolved to sustain long-term subsistence in a marginal environment. Eighty-six fodder trees and 67 species of economically valuable medicinal and aromatic plants occur showing the importance of the natural resources to local people.

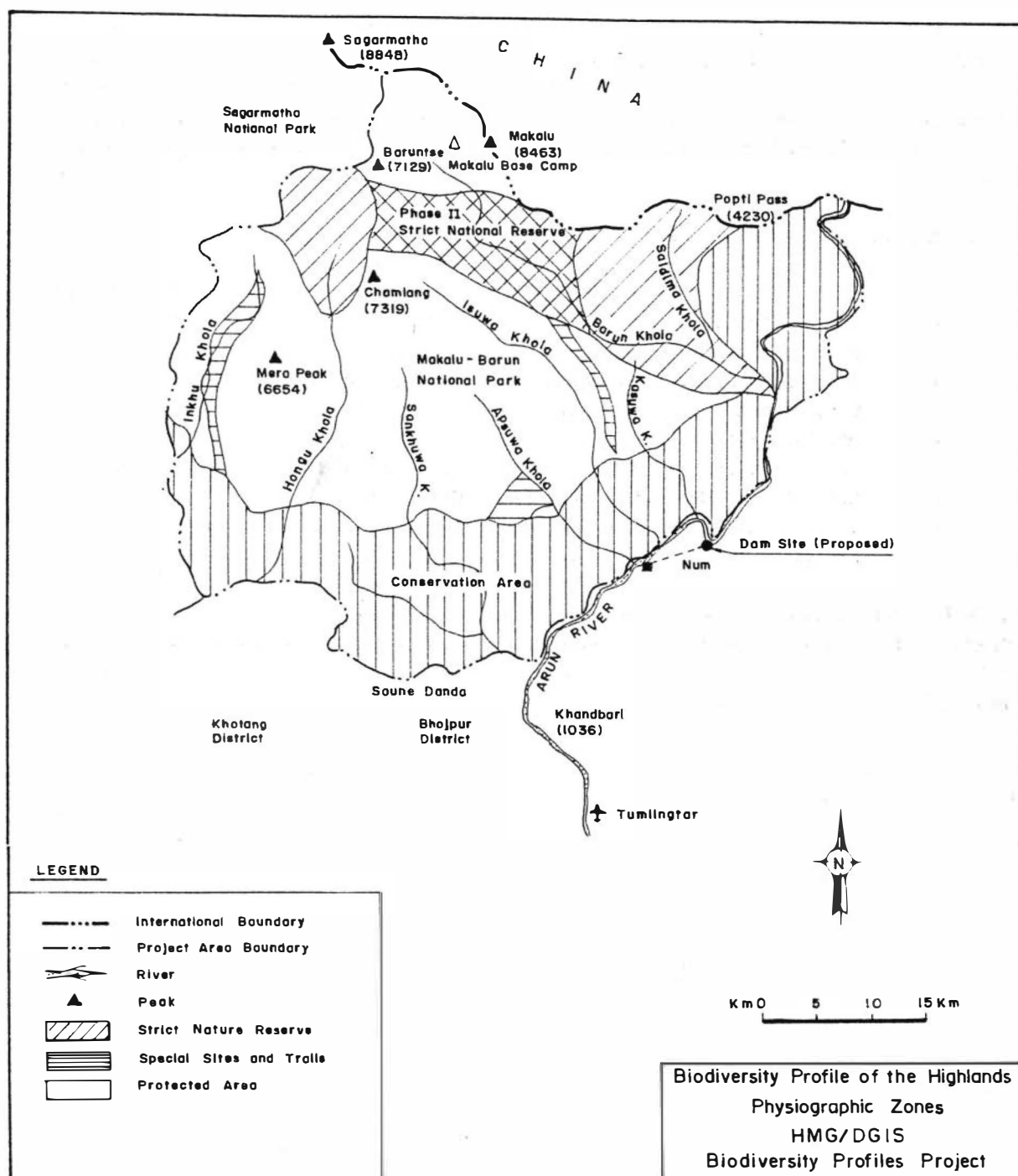
The Conservation Area is effectively a buffer-zone of the National Park. It was gazetted as a conservation area and not a buffer-zone as the buffer-zone legislation was not in place at that time. The main management focus in the National Park is wildlife conservation whereas in the Conservation Area community development, based on a participatory model of local management, is the priority. The Conservation Area is inhabited by people of the Rai ethnic group in the east and Sherpas in the west.

The main threats to the biodiversity of Makalu-Barun are (TMI/IUCN, 1995):

- fragmentation, encroachment and disturbance of forests lands by human activity
- the practises of slash and burn agriculture and cardamom cultivation in areas of natural vegetation
- over-grazing of cattle and the setting of uncontrolled fires
- the poisoning of wild animals for crop protection
- wildlife poaching
- lack of awareness of local people about the importance of preserving biodiversity
- invasion of exotic weed species in disturbed forest areas
- current socio-economic and religio-cultural practices; principally the use of wild animal body parts in religious ceremonies and in folk medicine.

MBNPCA receives financial and technical assistance from a large number of sources. Major donors are the Government of the Netherlands is supporting the implementation of the project through a five year grant with some US 2,5 million and The Global Environmental Facility/UNDP provided \$ 2.6 million. Other donors include USAID and IDRC.

Figure 5-2 Management zones for Makalu-Barun National Park





## 5.2 Proposed protected areas

Most of the important Highlands areas are already covered within the PAS. The designation of one further area in the north eastern corner of Nepal is well advanced.

### 5.2.1 Kanchenjunga Conservation Area

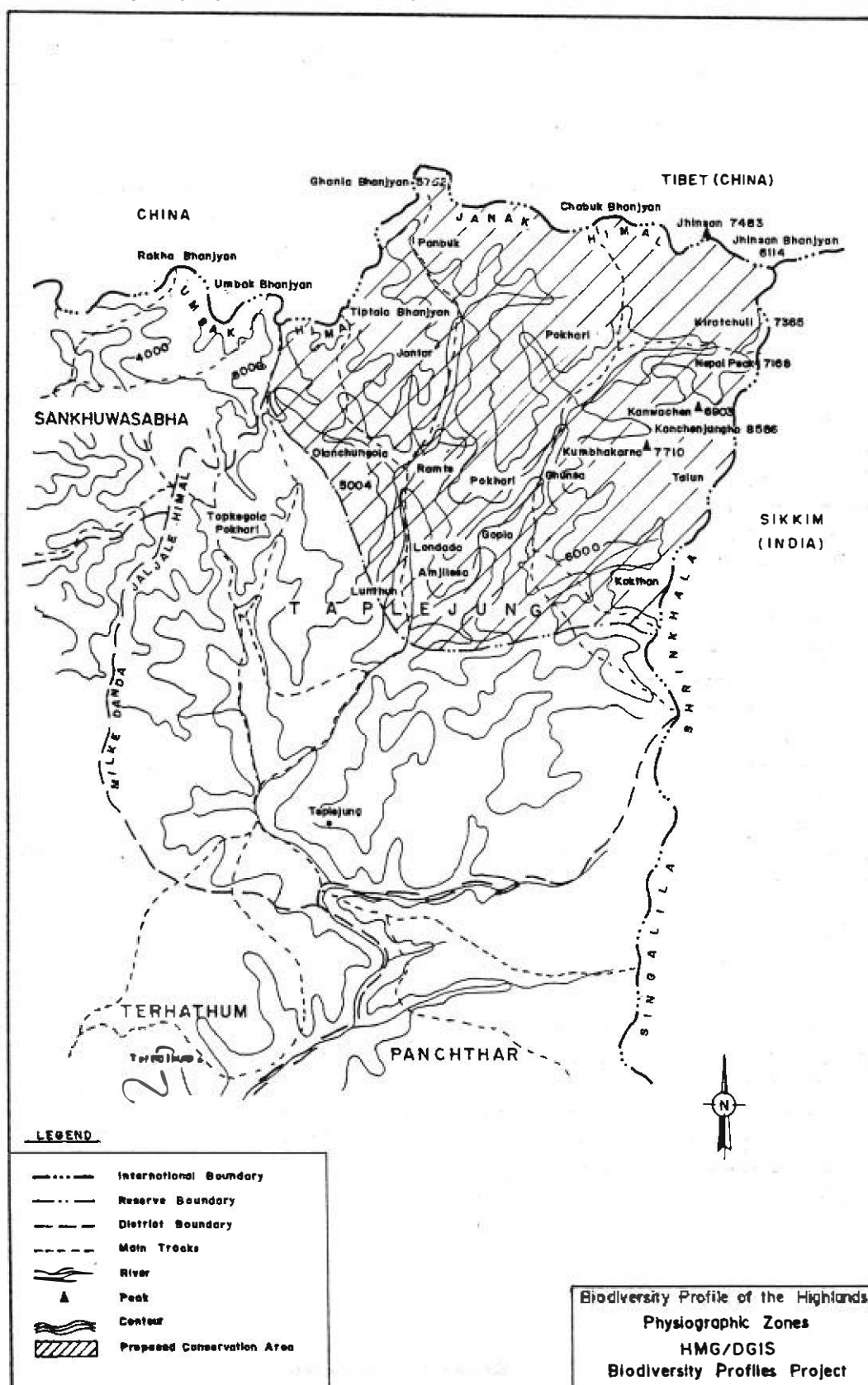
Kanchenjunga (Khangchendzonga) Himal is the second highest peak in Nepal and the third highest in the world (Figure 5-3). Work is well advanced for the creation of a new protected area - Kanchenjunga Conservation Area (KCA) - including Kanchenjunga Himal and its surrounding areas in the northern parts of Taplejung district. The new protected area will cover an area of over 2000 km<sup>2</sup>. It will adjoin the 850 km<sup>2</sup> Kanchenjunga National Park in Sikkim, India, a description of which is given in Appendix 5-2. The establishment of KCA would create nearly 3000 km<sup>2</sup> of trans-boundary protected area.

The area would be the first representative part of the Eastern Himalayan Range to be included in a protected area in Nepal. Areas of *Larix griffiana* forest mixed with juniper species - a characteristic east Himalayan vegetation type - are found in the two main river valleys of this area. The Conservation Area will cover vegetation types from Sal-*Schima* mixed forests at 1000 m altitude through *Castanopsis-Quercus* (1200-2500 m), *Abies-Tsuga* (2800-3500 m), and *Larix-Juniperus* forests (3000-3700 m) upto the tree-line and Rhododendron forests. The area is floristically very rich and over 2500 species of flowering plants would be expected to occur. Nineteen mammals have been reported from this area (Carpenter *et al.*, 1995). Two hundred and six species of birds were recorded during autumn and spring visits by ornithologists to only a part of the proposed KCA. The area is home to a number of threatened wildlife species, principally Snow Leopard, Musk Deer, Wolf, Red Panda and Leopard Cat. It also has an important eastern Himalayan population of Blue Sheep.

The area has considerable cultural importance with a large ethnic diversity and a number of important religious sites. It was only opened up to tourists in 1990 from which time a steadily increasing number of visitors have been recorded. Around 1000 trekkers were recorded in 1994/95. The potential for tourism is considerable especially as the Annapurna and Sagarmatha areas are losing some of their appeal due to pressure from the large number of visitors. Milke Danda in the Midhills lies nearby to the southwest. Milke Danda has been recommended as a conservation area by BPP with a good potential for tourist development (BPP, 1995a). This ridge could provide an entrance point to for those who would prefer to walk rather than fly in to KCA.

The designation of this area as a conservation area is being approached in a systematic way. A feasibility study has been produced describing the preparations upto May 1995 for the designation of Kanchenjunga Conservation Area - (HMGN/WWF, 1995). Consultation with the local people is a major component of the planning phase, by investigating current *de facto* land use systems in the area and trying to ensure that the local people benefit from the KCA initiative. The results of this study revealed the dependence of local people on the natural resources of the area. It was therefore decided to give the new protected area, conservation area status.

Figure 5-3 Map of proposed Kanchenjunga Conservation Area



### 5.2.2 Manaslu

The Manaslu region lies partly in Gorkha, Manang and Lamjung districts of the Gandaki Zone in the Western Development Region. It covers an area of approximately 400 000 ha, centred around Manaslu Himal - with 8163m, the seventh highest summit in the world. This remote and relatively inaccessible area is inhabited by Gurungs, Sherpas and Bhotes. In 1991, this region was designated as a Tourist Area to diversify opportunities for adventure and cultural tourists (Pande, 1995). In 1993 some 708 foreigners visited this mountainous area for its scenic attractions and its highly diverse cultural heritage. The present infrastructure for tourism development is, however very rudimentary and often lacking.

The area has a rich flora and fauna. Dense forest of (*Schima wallichii*) and (*Castanopsis indica*) are found at sub-tropical levels. On drier slopes Chir Pine (*Pinus roxburghii*) occurs. Forest of the temperate zone is mainly composed of Oak *Quercus semecarpifolia* which is found upto 3100m. The Dudh Khola Valley, south of Larke Pass has a rich Rhododendron forest. North facing slopes comprise Blue Pine (*P.wallichiana*) and Spruce (*Picea smithiana*). On ancient moraines Larix (*Larix himalaica*) is found. The tree-line is made up of Himalayan Birch (*Betula utilis*) interspersed with Juniper (*Juniperus recurva*). Above 4000m alpine meadows are found. In May 1994, 190 bird species were recorded and local reports were collected concerning the occurrence of Snow Leopard, Himalayan Black Bear, Red Panda, Common Leopard, Musk Deer, Blue Sheep, Himalayan Thar, and Himalayan Goral (Banskota *et al.*, 1994).

In 1994, IUCN conducted a tourism study of the Manaslu region (McEachern *et al.*, 1995). This study recommended that the upper Buri Gandaki Valley between Prok and Namrung, with its tracts of undisturbed forest and its rich biodiversity, be designated as a Special Protection Zone. In addition, a major portion of the valley lying north of Tilij village should also be designated as the same. Finally, the team recommended that areas of Larch forest *Larix himalaica* in the Lho area need protection. These recommendations do not seem to address the biodiversity management of the area as a whole, nor fit in with existing legislation. What is a Special Protection Zone? It is therefore recommended to consider designation of the Manaslu region as a Conservation Area, which will allow for adequate zoning (Figure 5-4). A comprehensive management plan to protect and wisely use these resources are to be formulated.

### 5.3 Trans-boundary protected areas

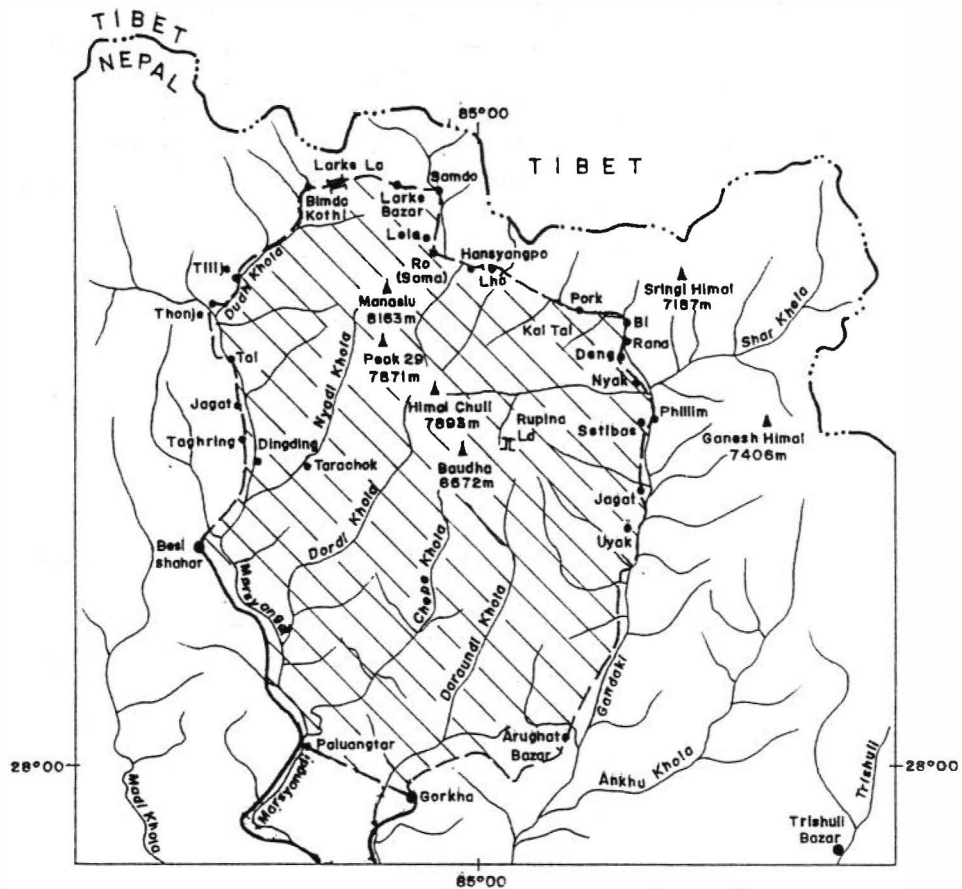
Many wildlife species perform regularly migratory movements which often cross international boundaries. Packs of wolves for example wander great distances and require large contiguous protected areas for their survival. Trans-boundary protected areas - spanning more than one country - allow unhindered migrations and the maintenance of healthy populations to avoid restricted breeding patterns leading to genetic degradation. Priority should be given to the setting up of new protected areas adjoining existing protected areas in neighbouring countries.

Three of Nepal's mountain protected areas are connected in the north to the huge Qomolangma Nature Reserve (QNR). QNR covers three and a half million hectares mostly of Tibetan plateau areas with an average altitude of 4500 m. A full description of QNR including its biodiversity is given in Appendix 5-2. In Nepal Sagarmatha National Park, Makalu-Barun National Park and Makalu-Barun Conservation Area adjoin. This contiguous protected area within Nepal adjoins QNR in the north.

Langtang National Park is also linked with QNR (Figure 5-5). Langtang National Park is bounded to the north by the Xixibanga Core Protected Area of QNR. The four adjoining protected areas cover more than four million hectares ranging from the Sal forests in MBCA and LNP over the High Himal of SNP, MBNP and LNP to the vast expanses of the Tibetan Plateau in QNR and on down to sub-tropical areas in China.

Trans-boundary management agreements are most urgently needed between China and Nepal to prevent the extensive illegal hunting and logging in the border areas. A 12 year co-operative management agreement has been signed between an INGO - TMI, and the QNR authorities (Gurung, 1995). TMI is also funding and giving technical assistance to the Nepali government for the management of MBNP. This link together with recent inter-country visits suggest that the prospects for trans-boundary co-operation are good. The gazetting of Kanchenjunga Conservation Area will create another trans-boundary protected area - linking UP with Kanchenjunga National Park in Sikkim, India, and covering a total area of 285 000 ha.

**Fig. 5-4 Proposed Manaslu Conservation Area**



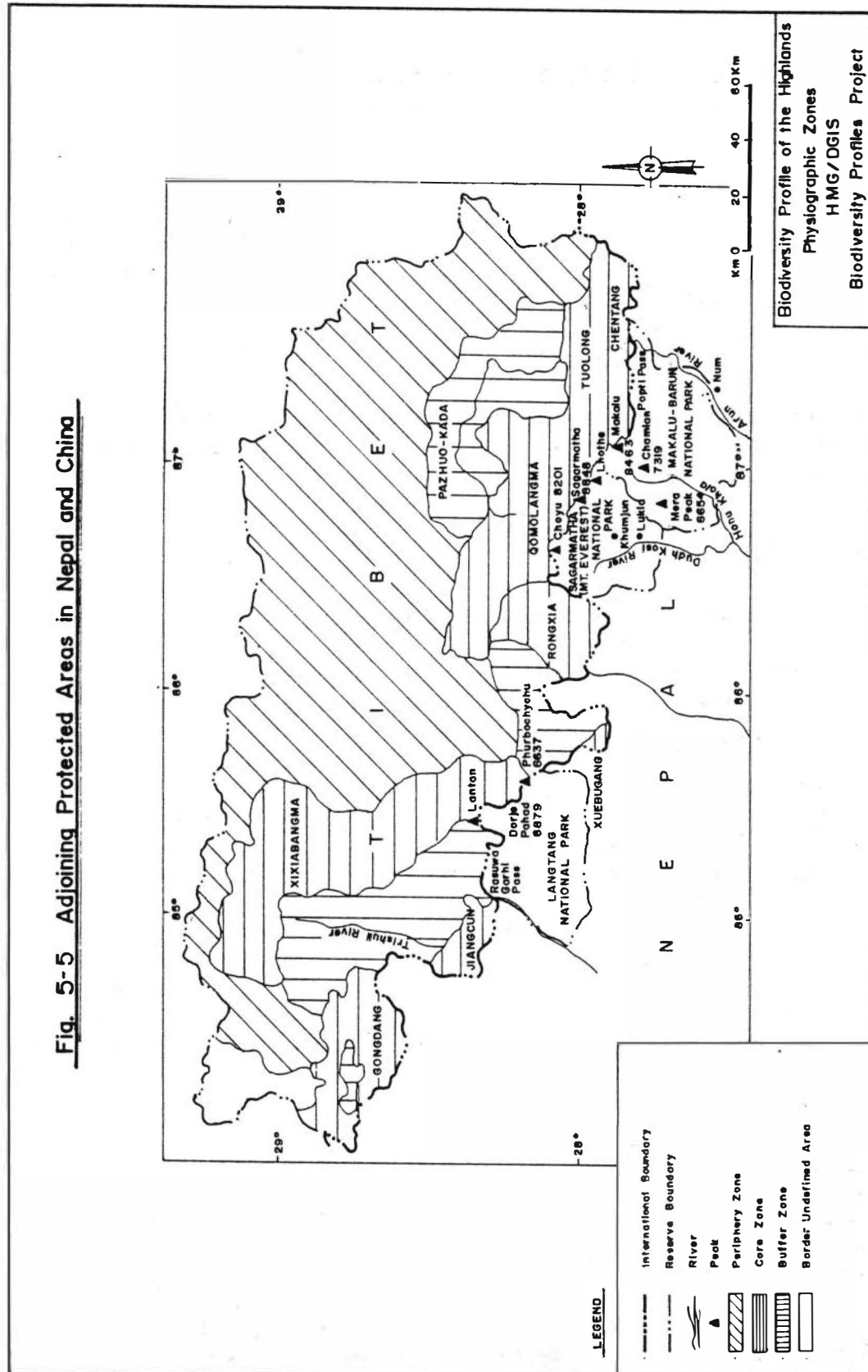
**LEGEND**

- — — International Boundary
- — — Motorable Road
- - - Trekking Route
- ~ ~ ~ River
- Town/Major Settlement Along Tourist Trail
- ▲ Mountain Peak
- ] ] Pass
- ▨ Proposed Extension



Km 0 5 10 15 20 Km

Biodiversity Profile of the Highlands  
Physiographic Zone  
HMG/DGIS  
Biodiversity Profiles Project



## **5.4 National forests**

National forests are those areas under the authority of the DoF and include grassland as well as forested areas. Although under the DoF's authority, hardly any of the extensive areas of national forest's grassland and forest in Nepal's Highlands are under active management by HMGN.

According to the LRMP study, 61% of the High Mountains (1 815 000 ha) and 6% of the High Himal (222 000 ha) was covered with forest in the late 1970s (Table 2-2 and 2-3). This includes all forest areas from dense, undisturbed high forest through to heavily degraded coppice and shrub. The Siwaliks is the physiographic zone with the largest area of good condition forest. Nepal's High Mountains have the second largest area with over one and a half million hectares. Considerable areas of grassland are also found in the Highlands. Twenty six per cent of High Himal and 17% of High Mountains are grasslands covering over one million hectares.

Section 5.4.1 below details the management types specified in the 1993 Forest Act - for the management of national forests. Section 5.4.2 reviews the issues concerning the management of the three main Highland forest management types: forested areas, pasture-lands and the medicinal herb resource. A short section covering the special case of buffer-zone forests is also given here. Management recommendations are given in Chapter 12.

### **5.4.1 Implementation of Forest Management legislation**

The 1993 Forest Act legislated for two categories of forests - National and Private Forest. There are five sub-categories of National Forests which are to be managed under the jurisdiction of the DoF (Table 6-1). The sixth type of forest is private forest - trees growing on private land. Under current legislation there are therefore six options for managing the national forests of the Highlands outside of the protected areas. Each of these types is discussed below.

#### **i) Private, leasehold and religious forests**

Private, leasehold and religious forests are not presently of significant importance in the Highlands. Trees on private land make up a very small proportion of the Highland's tree cover. Unlike in the Midhills where trees on private land contribute significantly for fodder and firewood needs; in the Highlands the still abundant areas of national forests has discouraged the tending of trees on private land. Leasehold forestry is currently not a practical option for managing the Highlands forests. The Leasehold Forestry Programme is tailored for the promotion of agroforestry on degraded areas of Midhills forests not suitable for handover as community forests.

There are areas of religious forest in the Highlands but little is known of them. Schmidt-Vogt (1988), however noted the positive attitudes of a Buddhist Religious community in Highlands Sindhupalchowk in protecting an area of forest nearby their monastery. They also encouraged the local people to care for the forests. Religious forests have also been noted in the Highlands from the Kanchenjunga area in the upper Tamar Valley (WWF/DNPWC, 1995). The main objective of protecting these religious forests is that local deities are believed to reside in them. Protection of religious forests is also carried out for "practical" reasons including the prevention of landslides. A full write up is given for religious forests in BPP's Midhills Biodiversity Profile (1995b) largely based on Ingles (1994).

**ii) Government managed and protected forests**

The categories of government managed and protected forests were created by the 1993 Forest Act. These two types of forest are to be managed by the DoF. Management plans are to be made with the emphasis in government forests being on production and in protected forests, on conservation. Data is not available on these types of forest but it is suspected that hardly any areas have had management plans written to date. However all areas that have not been handed over to FUGs as community forests or set aside for leasehold forest and are not religious or private forests remain by default within these two categories where all responsibilities and rights remain with the DoF.

The category of protected forests is of particular interest as an alternative designation for protecting biodiversity. As yet it is not clear if this category is just a feature of the legislation or whether protected forests will come under effective management by the DoF.

**iii) Community forests**

Community forestry involves handing over of use rights and management responsibilities to the local people who are formed into a user group comprised of those people who have traditionally used the forest and are prepared to take on its management. Management prescriptions are written into an operational plan. HMGN's policy is to hand over the use rights for all accessible Midhills and High Mountain forest to the local people. Significant progress towards this has already been made with an estimated, more than 200 000 ha handed over to 3000 user groups by September 1995 (Community Forest database - Community Forestry Division, DoF). The majority of activity has however been in the Midhills with little attention so far given to the areas of extensive forest in sparsely populated areas above 2500 m.

Only a few areas have been handed over to community forest user groups in the Highlands districts (Table 5-10). Many of the forests listed in Table 5-10 are actually at the upper limit of the Midhills (2500-3000 m) but are indicative of the picture for the High Mountains. For the three Highland districts listed an average of only 11 community forests had been handed over per district whereas in the Midhills the average was 94 per district (as of September 1995). However areas handed over are much larger in the High Mountains with an average of twice the total area handed over per district compared to the Midhills districts. In the Highlands the average area per household is 4.02 ha whereas the equivalent figure for the Midhills is 0.76 ha.

**iv) Buffer-zone forests**

Many of the areas of national forest that lie adjacent to protected areas in the Highlands are under heavy pressure from human disturbance and represent a special case. These forests and their associated flora and fauna are particularly threatened due to a number of reasons attributable to these areas lying adjacent to the protected areas. The protection of the forests within the protected areas transfers and intensifies pressure onto the areas outside the park. Forest areas within the national parks and hunting reserve are refuges for wild animals - such as Wild Boar and Common Leopard - that cause serious damage to local people's crops and livestock.



**Table 5-10 Data on Community Forests for three Highlands districts**

District	No of FUGs	Total CF area handed over (ha)	Total no. of household	Hectares per household
Mugu	11	987	878	1.22
Manang	13	5291	813	7.23
Dolpa	9	1840	607	3.61
<b>Highlands average per district</b>	<b>11</b>	<b>2706</b>	<b>766</b>	<b>4.02</b>
Midhills average*	94	5357	9100	0.76

Source: Community Forestry National Database, Community Forestry Division, DoF. Data includes those areas handed over to 10/9/95

\* Table 5-2 (BPP, 1995a)

CF Community forestry

An example of these negative effects is the Pharak area lying immediately to the south of the main entrance to Sagarmatha National Park. Restrictions on the collection of wood within the National Park allow only for the gathering of dead wood and six beams per household for house construction. These restrictions have meant that there has been heavy pressure on the forests outside of the National Park to provide firewood for the more than 30 000 visitors (tourists and accompanying guides and porters) who enter the Park each year. Between 200 and 300 loads of firewood pass out of Pharak into the National park each day (Whitehead, 1993). Some initiatives have however been taken. The Himalayan Trust has opened a seedling production nursery at Phortse. These seedlings are to be used for enrichment of the natural woodlands. It is appropriate that firewood is grown at the lower altitude areas of Pharak as the growth rates of Pharak are twice those of most of the forests within the protected area.

It is not yet clear whether these areas will be managed under the aegis of the DoF or the DNPWC. Buffer-zones are currently being established in the Terai. The management of populated buffer-zone areas in the Highlands and Midhills will probably follow the pattern of management through user groups.

#### **5.4.2 Management of Highland national forest areas**

Community forestry is the main initiative for the management of national forest outside of the protected areas. Forty seven per cent of forest sector investment over the twenty five year period of the Master Plan for the Forestry Sector was planned to go towards community forestry (HMGN/ADB/FINNIDA 1988a). To date this programme has concentrated on and policy tailored for the conditions in the Midhills. Attention is now beginning to be focussed on how to manage the large areas of forests in the upper Midhills and lower High Mountain areas. Here the locals are heavily reliant on the forests for their subsistence. Community forestry may not however be the most appropriate way of managing the Highlands national forests.

The circumstances in the Highlands are different to the Midhills in a number of ways:

- in many areas of the highlands it is often not the trees but the pasture grasslands and the medicinal plant resource that are most valued by local people
- unlike the Midhills there are hardly any reports of indigenous forest management systems in the Highlands
- being remote and sparsely settled it is difficult for DFO staff to cover these areas.

These areas are also highly important reservoirs of biodiversity and all management prescriptions must consider the impact on biodiversity. The impact of human activity is usually negative for wildlife. Schmidt-Vogt (1988), during his extensive studies of the Highland forests of Sindhu Palchok, recorded almost no mammals between April and October. At other times of year regular sightings of threatened animals such as Barking Deer, Himalayan Goral, Musk Deer and Red Panda were recorded. The lack of sightings between April and October is explained by the concentration of human activity during those months when villagers move their livestock to alpine meadows and high altitude forest for grazing.

#### i) Forested areas

The community forestry policy of HMGN was built on the foundation of the numerous local indigenous management systems found in Nepal's Midhills. In the Highlands such local management systems are largely lacking. It appears that national forest above 2500 m are, with only a few exceptions, unmanaged by the local people and are regarded as common property, where no rules apply.

A clear policy has not been worked out by HMGN for the management of high altitude forests. These forests are under threat in particular from the setting of fires and uncontrolled livestock grazing. The national forests of the Highlands remain largely unmanaged not assigned to any of the five types of national forest as detailed in the 1993 Forest Act. The main management option being explored is, as in the Midhills to handover management and use rights to FUGs.

Although many of these forests lie in largely uninhabited areas the impact of human activities on them is considerable. Schmidt-Vogt (1988) recorded a pattern of profound human influence on the forests above 2800 m in northern Sindhu Palchok. In the *Abies*-*Rhododendron* forests the *Abies spectabilis* trees were heavily exploited for roofing shingle production. This seems a quite minor use but between only five and ten per cent of each tree was actually used to make the shingles after other parts were rejected and the shingles soon rot and have to be changed every several years. The main human influence were however fire and over-grazing. Fire seriously threatens the Juniper forests as it seemed unable to regenerate following fire damage. The absence of small seedling stage trees was attributed to grazing by livestock. Grazing is seasonal in Highlands forests. Monsoonal grazing causes serious erosion in the *kharka* grassland clearings in the forests. Ring barking of trees was also common both to gather the bark for roofing material and as a way to kill the trees and extend the grazing areas.

Jackson *et al.* (1993) claim that the Highlands have large areas of forest, often remote from DFO Range offices in sparsely populated areas. They also argue that HMGN does not have the resources or manpower to protect or manage its high altitude forests as protected forests or government managed forests. The longer the government waits to implement improved management the more

degraded the Highland's forest resource will become. Community forestry is a management option that can be implemented relatively cheaply, building on expertise of DFO staff in handing over forests in the Midhills.

However Jackson *et al.* (*ibid.*) list three issues where high altitude forests present special difficulties:

- because settlements are widespread it is more difficult to accurately identify user group members
- these forests are often in good condition and a valuable resource. There is therefore the danger that the local elites hijack commercially valuable forest products for themselves
- appropriate silvicultural applications may well be different for the high altitude forests where some forest types regenerate less easily than lower altitude forests.

However, it is questionable whether community forestry is appropriate for most of the Highland's forests. Due to their remoteness, size, and commercial and ecological value a different model of forest management, possibly based on the Joint Forest Management system used in India, may be more applicable (Bill Jackson, NACFP, pers. comm.). This style of forest management would be participatory but with the government influencing management prescriptions more than is the case in community forestry.

## ii) Pasture-lands

The Highland's grassland areas are extensive and require different management prescriptions to the forested areas. These comprise the alpine and sub-alpine grasslands and areas of steppe some of them straddling the international border with the Autonomous Region of Tibet in China. Fifty five per cent of the pasture-lands in Nepal cover alpine meadows between 4000 and 5000 m (Rai and Thapa, 1993). Many of these grazing areas have indigenous management systems (Schmidt-Vogt, 1988; Rai and Thapa, 1993). In many areas herders have evolved complex arrangements to protect and regulate access to pasture lands. Many of these systems have however broken down for reasons detailed in Chapter 2 including the discouragement of indigenous institutions by Government policy and practice. Any initiatives to manage these areas must take into account the various local management systems and traditional forms of land tenure that have operated in these areas.

Many of the highland pastures are in poor condition due to over-grazing. These naturally occurring grasslands are fragile ecosystems and the heavy grazing combined with heavy monsoon rains causes serious erosion. This is occurring even within the PAS as has been reported from Khaptad National Park (BPP, 1995j). The transhumant grazing of these areas is often combined with medicinal plant collection and the poaching of wild animals. The consequences of this over-exploitation and illegal activities have serious effects on the biodiversity of the Highlands.

## iii) Medicinal and aromatic plants resource

The Highland's medicinal and aromatic plants are mostly found in the alpine and sub-alpine meadows. The medicinal plant resource is threatened due to over-exploitation with many areas being collected to destruction of the plant resource (Edwards, 1993). This is due to both gathering the plants prior

to the plants' seeding and also by over-exploitation and whole plant harvesting. The issues regarding the management of NFTP's are covered in detail in Chapter 7.

The user group model is being promoted for the management of the highland areas where medicinal plants grow. For example, an initiative to manage the Jatamansi medicinal herbs resource in Humla aims to manage the resource through the formation of user groups (ANSAB, 1995). It is not clear, however whether the large sparsely populated areas can be successfully managed in this way. The identification of user groups is difficult, although traditional pasture management systems did and in some cases still do manage these areas effectively. Stoian and Yadav (1995) point out that to date community forestry has been focused on fuelwood, fodder and timber management in forested areas with no experience on the management of the medicinal plant resource. Medicinal plants are usually found in grasslands where the DoF staff have little experience or knowledge to guide FUG management prescriptions. Medicinal plants are also collected over extensive areas usually by a different sub-set of the population than has so far been involved in community forestry. It is usually the poorer members of the community who gather the medicinal plants - people who are often excluded from decision making.

Policy on the Highlands forests and grasslands must be tailored to the diversity of conditions and the different potential of the natural resources of these high altitude areas. A number of recommendations are given in Chapter 12.



## 6. CONSERVATION ASSESSMENT

### 6.1 Representation of species and ecosystems in Protected Area System

#### 6.1.1 Occurrence of endangered species inside Protected Areas System

##### i) Flora

##### Flowering plants

None of the protected areas of Nepal have been floristically surveyed in any detail. Based on the altitude range of the protected areas and the broad horizontal distribution of Nepal's flowering plants the expected number of species along with the percentage of the country's endemics, has been estimated for the Highlands confined protected areas using the recorded species in de BDS (Table 6-1 and Figure 6-1). Figure 6-2 shows the expected number of endemic plant species in the PAS.

**Table 6-1 Expected number of flowering plants in the Protected Areas System of the Highlands**

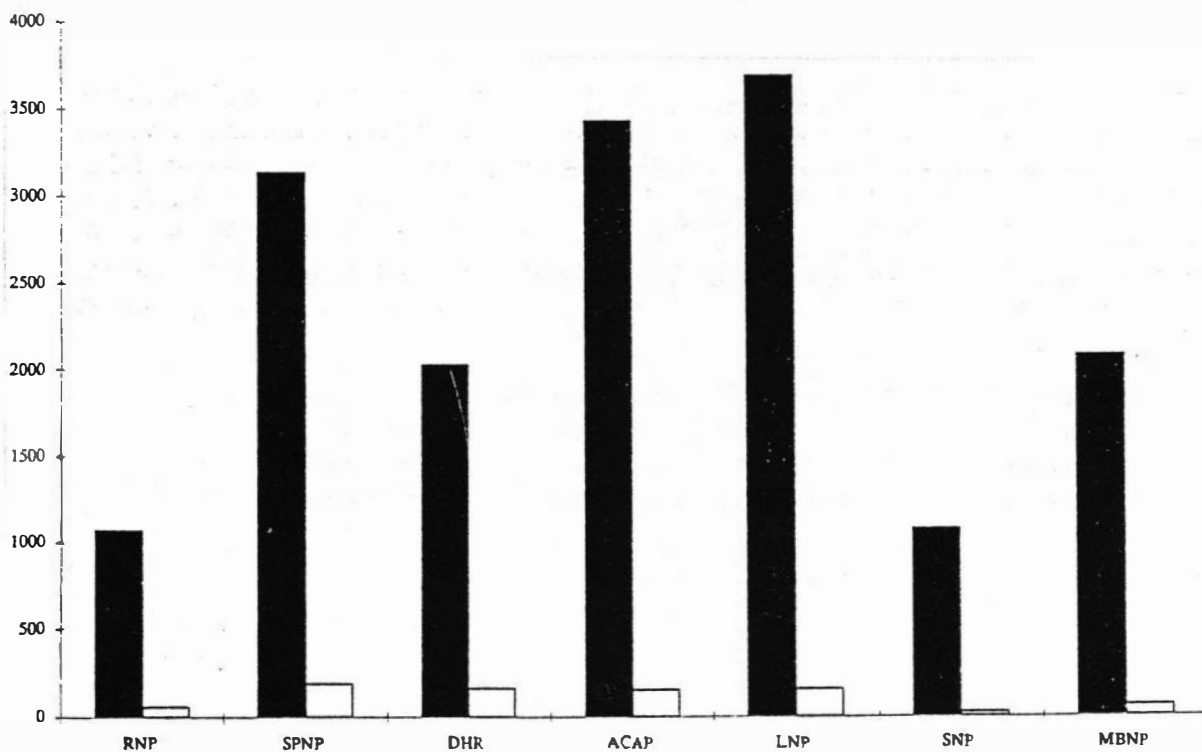
Protected areas	Area (km <sup>2</sup> )	Altitudinal range (meters)	Number of expected species	% of the country's total	Number of endemics	% of Nepal's endemic plants
Rara NP	106	2800-4048	1070	21	58	24
Shey-Poksundo	3555	2000-6883	3124	59	190	77
Dhorpatan	1325	2850-5500	2029	39	162	66
Annapurna	7820	1151-8091	3430	66	154	63
Langtang	1710	792-7245	3689	71	158	64
Sagarmatha	1148	2845-8848	1074	21	24	10
Makalu-Barun	2324	400-8463	3073	60	60	24

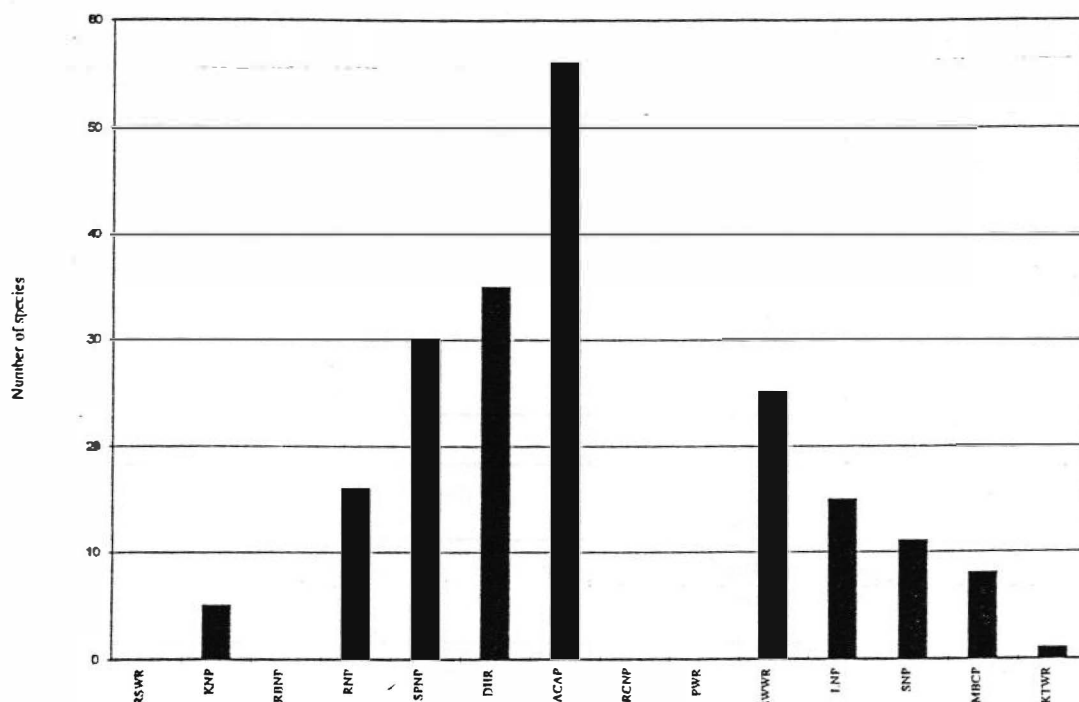
##### Gymnosperms

The distribution of gymnosperms within the Protected Areas System of the Highlands given in Table 6-2. Seventeen of the 19 indigenous gymnosperms are recorded from the PAS. The distribution of *Larix potanini* is restricted to LNP. This larch occurs in areas of lower rainfall, to the north of Gosainkund Lekh-Dorje Lhapka range. This species is known from SE Sechuan, China (Shrestha 1974).

**Table 6-2** Distribution of gymnosperms within the Protected Areas System of the Highlands

Species	RNP	SPNP	DHR	ACA	LNP	SNP	MBNP
<i>Cupressus torulosa</i>		+	+	+			
<i>Ephedra gerardiana</i>				+	+	+	+
<i>Juniperus indica</i>		+	+	+	+		+
<i>J. communis</i>		+		+	+		
<i>J. recurva</i>			+	+	+	+	+
<i>J. squamata</i>		+	+	+	+	+	
<i>Cedrus deodara</i>	+	+	+				
<i>Pinus wallichiana</i>	+	+	+	+	+	+	
<i>P. roxburghii</i>		+			+		+
<i>Tsuga dumosa</i>					+	+	+
<i>Picea smithiana</i>	+	+	+	+			+
<i>Abies spectabilis</i>	+	+	+	+	+	+	
<i>Larix griffithiana</i>		+				+	+
<i>L. potanini</i>					+		
<i>Taxus baccata</i>			+	+	+	+	+
<i>Gnetum montanum</i>							+

**Figure 6-1** Expected number of flowering plants and endemics in PAS of the Highlands

**Figure 6-2** Expected number of endemic plants in the protected areas system of Nepal

## ii) Fauna

Occurrence of endangered wildlife species in the PAS of the Highlands and their estimated population is given in Table 6-3, whilst Table 6-4 provides an overview of total number of mammals, birds and herpetofauna found in the seven protected areas and the number of threatened species (Figure 6-3). For the three Critical Endangered species: Wild Yak, Great Tibetan Sheep and Tibetan Antelope, Nepal is peripheral to these animals' range. Lynx has been reported only once in DHR (Wegge, 1976) and was reported for ACA (BCDPT, 1994); its distribution in other highlands parks is not known. Snow Leopards are reported from most Highlands parks; though there are no recent sightings in several of these areas.



**Table 6-3 Occurrence of endangered wildlife species confined to the PAS of the Highlands and their estimated population**

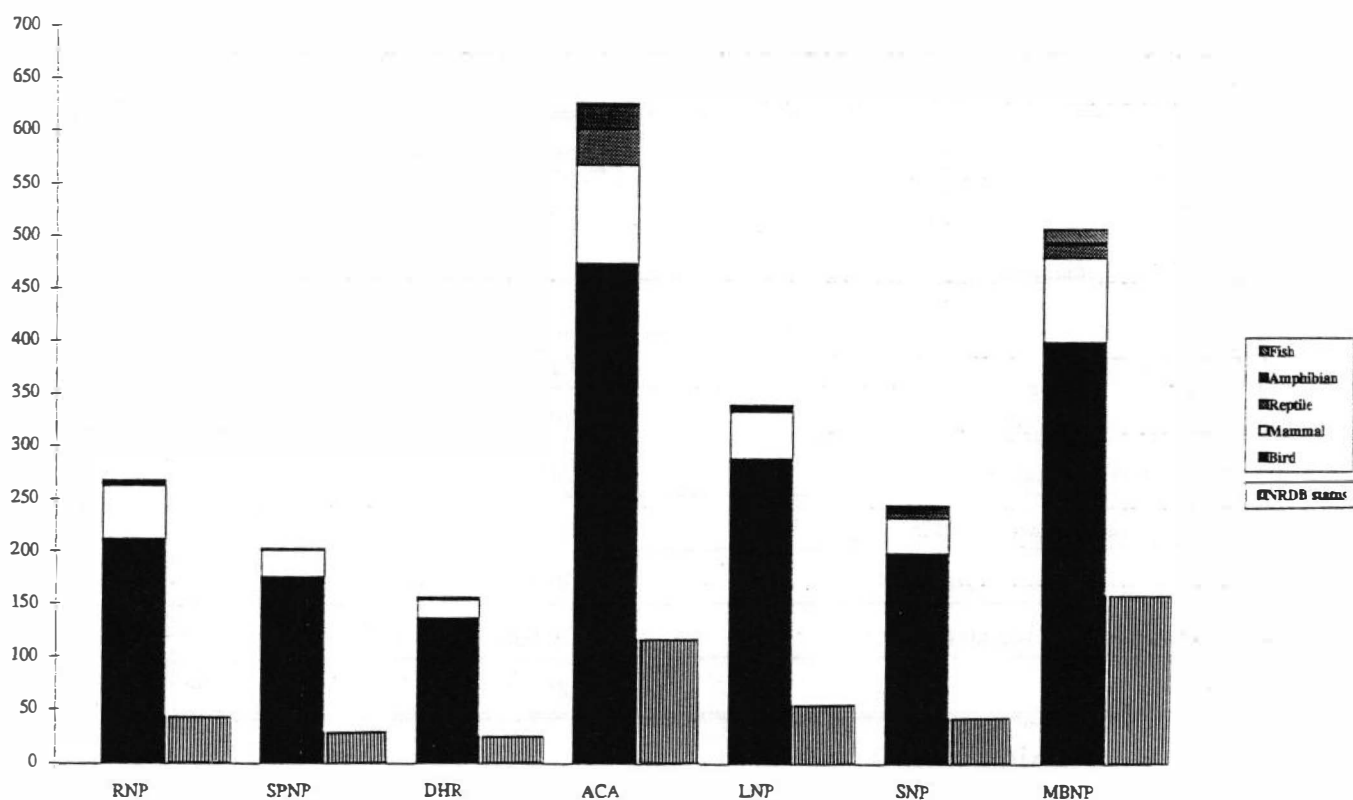
Species	Status	Occurrence	Population density	Population estimates
Tibetan Sand Fox	S	ACAP		< 10
Bharal	S	SPNP, DHR, ACAP	10 km <sup>2</sup> on alpine meadows	2000 - 3000; DHR population 740; LNP 220 in upper Langtang valley; SNP 300
Grey Wolf	V	RNP, SPNP, DHR, ACA, LNP, SNP, MBNP		< 200
Brown Bear	V	ACAP, RNP and perhaps SPNP		200 - 400
Lynx	E	DHR, ACAP		< 50
Snow Leopard	E	RNP, DHR, SPNP, ACAP, LNP, SNP, MBNP	5 - 10 per 100 km <sup>2</sup>	< 20
Himalayan Forest Musk Deer <i>M. chrysogaster</i>	E	RNP, SPNP, DHR, ACA, LNP, SNP, MBNP	45 per km <sup>2</sup>	RNP 20, SPNP > 1000, LNP 500, SNP 600-800
Musk Deer <i>Moschus fuscus</i>	E	SNP		< 100
Red Panda	E	RNP, SPNP, DHR, ACAP, LNP, SNP, MBNP	1/2.9 km <sup>2</sup> in <i>Fir-Jhapra</i>	154 - 354 (Yonzon 1991), figure may be an underestimate
Wild Yak	CE	SPNP, ACAP, perhaps SNP		< 10 mainly vagrants from Tibet, presence doubtful
Great Tibetan Sheep	CE	SPNP, ACAP, MPNP		< 30 mainly vagrants from Tibet
Tibetan Antelope	CE	SPNP, ACAP		< 20 mainly vagrants from Tibet

Sources: BCDPT, 1994; Fox, 1985; Heinen and Yonzon, 1994; Jackson, 1978; Jackson and Ahlborn, 1986, 1988; B. Kattel pers comm., 1995; Mitchell and Derksen, 1976; Schaller, 1977; Wegge, 1976; Wegge and Oli, 1988; Wilson, 1981; Yonzon 1991; Yonzon *et al.*, 1991.

**Table 6-4 Total number of mammal, bird, herpetofauna and fish species found in protected areas of the Highlands and number of threatened species**

Taxon	RNP	SPNP	DHR	ACA	LNP	SNP	MBNP
Fish	3 (0)	- -	- -	2 (2)	2 (1)	1 (1)	13 (5)
Amphibians	1 (1)	- -	1 (1)	22 (3)	2 (1)	6 (1)	2 (0)
Reptiles	1 (0)	1 (0)	1 (0)	34 (4)	2 (0)	5 (0)	12 (1)
Birds	212 (21)	176 (17)	137 (15)	474 (90)	289 (47)	199 (33)	400 (73)
Mammals	51 (24)	26 (16)	18 (13)	92 (33)	45 (14)	34 (14)	81 (26)

**Figure 6-3** Total number of mammals, birds, herpetofauna and fish found in the seven conservation areas of the Highlands and number of threatened species



### 6.1.2 Representation of ecosystems within protected areas system

Dobremez, together with his colleagues at CNRS and Nepali botanists produced ecological maps that cover the whole of Nepal (Table 1-4). MENRIS classified the information from all eight 1:125 000 maps to give 118 distinctive vegetation associations (MENRIS/ICIMOD, 1995). These maps were digitised and the areas for each ecosystem type: for each separate patch, overall for Nepal and within individual protected areas was calculated. This was done to assess the representativeness of Nepal's PAS in terms of coverage of all the different ecosystem types. The ecosystems listed in Table 6-5 are defined as Highlands ecosystems. A full listing of all ecosystem types by the four physiographic zones are given in Appendix 4-1. Thirteen of these are Siwaliks ecosystems, 10 Terai types, 53 are Midhills, and 38 Highlands, (Table 6-6). This excludes the four cultivated areas and one water body type.

**Table 6-5 Dobremez's Highlands ecosystems (as defined by BPP)**

Biogeographical region	Ecosystem code
Nival level	1000
Alpine level	2101-2110
Lower alpine level	2201-2206
Upper sub-alpine west Nepalese	3101-3103
Upper sub-alpine central Nepalese	3110
Upper sub-alpine eastern Nepalese	3120-3122
Lower sub-alpine west Nepalese	3201-3203
Lower sub-alpine east Nepalese	3220-3223
Steppic north-west Nepalese	8001-8007
Other	9900

Source: ICIMOD/MENRIS, 1995

The 113 ecosystems were reduced to 97 to allow for digitisation of the maps to avoid confusion over closely matched colours. This was done by combining a number of ecosystems whose associations were largely similar. For example ecosystems 2107 (high altitude discontinuous vegetation cushion plants) and 2109 (scarcely vegetated rocks and screes of upper alpine level) were merged.

Highlands ecosystems are found in nine of the protected areas. Separate data is not available for the adjoining Makalu-Barun National Park and Conservation Area and the two are counted as one protected area. This approach of mapping the occurrence of Highlands vegetation by CNRS's ecosystem type differs from that adopted in Chapter 5 where the altitude range of 1000 to 3000 m was used to assess the amount of Midhills area covered by Nepal's PAS (Table 5-1). The total areas of the protected areas differ also, but not significantly between Table 5-1 and Table 6-7. The differences are due to the errors in Dobremez's original maps and those inevitably incurred whilst transferring the data from the maps into the GIS system.

Table 6-6 Dobremez's ecosystems by physiographic zone

Zone	Dobremez's ecosystems
Teraí	10
Siwaliks	13
Midhills	52
Highlands	38
Other	5
Total	118

Source: interpretation from original maps and ICIMOD/MENRIS, 1995

Thirty eight of Dobremez and colleagues' ecosystems are found within the Highlands. Thirty of these are covered to a greater or lesser extent in the PAS (Tables 6-7 and 6-8). The coverage ranges from just 131 ha of lower sub-alpine hygrophytic Fir-Hemlock-Oak forest (code no. 3202) lying in SPNP to 426 142 ha of glacier, snow and rock (code 1000) and 119 610 ha of North-west steppic, high altitude cushion plant formation and 112 602 ha of *Caragana gerardiana*, *Lonicera spinosa* steppe (code 8003). Upper sub-alpine rhododendron - Birch and lower sub-alpine *Abies spectabilis* are the most commonly occurring found in six of the eight protected areas.

**Table 6-7 Area of Dobremez's Highlands ecosystems by protected area PA (ha)**

Ecosystem code	ACA	MBNP	LNP	DHR	KNP	SNP	RNP	SPNP	Total
1000	189810	61492	32712	10968		69555		61668	426205
2101		207							207
2102								72012	72012
2103	92			16789					16881
2104	18563						740		18637
2108			15326			25505			40831
2109						1489			1489
2110			7752			1242			8994
2201	10432	764		23301				11674	46177
2202		33593	15217						48810
2203			5271			8784			14055
2204								9396	9396
2206		6157							6157
3102	5924	1311	7554	24251			860	1913	41040
3103	7224							9013	16237
3110	75267								75267
3120		17309				489			17798
3121		12297	4056						16351
3122		12666							12666
3201					5291				5291
3203	13618	2259	11385	24876			2076	270	52563
3220		18343							18343
3222			2860						2860
8001	119449			203				82199	201810
8002	36722								36722
8003	64989							47613	112603
8004	21779							13413	35192
8005								34441	36155
8006	3010							8839	11849
8007	5005								5005
9900							1000	247	1247
PA Highlands ecosystems (ha)	571884	166398	102133	100388	5291	107064	4676	352698	1408850
PA total area	740086	223190	159834	131899	23516	112960	11455	356005	
% Highlands ecosystems	77%	75%	64%	76%	22%	95%	40%	99%	
No. Highlands ecosystems per PA	14	11	9	6	1	6	3	13	

Table 6-8 Representation of Highlands ecosystems within protected area system (ha)

Ecosystem code	Region	Type	PAS occurrence	Area within PAS	Total ecosystem area in Nepal	% of area within PAS
1000	alpine	glaciers, snow, rock	6	255 500	879 000	29
2101	alpine	alpine meadows with Graminae and Cyperaceae	1	207	107 000	<0.2
2102	alpine	xerophytic mat patches & veg. rocks	1	72 012	325 000	22
2103	alpine	mesophytic mat patches & veg. rocks	2	16 881	50 000	33
2104	alpine	mesophytic & hydrophytic mat patches & veg rocks	2	18 637	23 000	81
2108	alpine	meadows (mat patches)	2	40 831	65 000	63
2109	alpine	scarsely vegetated rocks and screes	1	1 489	12 000	12
2110	alpine	meadows and common land	2	8 994	85 000	10
2201	lower alpine	rhododendron mesohygrophytic scrublands	4	46 171	171 000	27
2202	lower alpine	mesohygrophile rhododendrons ( <i>R. anthopogen</i> , <i>R. nivale</i> ..)	2	48 810	139 000	35
2203	lower alpine	mesohygrophytic juniper scrublands	2	14 055	26 000	54
2204	lower alpine	xerophytic closed alpine mat and scrub	1	9 396	199 000	5
2206	lower alpine	shrublands with Rhododendrons	1	6 157	23 000	27
3102	west	upper sub-alpine rhododendron - Birch forest	6	41 040	203 000	20
3103	west	upper sub-alpine Birch Blue - Pine open forest	2	16 237	67 000	24
3110	central	upper sub-alpine north Himalayan alpine veg. ✓	1	75 267	94 000	80
3120	east	upper sub-alpine <i>Betula utilis</i> with Rhododendron and Fir	2	17 798	47 000	38
3121	east	upper sub-alpine rhododendron shrublands	2	16 351	54 000	30
3122	east	upper sub-alpine rhododendron-juniper shrublands	1	12 666	37 000	35
3201	west	lower sub-alpine mesophytic Fir forest	1	5 291	30 000	17
3203	west	lower sub-alpine Fir ( <i>Abies spectabilis</i> ) forest	6	52 563	299 000	18
3220	east	lower sub-alpine <i>Abies spectabilis</i> forest	1	18 343	76 000	24
3222	east	lower sub-alpine <i>Larix griffithiana</i> , <i>L. potanini</i> forest	1	2 860	3 000	100
8001	NW steppic	High altitude cushion plant formation	3	203 810	1 040 000	19
8002	NW steppic	<i>Caragana versicolor</i> , <i>Lonicera spinosa</i> steppe	1	36 722	74 000	49
8003	NW steppic	<i>Caragana gerardiana</i> , <i>Lonicera spinosa</i> steppe	2	112 603	169 000	54
8004	NW steppic	<i>Caragana brevispina</i> , <i>Artemesia</i> steppe	2	35 192	60 000	58
8005	NW steppic	<i>Caragana pygmaea</i> , <i>Lonicera spinosa</i> xerophile steppe	2	34 155	126 000	23
8006	NW steppic	<i>Myricaria-Hippophae-Salix</i> riverain thickets	1	11 849	19 000	63
8007	NW steppic	<i>Sophora moercroftiana</i> , <i>Oxalis mollis</i> sieppe	1	5 005	50 000	10
9900		water bodies	2	1 247	57 000	2
Total Area	-	-	-	993 718		

The three dominant ecosystem types in each of the Midhills and Highlands protected areas are given in Table 6-9. A full description of this analysis is given for each protected area in Chapter 5. The ecosystem types for each code number are given either in Table 6-8 or in Appendix 4-1.

**Table 6-9**      **Extent of three predominant Dobremez's ecosystem types for each of the Highlands and Midhills protected areas**

Protected area	Dobremez ecosystem with most area			Dobremez ecosystem with second most area			Dobremez ecosystem with third most area		
	code	area	%	code	area	%	code	area	%
ACA	1000*	189 810	26	8001	119 449	16	3110	75 267	10
DHR	3203	24 876	19	3102	24 251	18	2201	23 301	18
KNP	4003	7 806	33	3201	5 291	22	4001	4 901	21
LNP	1000	32 712	20	4009	28 060	18	2108	15 326	10
MBNPCA	1000	61 492	28	2202	33 593	15	3220	18 343	8
RNP	4002	2 602	23	3203	2 076	18	5010	1 750	15
SNP	1000	69 554	62	2108	25 505	23	2203	8 783	8
SPNP	8001	82 199	23	2102	72 012	20	1000	61 668	17
SWWR	5008	3 769	38	6221	2 545	26	4009	2 192	22

\* for ecosystem types see Table 6-8 and Appendix 4-1

Thirty of Dobremez and colleague's ecosystems are represented within the PAS (Table 6-7). Of these 30, three have areas of less than 1000 ha (10 km<sup>2</sup>). According to this data only eight ecosystems are not covered within the PAS (Table 6-10) whilst three have only a small area covered. Overall coverage of the Highlands ecosystems within the PAS is good. The only neglected groupings appears to be alpine grasslands (codes 2101, 2105, 2106, 2107) and larch forests (3221, 3223). The most extensive areas of *Larix griffithiana* occur in the proposed Kanchenjunga Conservation Area. Outside of the PAS these maps do not represent the actual status of ecosystems. Some of the areas not included in the PAS (Table 6-10) have only a limited occurrence but no matter how small an area covered by any ecosystem each one provides a unique set of habitat conditions for fauna and flora. These maps show potential ecosystems which will be actually represented on the ground in protected areas. Studies using the latest techniques of satellite imagery and GIS systems await for a comprehensive mapping of Nepal's ecosystems.

The data used for evaluating the coverage of ecosystems in the protected areas dates from 1971 to 1985. This system only showed the expected natural vegetation types with the Kathmandu Valley for example covered in *Schima-Castanopsis* forest hardly any of which now exists there. These maps do however have some inconsistencies in this and other regards. In spite of the maps claiming to show potential climax vegetation areas of cultivated land are depicted and secondary vegetation types such as *Daphniphyllum himalayense* are represented. This data also does not reflect the condition of the vegetation nor does it account for changes since the maps were made. These maps were used however as the best available depiction of Nepal's ecosystems and do give a good general picture.

**Table 6-10 Highlands ecosystems not covered in protected area system**

Ecosystem code	Ecosystem type		area (ha)
	region	type	
2105	alpine	alpine meadows on southern side of the Himalaya	70 000
2106	alpine	dry alpine vegetation on northern side of the Himalayas	30 000
2107	alpine	high altitude discontinuous vegetation cushion plants	60 000
2205	lower alpine	mesophytic closed alpine mat and scrub	53 000
3101	upper sub-alpine west	mesophytic closed sub-alpine mat and scrub	43 000
3202	lower sub-alpine east	Hygrophytic Fir-Hemlock-oak forest	18 000
3221	lower sub-alpine east	<i>Larix griffithiana</i> forest	4 000
3223	lower sub-alpine east	<i>Larix potanini</i> forest	4 000





## **7. ECONOMIC IMPORTANCE**

### **7.1 Introduction**

Biological resources are central to maintaining the environmental quality and living standards of people in a largely rural, subsistence economy such as Nepal. Biological resources provide major direct and indirect benefits. This chapter reviews mainly the direct economic values of the biological diversity of the Highlands with a brief summary on some of the secondary economic benefits of conserving biodiversity. The three areas of direct economic benefit are eco-tourism, timber, and the non-timber forest products (NTFP) resources. The tourism sector is focussed on trekking in the Highlands and contributes significantly to the local and national economy. Tourism has brought negative environmental impacts alongside the economic benefits. The timber resource of the Highlands forests is considerable but not significant commercially. It is still very important throughout the Highlands for local use and on a national level for soil conservation. Non-timber forest products (NTFP) are very important both locally for their various uses and nationally for their commercial value.

The conservation of biodiversity cannot be achieved through the establishment of protected areas alone. The natural resources of the Highlands make substantial contributions to the subsistence agrarian economy but their use is often unregulated and illegal. In the Highlands many large areas of forests remain but there is increasing human pressure on them especially in the lower reaches from the over-grazing of cattle and in the remoter areas through poaching of wildlife and over-exploitation of the medicinal plants resource. All types of land-use have some impact on biodiversity. The uses and values of biodiversity provide a powerful argument to augment the current area under sustainable forest management with different emphases on biodiversity conservation and subsistence and commercial use according to needs and potential.

One other value of Nepal's biodiversity not dealt with in detail here is the hydropower potential of Nepal's rivers. This is potentially Nepal's most valuable resource. If all potential 60 run-of-river plants and 30 reservoir/dams were built, Nepal would generate 145 000 giga-watt hours of electricity annually - enough to satisfy the needs of 700 million average South Asian families (Dixit, 1995). The impact of these dams on the biology of Nepal's river systems would of course be disastrous. This question is a very controversial one being the classic dilemma of, in the case of large dams, of a choice between development or conservation. Those opposed to large dams believe that a series of small scale and medium scale projects would better provide for Nepal's electricity needs.

### **7.2 Environmental protection**

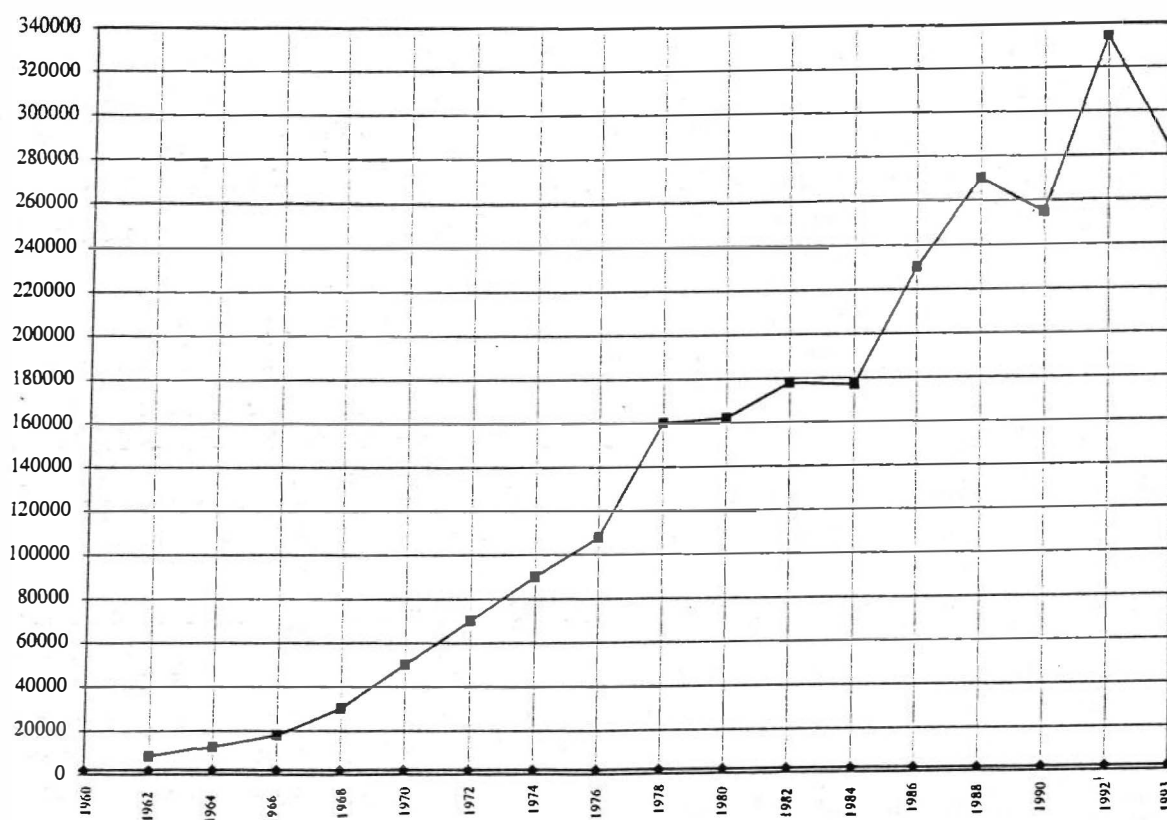
From the human point of view the most pressing reason for conserving biodiversity and in particular in preserving good forest cover is the often disastrous consequences of forest loss on environmental quality. Lying astride the steepest and highest terrain in the world the natural vegetation cover is crucial to control levels of soil erosion. In Nepal's Highlands forests are crucial both for preventing excessive erosion that can lead to catastrophic landslides, and as important underground reservoirs of drinking water. Natural forests are in nearly all respects superior to plantations in providing environmental protection. Forest loss is seen as a major contributing factor for global warming. The importance of forests in regulating global weather patterns and as carbon dioxide sinks is proven.

Nepal has about 0.15% of the world's forests (Jackson and Ingles, 1994). Economic values can be put on these indirect benefits which would outweigh any of the direct economic benefits outlined below.

### 7.3 Eco-tourism

Tourism is a major source of foreign exchange for Nepal. The number of tourists arriving in Nepal has increased steadily from a few thousand in the early 1960s to 327 000 in 1993 (Figure 7-1). Growth in tourist arrivals over the 20 years to 1993 averaged 8 % per annum. Current trends show large increases in Indian tourists visiting Nepal. Indians accounted for 31 % (103,000) of the total tourists in 1994 - an increase of 23 % on the previous year. Hardly any of these Indian tourists visit the Highlands however. Almost all tourist visits outside the Kathmandu and Pokhara valleys were limited to the protected areas of RCNP in the lowlands, and ACA, LNP and SNP in the Highlands.

**Figure 7-1 Tourist arrivals**



Source: Touche Ross *et al.*, 1988 and Ministry of Tourism 1994

Of total tourist arrivals 75 %, are categorised as "pleasure" tourists (Touche Ross, 1990). Trekkers are an important group providing 14 % of arrivals. Visitors to national parks and wildlife reserves are included in these two categories. The main tourist attractions found in Nepal are summarized in Table 7-1. The peak tourist seasons in Nepal are spring and autumn when the weather is most favourable. In 1994, 22.4 % of tourists came during October and November and 18.6 % during April and May (CBS, 1994a) against a mean figure of 16.6 % per month.

**Table 7-1 Main tourist attractions**

- |   |   |
|---|---|
| - | Cultural tourism in the Kathmandu valley including the World Heritage site of Patan with its Hindu and Buddhist temples |
| - | Trekking in the High Mountains/High Himal   |
| - | Rafting the rivers  |
| - | Wildlife tourism  |
| - | Pilgrimage to religious sites such as Pashupatinath, Lumbini, Muktinath   |

Source: Touche Ross, 1990

Eco-tourism involves visiting natural or semi-natural areas to enjoy their scenery, tranquillity, plants and wildlife. Eco-tourism in Nepal predominantly takes place in the PAS. River rafting is an exception to this. For 1988, Wells (1991) reported that US\$ 6.4 million was spent by tourists as a result of the attraction of protected areas. The Government of Nepal capitalizes on eco-tourism by charging visitors entrance fees and by collecting concession fees from lodge operators. Entry fees are collected either at the Department of Immigration in Kathmandu or at the park entrances and are sent on to the Ministry of Finance. Until recently the DNPWC was not entitled to benefit from any of these fees and charges to finance the management of the protected areas. Recently however important policy changes have been made. The Fourth Amendment (1993) to the 1973 NPWC Act stipulates that between 30 and 50 % of the revenue generated by any protected area are to be granted directly to the surrounding communities.

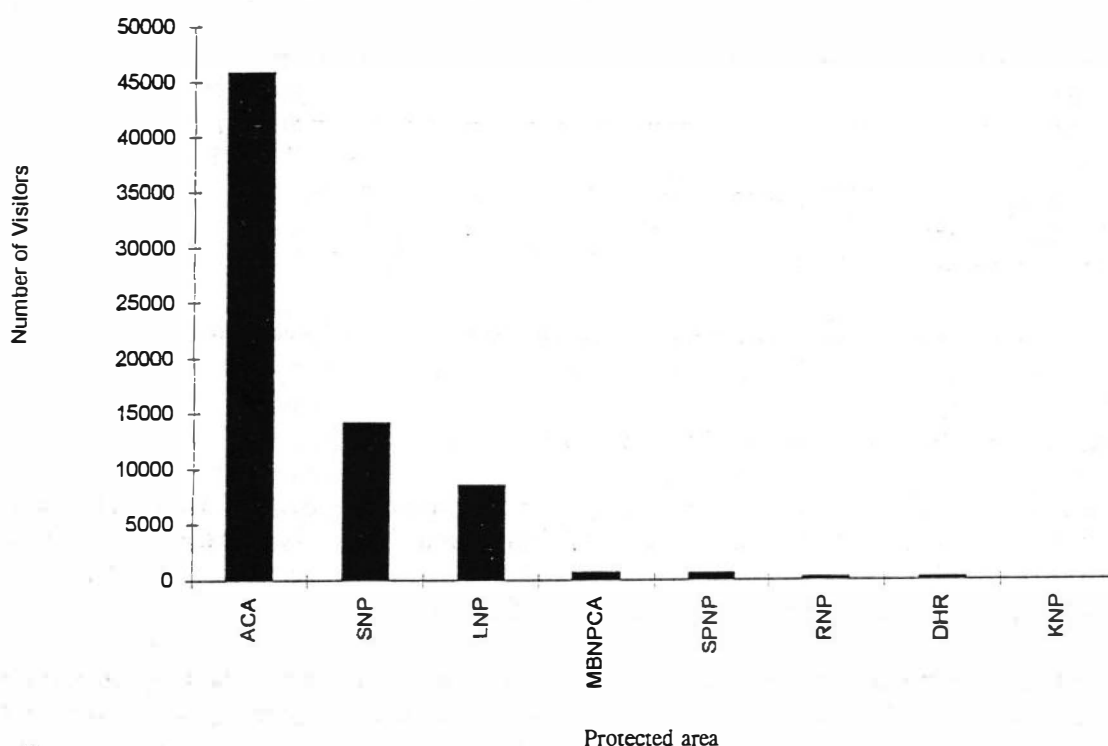
Eco-tourism in the Highlands is centred on trekking in the mountains. The main destinations are the three protected areas ACA, SNP and LNP. The Annapurna area receives by far the most visitors of the Highlands protected areas (Figure 7-2). Over 45 000 entry permits were issued for ACA to foreigners in FY 1994/95 generating US\$ 550 000 in revenue. Annapurna is the main destination for trekkers in Nepal due to its spectacular mountain scenery and relative accessibility. In 1991 of all trekkers visiting Nepal, 55 % of them headed for the Annapurna area. Over 14 000 visitors to Sagarmatha and over 8400 to Langtang purchased entry permits in the same year.

The entry permit for Nepal's protected areas cost US\$ 12 along with the same amount for trekking permits. Large areas adjacent to the Chinese border are restricted areas closed to foreigners. In recent years, however new areas have been opened up to foreign tourists allowing access to limited number of foreign tourists upon payment of large permit fees. One thousand tourists are allowed to visit Upper Mustang on the payment of US\$ 700 for a ten day trip. Other Highlands areas recently opened to tourists include North West Humla (the track to Mount Kailash through Nepal), the Kanchenjunga, Upper Dolpa, the trans-Himalayan part of SPNP and Manaslu areas.

The number of tourists visiting the Highlands protected areas is increasing every year (Figure 7-3). These figures do not include mountaineering expeditions. Mountaineering expeditions are nowadays usually largely self-sufficient bringing in their own supplies of kerosene or gas for use at their base camps (Brewer and Sherpa, 1995). On the approaches they and their large number of Nepali support staff and porters do use considerable amounts of firewood and are the worst litter offenders. Until the 1970s these areas had very limited contact with the world outside of their traditional domains. The influx of tourists has had a great impact on the areas of the Highlands on the tourist trail. Economic benefits have accrued but at the cost of serious negative impacts on the environment. The pressure

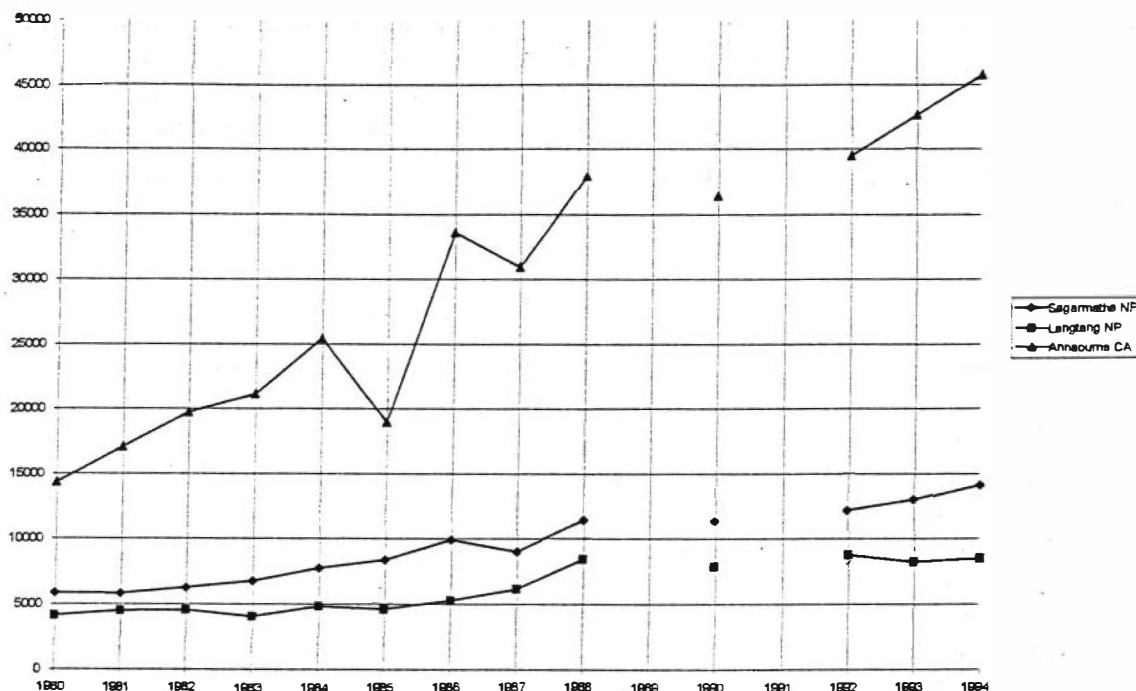
of the visitors is concentrated only in restricted areas of the three commonly visited protected areas. Visitors to Annapurna for example, tend to congregate at the three main bottle-necks of the Annapurna Sanctuary, the base of the Thorong Pass and Ghorepani village. The negative impacts of litter, and the "minefields" of human excreta are particularly evident in these areas. Tourism is also concentrated in time with most visits occurring in the four months of October, November, March and April. Foreign tourists with their higher living standard expectations use up far more natural resources per day than a local person. It has been estimated that foreign tourists use up to four times as much firewood per meal as Nepali nationals do (Heinen and Kattel, 1992b). Brewer and Sherpa (1995) list the negative effects of tourism as: litter, pollution, deforestation and inflation. Inflation has a negative effect on local poor people not involved in the tourism business by increasing prices of some essential goods.

**Figure 7-2** Visitors to Nepal's Highland protected areas FY 1994/95



Source: DNPWC, 1995

As well as damage to the environment the erosion of local cultural values has also been caused by the influx of tourists. Local youths see the tourists - often laden with the trappings of western consumer culture - passing through their villages. These effects are of course not limited to the impact of the visitors as the world is increasingly opened up to the influences of western culture.

**Figure 7-3 Growth in number of trekkers 1980-1994 in Highlands protected areas**

Source: Gurung and De Coursey 1994; DNPWC 1994, 1995

Tourist destinations need effective management to prevent negative impacts. The economic benefits from tourism are considerable and should spur the government and local communities to implement management. A few initiatives are beginning to be taken for the management of tourism to alleviate any negative effects of tourism and increase benefits to the local people.

A comprehensive management plan has been written for the Upper Barun valley of MBNP (Brewer and Sherpa, 1995). The background study found that tourism is just beginning to gain in popularity in this area and the first signs of negative impacts are beginning to appear as listed above. The plan made on the basis of this study aims to minimise and mitigate potential problems before they occur. These recommendations are guiding the work of the MBNP Project which works with DNPWC to put in place sound management. The plan outlines nine recommendations to:

- develop tourism related infrastructure by establishing designated campsites with requisite facilities, organising waste disposal, establishing kerosene depots and erecting signposts
- constructing national park administrative support facilities
- improve trails and bridges and building emergency shelters to minimise accidents
- provide extension activities for tourists, mountaineers and local people
- facilitate local people to benefit from increasing tourism by for example providing loans and training
- promoting the conservation of local culture

- ensure the enforcement of National Park regulations
- involve local people in the planning and management of eco-tourism in MBNP

The report gives specific recommendations on the details of work required such as for example where signposts and emergency porter shelters are to be built.

Recommendations to increase the benefits from eco-tourism in the Highlands are contained in chapter 12.

#### 7.4 Forest management for timber production

The timber resource of the Highlands is a valuable one. Kleinn (1994) has estimated that nearly 47 % of Nepal's total standing timber volume is found there (Table 7-2). Highlands forests are however not valuable commercially as the market opportunities are insignificant due to the inaccessibility to the Nepali markets. Timber smuggling is however increasing from Nepal into China. Trees are illegally cut, sawn into planks and then carried over the border. These forests are largely in good condition with the average volume per hectare of 140 m<sup>3</sup> for the High Mountains - two and a half times that for the Midhills forests. These forests are however the only source of building timber for Highlands people. Local communities recognise the multiple use value of their forests for soil conservation and daily needs with the timber value of these forests being only one aspect. The timber reserves of the Highlands represent the most valuable renewable asset. Their management is central to the conservation of the biodiversity and is discussed in Chapters 2, 5 and 12.

**Table 7-2 Tree growing stock by physiographic zone**

	Forest Area (1000 ha)	Tree stand volume (1000 m <sup>3</sup> )	% of total tree stand volume	Mean volume per ha (m <sup>3</sup> )
Terai	587	61 694	11.5	105
Siwaliks	1 445	117 423	21.9	81
Midhills	1 791	106 560	19.9	60
High Mountain	1 628	227 688	42.4	140
High Himal	154	23 231	4.3	151
<b>Total</b>	<b>5 605</b>	<b>536 596</b>	<b>100</b>	<b>average 96</b>

Source: Kleinn, 1994

## 7.5 Non-Timber Forest Products Trade

Natural forest ecosystems consist of an abundance of floral elements many of which have medicinal and aromatic properties. About 700 species of plants - 14 % of Nepal's vascular plant species - have various uses for "man". Non-timber forest products (NTFP) include all products for commercial, industrial or subsistence use derived from forest plants other than timber, fuelwood and fodder including those useful as medicines, perfumes, food, and fibre. Various parts of both perennials and non-perennials, from rhizomes to flowers and from bark to essential oils, are used in Nepal. This group of products has also been termed minor forest products but in some cases their volume and value can in no way be described as minor. They are important because of their many uses and commercial value. The exploitation of NTFPs, if done in a sustainable way will have less impact on biodiversity than timber harvesting - no matter how sensitively timber harvesting is carried out. The sustainable exploitation of NTFPs can provide valuable cash for rural people whilst having minimal impact on biodiversity.

Medicinal herbs are the basis for ayurvedic therapy and many of these are found in the High Mountains and High Himal and have high medicinal values being used in both traditional medicines and by modern pharmaceutical companies. Of the 700 NTFP species some 104 are commonly traded (Appendix 7-2). Trade figures for 1993/94 shows at least 61 plant species as commonly traded (Appendix 7-3).

Of all the species in trade (1993/94) only, *Acorus calamus* (Bojho), *Picrorhizakurroa* (Kutki), *Rheum australe* (Padamchal), *Swertia chirayita* (Chiraito), and *Valeriana wallichii* (Sugandawal) were noted from all three physiographic zones. Ten species are licensed for collection for amounts exceeding 100 tons in one year: *Bergenia ligulata* (Pakhanbed), *Cinnamomum tamala* (Tejpat), *Cinnamomum zeylanicum* (Dalchini), *Juniperus sp.* (Dhupi), *Nardostachys jatamansi* (Jatamansi), *Pinus roxburghii* (Khote salla), *Sapindus mukorossi* (Rittha), *Shorea robusta* (sal), *Swertia chirayita* (Chiraito), and *Zanthoxylum armatum* (Timur).

In terms of NTFP importance for the five development regions, the districts of the Far-Western Development Region of the Highlands register the highest legal trade volumes of NTFPs, totalling almost thirty eight tons in 1993/94 (Appendix 7-5). In terms of species in trade, the Eastern Development Region of the Midhills physiographic zone issued licenses for collection and export of the most plant species.

Data on NTFP is collected from District Forest Offices (DFO) records. It is the DFOs who are responsible for issuing NTFP collection licences and collecting royalties. The point at which licenses are issued and royalties paid for the collection of NTFPs is not necessarily the district where collection occurs. Many NTFP species from the Highlands are licensed for collection in Terai and Midhills District Forest Offices. Some districts cover different physiographic zones and collection often occurs from districts other than where the licence was issued. As such the data on NTFPs is not accurate although it does present the general picture.

A number of heavily exploited NTFPs have been recommended for special monitoring (Appendix 7-2).

The trade in NTFPs is increasing rapidly as reflected in yearly revenues generated from the granting of NTFP harvesting permits (Figure 7-4). These figures increased from 3.48 million NR in 1989/90



to over four times that figure (15.72 million NR) in 1993/94 (Appendix 7-5). A total of 11 709 tons of NTFPs were legally collected and exported, with revenue totalling 15.7 million NR (Appendices 7-3 and 7-5). However, these figures are suspect as HMGN has only recently begun to keep data on the NTFP trade and only FY 1993/94 figures are reliable. There is however undoubtedly an increasing trade. Of the three zones the most royalty revenues are realised from the Terai/Siwaliks although this does not necessarily represent the source of these NTFPs. Export demand is increasing, mainly from India. Some 97 percent of Nepal's NTFP exports go to India predominantly in the form of unprocessed raw materials. NTFPs exported to third countries, though small in volume, are often in processed form and of higher value. If the same quantity of NTFPs is licensed for collection and export in the coming years, the government revenue will be substantially increased as the price of most NTFPs is increasing. HMGN needs to encourage the processing of NTFPs to increase value before export rather than the majority of the profits being realised by Indian middle-men and manufacturers.

The Forest Rules 1995, enforced in accordance with the Forest Act 1993, categorized a number of NTFPs requiring licenses for their collection. Some 43 species are listed for their root collection; 20 species for bark; 31 for leaves; 24 for their flowers; 65 for fruit and seeds; 12 species for whole plants; 10 species for resin, gums and lac; and another 29 herbs. These species can only be collected for sale after the granting of a license from the DFO and can only be exported on production of the license and after payment of royalties due (Appendix 7-6). The royalty rates on a number of NTFPs rose with the passing of the Forest Rules. The royalty payable on Jatamansi for example rose from seven to 15 rupees per kg.

Also HMGN has prohibited the collection, utilization, sale and distribution, transportation and export of *Cordyceps sinensis* (Yarsa Gumba), and *Orchis latifolia* (Panch Aunle). Other NTFPs, prohibited for export in unprocessed form include *Nardostachys jatamansi* (Jatamansi), *Rauwolfia serpentina* (Sarpagandha), *Cinnamomum glaucescens* (Sugandha Kokila), *Valeriana wallichii* (Sugandawal), lichens, silajit (rock exudate), *Abies spectabilis* (Talispatra), and *Taxus wallichiana* (Lauth Salla). The felling, transportation and export of a number of tree species: *Michelia champaca* (Champ), *Acacia catechu* (Khair), and *Shorea robusta* (Sal) is prohibited. However, non-timber usages of these timber species is not clear in the legislation.

DFO staff, who issue licenses and collect royalties for the collection of NTFPs often lack sufficient information on the local, scientific and trade names of NTFP plants. This creates confusion in revenue collection. Local names of the same plant may differ from place to place, and between ethnic groups. Different rates of royalties are often charged for the same plant. There are a number of plant species traded, which have still to be identified by their scientific names. More than 17 such species are recorded in Appendix 7-2. This is due to the licensing of plant species for collection by their local and trade names. Some of the NTFPs whose collection has been banned are collected and even exported in the name of look-alike medicinal herbs. NTFPs such as the bamboos *Arundinaria* sp. (Nigalo) and *Dendrocalamus* sp. (Bans) and the grass *Saccharum* sp. (Khar) are neither quantified in weight nor specified by species in the legislation.

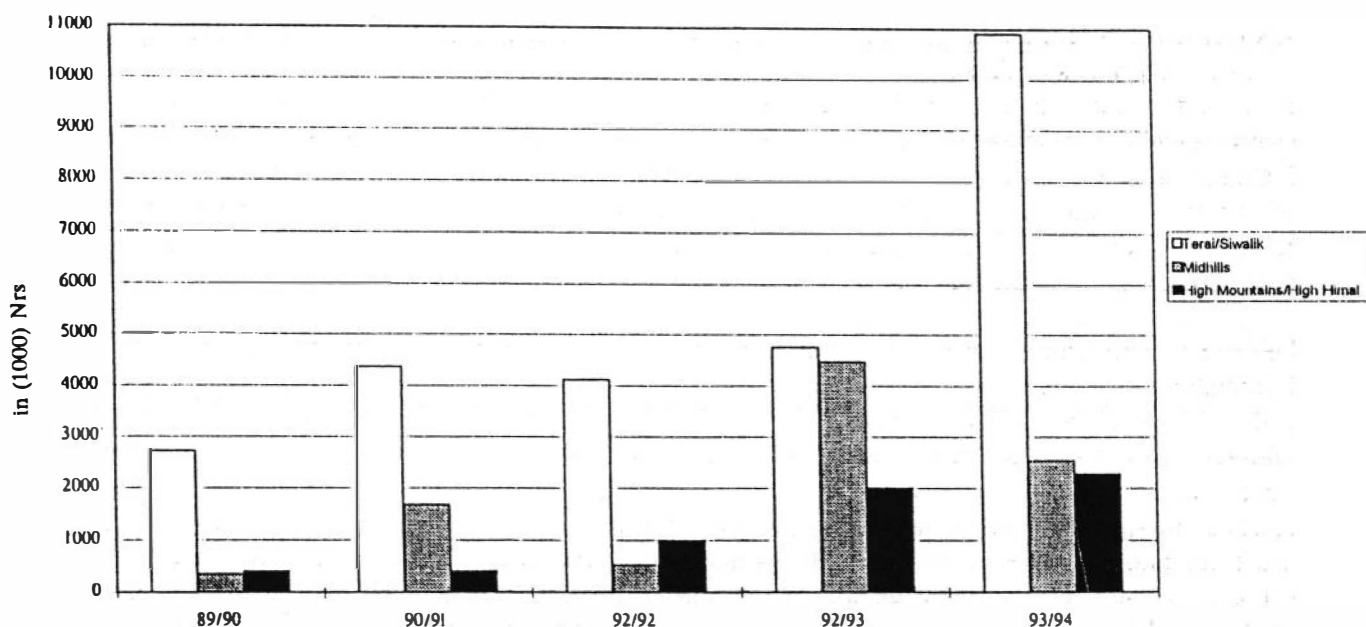
The exports of NTFPs far exceeds the permitted volume for collection with an estimated five times greater volume (illegally) collected than licences are issued for. HMGN has yet to develop a system to establish quotas to limit the collection of NTFPs or to identify the actual origin of the plant species being traded. Villagers collect NTFPs from the wild as per the demand and instructions of the trader, without consideration for their regenerative capacity. Villagers usually obtain little remuneration with

most of the profits going to the middlemen and the (largely Indian) medicine manufacturers.

A number of high value NTFPs are over-exploited and threatened. Some however are cultivated commercially in HMGN promoted herbal farms. Herbs Production and Processing Co. Ltd. (HPPCL) and some private entrepreneurs such as Gorkha Ayurved use large quantities of NTFPs for medicine production. HMGN has established a Natural Products Industries Board in Krishnanagar, Central Nepal, to extract essential oils, concrete and absolute from valerian, spikenard, Sweet Flag, lichens and pepper. There exists the potential for extracting other NTFPs. In addition industries such as Rosin and Turpentine Factory, Sal Seed Processing Industries, and paper factories at both village and industrial (Bhrikuti and Everest Paper Mill) level and ayurvedic institutions such as Singha Durbar Vaidhyakhana, Naradevi Ayurvedic Hospital, Royal Drugs Ltd. all demand significant amounts of NTFPs for producing various derivatives.

To conserve and use NTFPs on a sustainable basis, it is essential to carry out inventories; develop conservation and management guidelines, initiate plant breeding programmes, and carry out research into processing and utilization. A system that facilitates the proper identification of the species in trade needs to be developed for the use of the government agencies that oversee the trade. A number of recommendations for the realisation of maximum benefits from NTFPs by the sustainable management and use of the resource are given in Chapter 12.

**Figure 7-4 Trends in HMGN royalties generated from the harvesting of NTFPs FY 1989/90 to 1993/94**



### 7.5.1 Highlands Non-Timber Forest Products

The number of medicinal plant species found in Nepal decreases by altitude (Appendix 7-1). Although fewer species are found at higher altitudes they are mostly of high value, low volume type (Edwards, 1993). The other type - high volume, low value, comprise many of the NTFPs gathered from the Midhills and Terai zones.

Of the 61 species commonly traded in Nepal 24 are from the Highlands. Of these Jatamansi, *Juniperus* spp., and Chiraita are the most exploited with licensed collecting volumes exceeding 100 tons (Appendix 7-3). Appendix 7-3 under-estimates the importance of NTFPs as it does not include NTFPs gathered locally for home use and in cottage industries.

In 1993/94 nearly 2.3 million rupees of NTFP collection royalties were collected for the Highlands. This is most likely a gross under-estimate of the royalty value of Highlands collected NTFPs. Edwards (1993) after extensive field studies in eastern Nepal estimated that over three million rupees worth (price paid to collectors at Hile) of the two major Highlands medicinal plants alone passed through the middlemen of the major collecting point for Highlands eastern Nepal (Table 7-3). At the time of the study the royalty payment for Jatamansi was 7 NR/kg. This would have realised 210 000 NR from one species in only one part of Nepal. This suggests that many NTFPs are collected illegally without license or royalty payment. Also many Highlands collected NTFPs are registered and royalties collected in the Terai increasing the figures for the Terai/Siwaliks at the expense of the Midhills and Highlands figures.

Table 7-3 The non-timber forest product trade Hile and Basantapur in 1991/92 by air dry weight and value

Commodity	Weight (tonne. yr <sup>-1</sup> )	Price (NRs kg <sup>-1</sup> )	Value (NRs yr <sup>-1</sup> )
<i>Picrorhiza kurroa</i> (kutki)	24	65	1 560 000
<i>Nardostachys jatamansi</i> (jatamansi)	30	50	1 500 000
<i>Aconitum spicatum</i> (bhik)	10	55	550 000

Source: Edwards, 1993.

Gorkha District in central Nepal covers a wide altitudinal range from sub-tropical to High Himal areas. According to Gorkha DFO records the medicinal and aromatic plants found above 3000 m are both by value and weight by far the most important NTFPs collected there (Olsen, 1995). The other main species are Jatamansi (*Nardostachys grandiflora*), Padamchal (*Rheum australe* or *R. moorcroftiana*), Amalbed (*Rheum australe* or *R. moorcroftiana*), Panchaunle (*Dactylorhiza hatagirea*), Nirmansi (*Aconitum* spp.) and Kutki (*Picrorhiza scrophulariflora*) - all high value plants. In the four financial years from 1989 to 1993, 59 % of the royalty revenues accruing to Gorkha DFO from NTFPs were from Jatamansi alone (Stoian and Yadav, 1995). Jatamansi grows at altitudes of between 3100 and 3500 m. These Highlands NTFPs are collected from the meadows and barren land above the tree-line. Their collection is a very arduous under-taking and is usually done by the poorest sector of society.

The NTFP resource is under threat from unsustainable harvesting practises. In Gorkha district local people report that the availability of herbs is decreasing and they have to travel further to collect them (Amatya and Amatya, 1995). Many of the medicinal and aromatic herbs growing at high altitudes are slow growing and slow to regenerate due to the harsh climatic conditions. As a result they are very prone to over-exploitation. Prior to the new Forest Act collectors could harvest all medicinal and aromatic plants (except for Yarsagumba) from the areas north of the Mahabharat Range without permit or license (Yonzon, 1993). The uncontrolled collection of medicinal plants is going on even in the protected areas as reported by Yonzon (op.cit) for Langtang National Park.

HMGN is not getting the benefit from the collection of NTFP due to unsystematic control of the trade with many of the benefits being lost through illegal collection, smuggling, and the fact that most processing (value adding) occurs in India. This is partly due to the DoF not controlling the harvesting of the NTFP resource. Many of the NTFPs are gathered in remote areas and DFO staff are usually unable to identify the species. One study (Shrestha, 1995) found that in the Western Development Region 77 % of species were wrongly named and/or categorised by the DFOs.

The sustainable management of Medicinal and aromatic herbs has been receiving increased research and technical support interest in the 1990s. This is due to the realisation that the resource is being collected to destruction in many parts of the Highlands and that the local people and the Nepalese economy are not receiving the potential large economic benefits from these NTFPs. A number of initiatives have been launched however.

An NGO, the Centre for Community Development and Research (CCODER) is working in Gorkha District carrying out trials on the cultivation of high altitude medicinal herbs. Although these species have relatively slow growth rates, results have been promising for Jatamansi, Paunchaule, Kutki and Mirmansi (Simkhada, 1995). The collection and marketing of Paunchaule is banned in Nepal and so cultivation is the only legal source of this NTFP in Nepal.

Humla Oil Pvt. Ltd. has been set up to ensure the sustainable management and the enhancement of benefits accruing to the local people from the collection of Jatamansi in Humla District of North-western Nepal (ANSAB, 1995). Up to now the harvested plants had been sold raw to India. Value was added through processing in India and the profits accrued there. A modified water-cum steam distillation process is being used to extract the oil in Humla. Local people are benefitting from the local processing and more oil is being produced per kg of Jatamansi. If Jatamansi is processed locally the oil content at that time is two to three times higher than if processed several months later in India (Olsen, 1995). Also marketing links are being developed and user groups set up as the first stage in managing the resource in the wild.

The best way to manage these resources has not yet been established. A number of initiatives call for the management of the Highland medicinal plant resource through community user groups. Stoian and Yadav (1995) say however that there is a danger of collection to destruction of Highlands's NTFPs due to the difficulty of instigating common property management through user groups in the remote and sparsely settled locations. A number of recommendations for increasing the benefits gained from NTFPs at local and national level whilst ensuring the regeneration of the resource are presented in Chapter 12.

1. The first part of the paper discusses the importance of the study of the history of the United States.

2. The second part of the paper discusses the importance of the study of the history of the United States.

3. The third part of the paper discusses the importance of the study of the history of the United States.

4. The fourth part of the paper discusses the importance of the study of the history of the United States.

5. The fifth part of the paper discusses the importance of the study of the history of the United States.

6. The sixth part of the paper discusses the importance of the study of the history of the United States.

7. The seventh part of the paper discusses the importance of the study of the history of the United States.

8. The eighth part of the paper discusses the importance of the study of the history of the United States.

9. The ninth part of the paper discusses the importance of the study of the history of the United States.

10. The tenth part of the paper discusses the importance of the study of the history of the United States.

## 8. POLICIES, LEGISLATION AND PRACTICES

The importance of conserving wild species of fauna and flora was first recognised by HMGN in Nepal's First Five Year Plan (1956-1961). The earliest legislation to protect Nepal's wildlife had however been introduced more than a hundred years previously in the 1840s during the regime of Jang Bahadur Rana putting restrictions on the hunting of certain animals. The Central Zoo was also established during the Rana period. The first practical measures to conserve Nepal's endangered fauna began with the establishment of Mriga Kung as a royal hunting reserve in Chitwan. The associated Rhino Patrol (*Gaida Gasti*) stopped the poaching of larger mammals although whether the positive protection measures outweighed the "negative" losses of animals to hunters' guns is not known. Sukla Phanta also became a royal hunting reserve in 1965. Management of wild animals was initiated with the enactment of the National Parks and Wildlife Conservation Act, 1973. SNP and LNP were created later in 1976. The protection of Nepal's flora is ensured inside the PAS. The policy and legal measures are nation-wide and there are few aspects tailor-made to the different conditions and threats to biodiversity in each physiographic zone. The major events and legislation relating to the conservation of Nepal's biodiversity are listed in Appendices 8-2 and 8-5.

HMGN has initiated various conservation policies for biological diversity and forest conservation including the Master Plan for the Forestry Sector - (HMGN/ADB/FINNIDA, 1987); National Conservation Strategy (HMGN/IUCN, 1983); Nepal Environmental Policy and Action Plan (HMGN, 1993a); and its current (the eighth) Five Year Plan. These policies were enacted before Nepal's ratification of the global Convention on Biological Diversity (UNCED) in 1992 and hence the policy measures do not clearly reflect the need of conserving biological diversity in the spirit of UNCED. It is only in the last decade that the widespread realisation on the importance of conserving the Earth's biological diversity has emerged. Appendix 8-4 lists all bio-conservation related treaties and conventions ratified by Nepal.

In 1991, the revised forestry sector policy sought the conservation of Nepal's ecosystems and genetic resources. It recommended measures for the sustainable management of land and forest resources to ensure the conservation of flora and fauna with priority given to representing the various ecosystems in the PAS. The policy recognizes the need for carrying out environmental impact assessments before implementing development programmes, and calls for minimizing park-people conflict, and regulating tourism activities.

In the same year as the MPFS was published a National Conservation Strategy was prepared and endorsed by the National Planning Commission. It recommended the protection of areas that contain essential habitats for terrestrial and aquatic mammals, migratory birds, freshwater fishes, and rare and/or endangered species. It seeks the conservation of Nepal's natural resource base through sustainable use.

The Nepal Environmental Policy and Action Plan, as endorsed by the Environment Protection Council in 1993, recommended:

- the preservation of endemic and endangered species and their habitats
- the promotion of private and public institutions for biological resource inventory and conservation
- the strengthening of the capacity of the DNPWC to act as the main institution responsible for biodiversity conservation.

The Eighth Five Year National Development Plan (1992-1997) recognized the role of local people in managing Nepal's forests and aims to involve them in managing natural resources where appropriate and allow them to share in the benefits. This new direction in policy is critical since an increasing spiral of poverty and environmental damage threatens the forest resources. The Plan estimates that 49% of the population lives below the poverty line, lacking the basic necessities of life. The Plan calls for 5 000 community forestry users group to be constituted during the Plan's five-year period and for the transfer of 252 000 ha of community forests to these groups. More than 200 000 ha has already been handed over to 3000 user groups by September 1995. The environment and resource conservation policy of the current plan calls for the recording of the country's natural heritage and expanding the conservation of biological diversity.

Since the late 1980s people's participation has become a central element of most natural resource management policies and programmes. True people's participation usually involves the formation of user groups with these having a prominent say in the management of a resource and a share in the benefits accruing. The philosophy of this approach is that if people have a sense of ownership and benefit from any resource then they will care for it. People's participation is often a misnomer when describing initiatives to try and ameliorate the negative impacts that protected areas can have on the people living around the fringe. People do not participate in the management of protected areas. Rather policies are adopted to: facilitate community development in these fringe (buffer-zone) areas by for example tree plantation and community health projects; and to educate people about the necessity of having protected areas for the conservation of biodiversity. These community development and extension programmes are best carried out through people's participation.

Policies and legislation enacted to protect Nepal's forests, wildlife are detailed below as they relate to: forest management outside of the protected areas; protected area and wildlife management; the resolution of park-people conflicts; and overall biodiversity conservation.

### **8.1 Forest management**

Nepal's forests are the most important refuge of Nepal's biodiversity. It must be noted that in Nepal forest management also refers to the management of grassland and shrub areas.

Prior to the 1950s the forest resources of Nepal were fairly well managed with protection and land use mostly based on indigenous practices (Talbot and Khadka, 1994). These practises continue in many places to this day regardless of legal stipulations or national programmes with many examples recorded in the community forestry literature (eg. Chhetri and Pandey, 1992; Gilmore and Fisher, 1991). National level policy for the management of Nepal's forests began in the mid-1950s. From the First National Development Plan (mid-1950s) until the Fifth Plan (1975-80) policy was guided towards the utilization of forests. In the 1957 the Private Forest Nationalization Act declared all forest lands as state owned. Strict Forest Acts and Rules were imposed which were however not effective in conserving forests. Management plans for most of the forest divisions were prepared but could not be implemented due to lack of commitment of both the government authorities and politicians. The management and conservation of forest resources remained a major issue but policies goals did not materialize and deforestation and forest degradation continued.

The National Forest Plan of 1976 and proceeding national five year plans focussed on increasing community participation. The aims were to optimize economic benefits from forest management, and

ensure the conservation of rare and endangered wildlife. Emphasis was laid on country-wide afforestation programmes; water source protection; and the encouragement of labour intensive forest management. In the late 1970s HMGN realized the need to formulate an environment policy and began to incorporate environmental considerations in its development activities.

In spite of these policy aims deforestation continued resulting in increasing losses of biodiversity and the emergence of a scarcity of forest products. In the 1980s, HMGN initiated integrated rural development programmes integrating forestry and soil conservation as major components. Community forestry programmes were launched across the country and local people motivated to use and manage the local forests by the formation of Forest User Groups (FUGs).

#### **i) Master Plan for the Forestry Sector**

In 1988 HMGN, with the assistance of the Asian Development Bank and the Finnish Government, prepared and endorsed the Master Plan for the Forestry Sector (HMGN/ADB/FINNIDA, 1988a). This plan covered a 25 year period documenting priority forestry programmes, implementation mechanisms and estimates of investment needs for the overall development of the forestry sector.

The long-term objectives of the MPFS are to meet the basic needs of rural Nepalese for fuel, fodder, and timber by:

- improving farming systems
- conserving soil and water ecological balance
- conserving genetic resources and ecosystems
- developing and managing forests for income and employment opportunities.

The medium term objectives are:

- to achieve people's participation in forest development, management and conservation by decentralizing authority
- to develop a legal framework to involve people in forest management
- to build the institutional capability of forestry institutions to perform their job effectively.

The 12 main MPFS programmes - interdependent and complementary to each other - emphasize the expansion of activities for community and private forestry as the highest priority, aiming for the management and development of the nation's forests through the active participation of people to meet their basic needs. The Master Plan recommended, within the community forestry programme, the handing over of use rights and management authority for all accessible hill forest to communities that are willing and able to manage them. The national and leasehold forestry programme aims to increase the supply of forest products (alongside conservation measures) from Nepal's forests by government and private initiatives to complement community forestry. One other component of the MPFS was a Plan for the Conservation of Ecosystems and Genetic Resources (HMG/ADB/FINNIDA, 1988b) - described in section 8.2.



**ii) Eight Five Year Development Plan**

The Eight Five Year Plan, published after the re-instatement of democracy in Nepal in 1990, considered the growing awareness of forest management through people's participation. Major policy enunciations in this Plan were to:

- encourage the involvement of individuals, communities and non-governmental organizations in the plantation, development, management and sustainable use of forestry resources
- encourage agroforestry
- provide leasehold forests to small and marginal farmers
- encourage private plantations, leasehold and community forestry without any restriction on their use.

Nepal's forestry programmes for the Midhills and High Mountains are now people-oriented with people's participation encouraged in most forest management activities. To date, however, there have been few successful initiatives to stem the tide of deforestation in the Terai.

**iii) Forest Act 1993**

The Forest Act, 1993 and the Forest Rules, 1995 defined six types of forest: government managed, protected, community, religious, leasehold and private forests (Table 8-1). The first five types are national forests and are to be managed through the production and implementation of management plans. For example, community forest user groups shall prepare an operational plan for their community forest including information on: types of forests, main species, useful species, natural regeneration potentials, silvicultural practices to be followed, cultivation and type of herbs, benefit sharing mechanisms, and prohibited actions. Effective implementation and monitoring of such provisions should facilitate the regeneration of the forests. The condition of many handed over forests has greatly improved with protection leading to abundant natural regeneration. The Department of Forests is now considering how to integrate environment and biodiversity conservation alongside socio-economic development. The integration of an environmental assessment system for development projects will also facilitate the conservation of biological resources.

Protected forests is the only type of forest in the new Forest Act where biodiversity conservation is a main explicit management objective. The Act empowers the government to declare any part of the national forest as a protected forest if it is of scientific, environmental or cultural importance, by notification in the Nepal Gazette.

**Table 8-1 Forest types under the 1993 Forest Act**

Classification	Definition
National forests	all forests, excluding private forests, within the kingdom of Nepal, whether marked or unmarked with forest boundary markers: the term includes waste or uncultivated lands or unregistered lands surrounded by or adjoining forests, as well as paths, ponds, lakes, rivers or streams and riverine lands within forests.
Government-managed forest	National forest managed by His Majesty's Government with production as the main objective.
Protected forest	National forest declared by His Majesty's Government as a protected forest, considering it to be of special environmental, scientific or cultural significance.
Community forest	National forest handed over to a users group for its development, conservation and utilization for collective benefit.
Leasehold forest	National forest handed over as a leasehold forest to any institution established under current law, industry based on forest products or community for purposes mentioned in Section 31.
Religious forest	National forest handed over to any religious body, group or community for its development, conservation and utilization.
Private forest	Forest planted, nurtured or conserved in any private land owned by an individual under current law.

Source: HMGN, 1993

## 8.2 Protected areas and wildlife conservation

A large array of species occur across Nepal as demonstrated for the Highlands (Chapter 4). An overall picture of Nepal's biodiversity is only beginning to emerge. There are still largely unexplored sites due to the lack of a national wildlife inventory programme. The diverse ecosystems and habitat types, from Terai to High Himal, probably harbour many new species.

Nepal's pre-1960, largely undisturbed forest habitats, comprised a diverse fauna. The demands of a growing population and an inadequate forest management system increased the pressure on forestry resources, adversely affecting wildlife habitats. Government sponsored development programmes implemented since the 1950s have shown a major change in policy emphasis for wildlife conservation from protection to a people's participation approach and from a species to an ecosystem focus (Appendix 8-1). Almost all five year development plans have stressed the need for conserving wildlife.

The MPFS stressed the need to manage Nepal's diverse ecosystems by conserving the floral and faunal diversity through legal measures and people's participation, strengthening institutional capabilities and encouraging research and extension. The Eighth Plan (1992-1997) stipulated the

conservation of ecosystems and genetic resources as an integral part of natural resources management and has emphasized their preservation, promotion and management with the involvement of local people through ensuring equitable sharing of benefits.

The *in-situ* conservation of Nepal's biological resources gained momentum after the initiation of the protected areas network. The PAS, covers some 14 percent of Nepal's area comprising 15 protected areas (Appendix 8-3). Representative examples of Palaearctic and Indo-Malayan flora and fauna elements are conserved through this protected area system. Due to the uniqueness of both their natural and cultural heritage, Royal Chitwan National Park (RCNP) and Sagarmatha National Park (SNP) are included in the World Heritage list. Other protected areas have national significance for the protection of Nepal's species and landscape. The various types of protected areas created under the 1973 Act are detailed in Table 8-2.

**Table 8-2 Types of protected areas in Nepal under the 1973 NPWC Act (and amendments)**

Classification	Definition
National Park	An area set aside for the conservation and management of the natural environment including wild animals, plants and landscape, together with their utilisation
Reserve	A general term including strict nature reserves, hunting reserve and wildlife reserves.
Strict Nature Reserve	An area of ecological or other significance, set aside for scientific study
Wildlife Reserve	An area set aside for the conservation and management of wildlife (resources) and their habitat
Hunting Reserve	An area set aside for conservation and management of wildlife to provide hunting for legal hunters
Conservation Area	An area set aside for the conservation of the natural environment and the natural resources, for its utilization in a balanced way on the basis of an integrated management plan
Buffer-zone	An area designated surrounding national parks and reserves in order to provide for the use of forest products to local people.

HMGN introduced various measures to address the increasing global concern for wildlife management and conservation in representative ecosystems through institutional development, legislative instruments, and programme implementation. National level wildlife conservation and management took shape both legally and institutionally only after the establishment of the DNPWC in the 1973 NPWC Act (Appendix 8-2 and 8-4). Section (3) of the Act empowers the government to declare any part of an area as a national park, wildlife reserve, hunting reserve or a conservation area. RCNP and Langtang National Park were the first gazetted as protected areas in 1973. The Act prohibits most human activities - wildlife hunting, livestock grazing, cultivation in the protected areas. Licensed

hunting is provided for in Dhorpatan Hunting Reserve.

In an amendment to the 1973 NPWC Act the government introduced the protected area category of "conservation area" where wildlife management occurs alongside the development of local people's livelihood. Conservation and community development activities for the conservation of biodiversity were introduced in the Annapurna Conservation Area Project (ACAP). The success of ACAP has demonstrated the possibilities for people's involvement in the conservation and sustainable use of biological resources. Makalu-Barun Conservation Area, under the joint-administration of HMGN and The Mountain Institute has also adopted a people-centred conservation approach for biodiversity conservation. The management of conservation areas encourages local people's conservation awareness through extension programmes and provided for community development by the participation of local people and NGOs from the planning through to implementation and monitoring of activities.

The difference between Protected Forest as defined in the 1993 Forest Act and Conservation Area as defined in an amendment to the 1973 NPWC Act is not clear.

HMGN's efforts in wildlife conservation through habitat protection and improvement and largely successful anti-poaching measures have demonstrated an increase in the population of some threatened species. For example, the population of One-horned Rhino (*Rhinoceros unicornis*) increased from between 60 and 80 individuals in the late 1960s to 460 in June 1994 in RCNP alone.

#### i) **The Environmental Policy and Action Plan for Nepal**

The 1993 Environmental Policy and Action Plan for Nepal focuses on the sustainable management of natural resources, the mitigation of adverse environmental impacts and the intervention of supporting programmes including legislation, institutional capacity building and public awareness programmes.

Policy recommendations directly addressed to the DNPWC include:

- strengthening the institutional capacity for management of the PAS
- ensuring adequate representation of all ecosystems in the PAS
- involving local people directly in the management of parks and reserves
- promoting private and public institutions for biological resource inventory and conservation.

### **8.3 Resolution of park-peoples conflict**

Prior to the establishment of the PAS local people were *de facto* although not usually *de jure* free to collect firewood, fodder, timber and grasses; and to graze their livestock and hunt in the national forests. They depended on these forests for their daily needs. However with the establishment of the protected areas local people were denied access to a number of forest areas. Local people still feel that they have rights over the use of park resources, to meet their firewood, fodder, grass and grazing requirements - in view of the lack of alternatives. Increased forest degradation and the conversion of forests to agricultural land outside of the protected areas has resulted in an inadequate supply of forest

products. Local people are compelled to illegally use the forests of the protected areas to meet their daily needs.

Agriculture and livestock depredation by protected wildlife is a serious problem around most parks and reserves. Farmers in the Highlands suffer crop and livestock depredations by wild animals mostly from Wild Boar, and Himalayan Black Bear. People are also occasionally killed or maimed by wildlife attacks. People living on the periphery of protected areas have no legal recourse to procure compensation for damage to their property. They protest by engaging in prohibited activities such as illegal grazing, firewood and timber cutting inside the protected areas and even by vandalizing the park's properties by damaging bridges, signposts, and boundary pillars.

Conflicts between the park management and local people arise due to:

- prohibition of the free collection of forest products
- prohibition of the setting of fires in grassland and forest areas
- prohibition of the hunting of birds and animals
- prohibition of the harassing of wildlife or destroying or disturbing bird nests and eggs
- restrictions placed on livestock grazing and watering
- restrictions placed on the channelling of water to agricultural land
- the clearing of settlement or agricultural areas from within the protected areas.

The level of these conflicts are intensifying in the protected areas. The lack of understanding and sense of partnership between the protected areas' staff and local communities pose a direct threat to both the biodiversity and economic value of the protected areas.

As people-park conflicts emerged, HMGN realized that the conservation of biodiversity inside the protected areas cannot be sustained without the co-operation of the people living around the periphery. Accordingly, the NPWC Act 1973 was amended in 1989 to include conservation areas as a type of protected area and in 1993 (fourth amendment), to include the provision of buffer-zones around the protected areas. The Act defines buffer-zones as:

Areas surrounding national parks and wildlife reserves designated to provide facilities for the use and regular supply of forest products by the local people.

Article 3 (a) of the Act empowers the government to declare the surrounding areas of the parks and reserves as buffer-zones "with detailed description of the boundaries thereof by notification in the Nepal Gazette". According to Article 3 (b), the warden shall perform buffer zone management and conservation related works without any effect on land ownership. The DoF foregoes authority to the Buffer-Zone Warden over buffer-zone forests. Local people, formed into user groups, will be mobilized for sustainable development of the areas surrounding the protected areas. The legislation specifies that 30 to 50 percent of the revenue generated in the parks and reserves will be shared with the local people for community development activities.

### **8.3.1 Buffer-zone management rules**

In accordance with Article 25 of Amendment 4 of the NPWC Act, the ministry is empowered to fix the percentage of the revenue earned from the protected areas to be allocated for local community

development. However, the amount to be distributed to each user group shall be determined by a user committee. The Buffer Zone Management Rules have been drafted and await approval. After their approval the benefit sharing mechanism and the amount of revenue to be channelled to the respective communities will be established. The draft Rules include procedures for:

- the preparation of buffer zone management plans to facilitate community development, environment conservation and the sustainable use of forest products
- the formation of user groups and their rights and duties
- the formation of user committee and its rights and duties
- the preparation of working plans detailing the work, responsibilities and authority of user groups and user committees.

The user committee shall ensure that the user group obeys forest legislation and provisions, as outlined in an approved operational plan. Article 6 of the draft Rules empowers the warden, to encourage works related to the conservation of wildlife; natural environment; natural resources; biodiversity; development and construction works. It prohibits the carrying out of activities that can adversely affect the environment, without written permission of the warden. The draft Rules provide provision for hunting in the buffer zone areas, as determined by the DNPWC according to the existing legislation.

The draft Rules provide for the community development and wildlife conservation within the buffer-zones through the formation of:

- buffer-zone community forests
- buffer-zone leasehold forests to the local community of those living below the poverty line especially to introduce agro-forestry
- buffer-zone religious forest to the religious groups or community with no detriment to the traditional rights of the users
- buffer-zone private forests in order to promote private forests for their conservation, management and development.

Enforcement of these Buffer-zone Management Rules will empower user groups by encouraging community development activities especially ones that maintain a regular supply of forest products so as they can fulfil their needs without having to disturb the wildlife habitats of the protected area.

Buffer-zones are proposed for a number of protected areas including Khaptad and Shey Phoksundo. Although these protected areas are mostly in the High Mountain/High Himal zones their buffer zone areas if implemented will fall mostly in the Midhills. The Himalayan Trust is currently carrying out reforestation activities in the Midhills areas to the south of Sagarmartha National Park to ameliorate the pressure for firewood caused by the growth of the tourist industry in Sagarmartha National Park.

#### **8.4 Biodiversity conservation**

Separate policies and legislation for biodiversity conservation do not exist in Nepal. Policy enunciations and legal instruments, favour the *in-situ* conservation of biodiversity. They have to be implemented effectively to ensure conservation, sustainable use and equitable sharing of the benefits that accrue from biodiversity conservation. Legal provisions concerning the conservation of

biodiversity are given in the NPWC Act 1973; the Forest Act 1993; and the Forest Rules 1995.

The Plant Protection Act, 1973 was enacted to regulate the export and import of plant and plant products. The Plant Protection Rules, 1975 facilitates the enforcement of the prohibited actions as listed in the Act by designating check points and establishing a quarantine office. The Department of Plant Resources is actively involved in botanical surveys for the publication of the Flora of Nepal, which will contribute to the knowledge on Nepal's floral richness.

The Eight Year Development Plan calls for result-oriented research and studies on flora and fauna and their sustainable use to generate income and employment opportunities for the rural people. Within the broad framework of conserving biological diversity, the Plan calls for the involvement of individuals, communities and NGOs; the establishment of a Trust Fund and strengthen the gathering of data (Appendix 8-1).

The United Nations Rio Convention on Biological Diversity focussed on the conservation, sustainable use and the sharing of benefits arising out of the utilization of genetic resources. The Convention is the only international legal instrument solely concerned with the conservation of biological diversity. Nepal signed it on June 12, 1992 at the Earth Summit, subsequently ratified on September 15, 1993 by the Fifth Session of Nepal's House of Representatives. The Convention was effective in Nepal from February 21 1994 according to its article 36.1. In addition, HMGN is responding to the objectives and activities, as stipulated in Chapter 15 of Agenda 21 of UNCED, by integrating the conservation of biological resources in its plans and programmes. However, some areas mentioned in Agenda 21 have not been adequately addressed.

Other international initiatives concerned with biodiversity and resources conservation in which Nepal participates are the South Asian Co-operative Environment Programme, and the South Asian Association for Regional Cooperation. Nepal is a signatory to the Convention concerning the Protection of the World Cultural and Natural Heritage - World Heritage Convention - which it signed on 20 June 1978.

## 9. INSTITUTIONAL RESPONSIBILITY FOR BIODIVERSITY MANAGEMENT

Article 2 of the Global Convention on Biological Diversity defines biodiversity as:

*the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.*

Biodiversity therefore includes all terrestrial, aquatic, domestic and wild species.

The Ministry of Forests and Soil Conservation (MFSC), its departments and para-statal are concerned with the conservation of biodiversity as per their different mandates. HMGN's (Work Division) Rules, 1990 give a clear mandate to the Ministry of Forests and Soil Conservation to carry out activities related to the sustainable management of biodiversity, including the:

- formulation of forest related policies and plans
- implementation of activities across Nepal's different forest types
- conservation and utilization of wildlife.

HMGN agencies are involved in both *in-situ* and *ex-situ* conservation of biological resources as outlined below. The work of one NGO is also outlined due to its pioneering approach in biodiversity conservation and its close links to HMGN.

### 9.1 Ministry of Forests and Soil Conservation

The Ministry (MFSC) is the main policy making body for forests and wildlife management. It is also the national agency responsible for the implementation of the Global Convention on Biological Diversity. All activities related to the conservation of flora and fauna inside national forests are implemented by the Ministry through its departments and para-statal.

HMGN re-structured the MFSC in 1993. Whereas previous re-structuring exercises had sought to strengthen and expand central organizations this time it was the strengthening of the field level (district level) offices that benefitted. The MFSC is organised into a number of policy divisions and implementing departments. The three policy divisions of: Planning; Monitoring and Evaluation; and Administration are split into sections. A Policy and Co-ordination Section, and the Law Section assist the secretary in policy and legal matters. The MFSC has four implementing departments - National Parks and Wildlife Conservation, Forests, Plant Resources and Soil Conservation. The overall structure of MFSC is shown in Appendix 9-1.

The Planning Division formulates plans and programmes and is mandated through its Environment Section, to integrate biodiversity conservation in the Ministry's various development plans and programmes. The section's duties are to:

- oversee MFSC inter-agency co-ordination on the natural environment
- prepare and implement appropriate guidelines for environmental assessment
- assist in and provide comments and suggestions on integrating environmental aspects in MFSC projects



- carry out necessary works related to natural environment conservation.

The Foreign Aid and Programme Section oversees funding issues and looks favourably on project proposals that seek to integrate biodiversity conservation.

The duties and responsibilities of the Department of Forests, the Department of Plant Resources, the Department of National Parks and Wildlife Conservation, the Forest Research and Survey Centre, the para-statal Herbs Processing Company Limited, the Forest Products Development Board and the King Mahendra Trust for Nature Conservation are outlined below as being influential in the area of biodiversity conservation.

## **9.2 Department of Forests**

The Department of Forests (DoF) was formed in 1947 as the original agency over-looking all forest areas. Since its establishment many areas previously within the DoF's mandate have been given over to other departments. The DoF is responsible for the management, demarcation, control and conservation of national forests outside the PAS. The DoF has District Forest Offices in 74 of Nepal's 75 districts. The Department is responsible for conservation and utilization activities in all forests and other areas such as grasslands defined as within the control of DoF. The Community and Private Forestry Division of the DoF carries out forest development, management and utilization programmes in community and private forests, with specific initiatives including the encouragement of agroforestry activities and a tree seed improvement programme.

The Planning and Training Division formulates plans and programmes for the conservation and promotion of Nepal's forests and its rational utilization. The Training Section conducts training programmes, mostly in-service at the five regional training centres and at district level, while the Extension Section provides information for the conservation and more efficient utilisation of forest resources. The Department is considering the establishment of a separate biodiversity section.

The National Forest Division is entrusted with:

- developing forest management plans and working schemes
- the sale and distribution of forest products
- overseeing the implementation of leasehold forestry.

The DoF has important international responsibilities chiefly as a national node of the International Tropical Timber Agreement, with a supporting role to CITES.

The effective enforcement of the Forest Act, 1993 and follow up to the policy guidelines enumerated in the Master Plan for the Forestry Sector provides the foundation for the conservation of biological diversity found in Nepal's forests outside of the PAS. The developing role of the DoF is to consider biodiversity conservation and community involvement alongside its original remit of developing the efficient utilisation of Nepal's forests' resources outside the protected areas.

### 9.3 Department of Plant Resources

The Department of Plant Resources (DPR) was formed in 1960 under the name of the Department of Medicinal Plants. It is mainly a research institution responsible for:

- carrying out activities related to the conservation, promotion and utilization of plant resources and their scientific and practical studies
- assist in scientific and technical research studies of plants with an emphasis on medicinal plants.

The DPR's Plant Research Division, is responsible for:

- collection and classification of plants
- development of germplasm
- conservation and promotion of threatened plant species
- management of the seven herbal farms (covering different climatic zones)
- management of the Royal Botanical Garden for *ex-situ* conservation of Nepal's plants including orchids, rhododendrons and threatened plant species.

During the 1960s it carried out preliminary botanical surveys and collected, named and preserved more than 10 000 plant specimen. A herbarium was established at Godavari with laboratories and the plant collection now contains over 45 000 plant specimens. Vegetation maps were also prepared covering the entire country and a large number of threatened plant species recorded.

The National Herbarium and Plant Laboratory is located at Godavari south of Kathmandu. It maintains records of Nepalese flora. Collections of germplasm of economic plants are maintained within the Royal Botanical Garden at Godavari and in six out-stations located to represent the altitudinal range found in Nepal (Table 9-1). More than 2500 plant species are held in these conservatories.

**Table 9-1 Botanical conservatories**

Name	District	Zone	Altitude
Dhitachaur	Jumla	Sub-alpine	2500 m
Kapurkot		Temperate	2000 m
Dhakeri	Banke	Tropical	130 m
Godavari	Lalitpur	Temperate	1600 m
Tristung	Makwanpur	Temperate	1700-2100 m
Vrindavan	Makwanpur	Tropical	500 m
Maipokhari	Ilam	Temperate	2200 m

The Plant Breeding and Propagation Section is developing hybrid species and propagating a number of rare species by modern techniques such as micro-propagation. The Herbs Section is managing a germplasm centre and is responsible for the commercial cultivation of medicinal plants. The Higher Plant Section is mandated to publish the Flora of Nepal. The Ecology Section carries out ecological studies on plant communities in different geographic and climatic zones and is mandated to promote their scientific utilization based on research findings.

With overall responsibility for recording and researching Nepal's wild floral diversity DPR has a key role facilitating the conservation of Nepal's biodiversity and its sustainable utilisation.

#### **9.4 Department of National Parks and Wildlife Conservation**

The DNPWC although not formally established until 1980 was effectively in operation from 1972 as the NPWC Section (and later Office) in 1972 establishing a separate agency with responsibilities for protected areas and wildlife conservation. It co-ordinates and implements all activities concerned with wildlife management in Nepal's protected areas including national parks, wildlife reserves, hunting reserves and conservation areas. The Department has two divisions - Planning and Conservation Education Division, and Parks and Reserves. The Ecology Section, within the Planning Division, co-ordinates research activities by:

- assisting and supervising field research
- collecting and up-dating conservation related statistics
- maintaining contact with other agencies related to research
- carrying out feasibility studies.

The Planning Section is mandated to prepare management plans for the protected areas and to periodically review them (Appendix 9-1). The organisational structure of the DNPWC is shown in Figure 9-1. The Management, Monitoring and Evaluation Section, under the Parks and Reserve Division, performs monitoring of works related to biodiversity conservation. Results of monitoring and evaluation support the execution of future plans and programmes.

The DNPWC is the national agency for implementing the following international conventions:

- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Appendix 8-3).

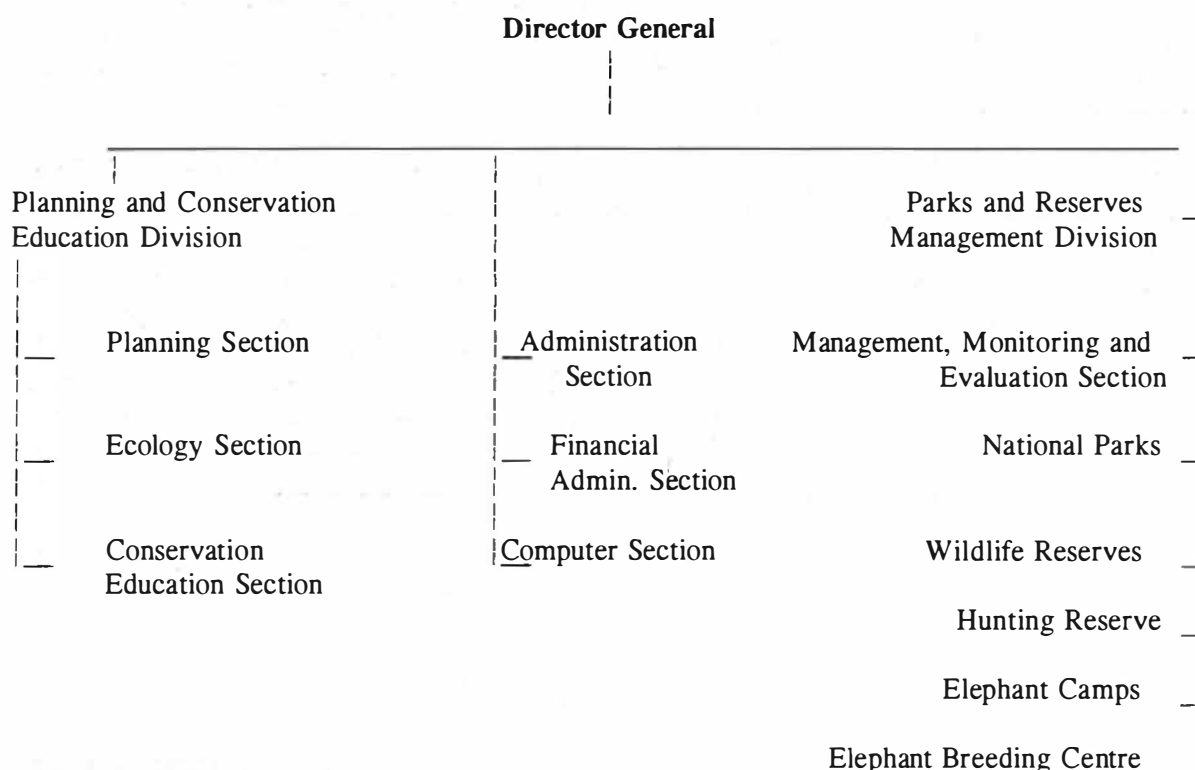
The department is involved in biodiversity conservation management within the protected area system, enforcing the NPWC Act, 1973 and Rules (Appendix 9-1). This Department has the most direct mandate for the conservation of Nepal's biodiversity and has been entrusted with implementing biodiversity conservation activities through policy and legal instruments. When first formed the emphasis of its programmes were to protect wild species in the protected areas chiefly by the Nepalese army. Although large numbers of soldiers are still employed to guard the protected areas the effectiveness of this approach is now questioned and the emphasis is now moving towards involving the local people in conservation activities in ways that benefit their livelihoods.

Budget restraints saw a large reduction in the DNPWC's staffing levels in 1994 (Table 9-2). It is not clear what effect these cuts will have as previously there was considerable over-staffing.

**Table 9-2 Staffing of Department of National Parks and Wildlife Conservation for 1990 and 1994**

	Technical		Non-Technical		Total		(of which Gazetted officers)	
	1990	1994	1990	1994	1990	1994	1990	1994
DNPWC HQ	30	22	44	23	74	45	20	15
<b>National Parks</b>								
Royal Chitwan	88	94	18	14	106	108	9	5
Royal Bardia	74	89	13	8	87	97	7	3
Langtang	81	70	11	6	92	76	7	2
Sagarmatha	56	35	10	3	66	38	6	1
Shey Phoksundo	54	43	10	2	64	45	4	1
Khaptad	42	28	9	3	51	31	4	1
Rara	30	25	9	3	39	28	4	1
<b>Wildlife Reserves</b>								
Royal Sukla Phanta	52	47	11	5	63	52	4	1
Parsa	36	38	8	5	44	43	4	1
Koshi Tappu	25	24	11	14	36	28	4	1
<b>Hunting Reserve</b>								
Dhorpatan	48	31	9	4	57	35	4	1
<b>Field Units</b>								
<b>Elephant camps</b>								
Chitwan	65	67	2	1	67	68	1	
Bardia	32	33	2	1	34	34	1	
Biratnagar	32	33	2	1	34	34	1	
Birgunj	32	33	2	1	34	34	1	
Kanchanpur	32	24	2	1	34	34	1	
Breeding Centre	62	63	2	1	64	64	1	1
<b>Total</b>	<b>894</b>	<b>817</b>	<b>232</b>	<b>128</b>	<b>1126</b>	<b>954</b>	<b>82</b>	<b>37</b>

Source: DNPWC, 1994

**Figure 9-1      Organisational structure of the Department of National Parks and Wildlife Conservation****9.5      Department of Soil Conservation and Watershed Management.**

The Department of Soil Conservation was formed in 1974 separating responsibilities for programmes concerning soil conservation from the DoF. The Department works under the mandates laid out in the Soil and Water Conservation Act, 1982 and its Rules 1995. Although not directly related to biodiversity conservation the department's programmes have indirect benefits. Soil conservation offices concentrate their activities on vulnerable watershed areas. Watershed conservation and management activities such as conservation plantations, water source protection and land use studies assist the conservation of flora and fauna through habitat improvement.

**9.6      Forest Research and Survey Centre**

The Centre is a technical research unit within the MFSC established to provide solutions by recommending management interventions in the forestry sector. The Centre is responsible for conducting forestry research activities including natural forest management, silvicultural methods, utilization of forest resources, agroforestry techniques, and tree improvement. The publication of research findings is a key aspect of its work. It is also mandated to carry out forest inventories, analyse remote sensing information, and biomass studies.

### 9.7 Central Zoo

The Central Zoo was established in 1932 as the private collection of Prime Minister Judha Shamsher Rana. The zoo is now run both as an educational centre and for the *ex situ* conservation of endangered wildlife - particularly mammals and birds. The zoo has been involved in wildlife breeding programmes, in particular for the Black Buck.

At present the Central Zoo contains 505 animals of which 230 are mammals of 31 species; 240 are birds of 53 species; and 35 are reptiles of 16 species. The Central Zoo has a number of endangered mainly lowland species including: One Horned Rhino (*Rhinoceros unicornis*), Bengal Tiger (*Panthera tigris*), Gaur (*Bos gaurus*), Black Buck (*Antelope cervicapra*), Assamese Macaque (*Macaca assamensis*), Striped Hyena (*Hyaena hyaena*), Chinese Pangolin (*Manis pantadactyla*) and Lynx (*Felis lynx*). Of the endangered bird species, the Zoo has on display Saker Falcon (*Falco cherrug*), Himalayan Monal (*Lophophorus impejanus*), Sarus Crane (*Grus antigone*), Demoiselle Crane (*Anthropoides virgo*), Black-necked Stork (*Ephippiorhynchus asiaticus*) and Lesser Adjutant (*Leptoptilus javanicus*). Of the reptiles Gharial (*Gavialis gangeticus*), Asiatic Rock Python (*Python molurus*) and monitor lizards (*Varanus bengalensis* and *V. flavescens*) are of note.

In 1993, the Zoo received 829 800 visitors of which 11 800 were foreigners (Maskey and Baral, 1995). In 1996, the management of the Central Zoo will be transferred to KMTNC.

### 9.8 Herbs Production and Processing Co. Ltd.

The Herbs Production and Processing Company (HPPC) is a commercial company operating under the MFSC and is mandated to extract the constituents of medicinal and aromatic plants for medical use. It promotes the cultivation of and acts as the purchasing and processing agency for both cultivated and "gathered in the wild" medicinal and aromatic plants. It has 150 employees and is supplied by around 5000 collectors. Herbal farms are established and operated across Nepal's physiographic zones.

Medicinal and aromatic plants under commercial cultivation include *Atropa belladonna* (Belladonna), *Cinnamomum glaucescens* (Sungandkokila), *Chrysanthemum cinerariaefolium* (Pyrethrum), *Cymbopogon winterianus* (Citronella), *C. flexuosus* (Lemon Grass), *C. martinii* (Palmarosa), *Mentha arvensis* (Japanese Mint), *Rauwolfia serpentina* (Sarpagandha), *Tagetes glandulifera* (Tagetes), and *Valeriana jatamansi* (Sugandhawal). The production of essential oils is increasing and proving to be a profitable enterprise. Sungandkokila, Sugandhawal, citronella and lemon grass are four of the main herbs cultivated in the Midhills herbal farms.

A number of constraints exist for the development of the medicinal and aromatic plants business. Their cultivation is impeded by short-comings in planning, policy - chiefly infrastructure development, pricing and marketing. Collection in the wild is threatened by over-exploitation and lack of knowledge of how to manage the resource. However, there is much potential for the cultivation of high valued medicinal and aromatic plants, not only to provide raw materials to the company but to improve the socio-economic conditions of rural people. Over 600 families are involved as out-growers of HPPCL and are guaranteed a market for their produce (Rawal, 1993). A factory in Kathmandu processes the raw materials into various medicinal extracts and essential oils.

## 9.9 King Mahendra Trust for Nature Conservation

The King Mahendra Trust for Nature Conservation (KMTNC), an autonomous, non-governmental organization, was established in 1982 in accordance with the King Mahendra Trust for Nature Conservation Act, 1982. It became fully functional in 1984 and has successfully undertaken, over 60 projects in biodiversity conservation, and sustainable rural development. According to the Act, the KMTNC is mandated to:

- conserve, promote and manage natural resources
- undertake the development of national parks and wildlife reserves
- carry out scientific studies and research on natural resources.

Based on the KMTNC Rules, 1984, the Trust carries out various works related to:

- afforestation
- soil and water conservation
- management studies on protected areas and the conservation of wildlife
- public awareness programmes on conservation
- scientific study and research on natural resources.

It is also to provide comments and suggestions to the government during policy formulation on nature and natural resources conservation and management. The Trust can raise money to help in the implementation of its activities.

Since 1986 the Trust has been involved in the Annapurna Conservation Area Project, which has been developed as a model for integrating people's participation in natural resources conservation, for the improvement of local people's living standards.

ACAP is run on the basis of seven guiding principles:

- sustainability
- people's participation
- to act as a catalyst
- conservation for development
- grass-roots methods
- multiple use
- implementation of programmes by stages.

The main programmes are focussed on community development and tourism management programmes. These include encouraging the use of alternative energy; forest regeneration activities; conservation education and extension and research and training.

#### **9.10 The Ministry of Population and Environment**

This ministry was established in September, 1995. It was created with a view to streamline the existing environment improvement programmes executed through various line agencies with a broader prospective.

The ministry will be involved in formulating and implementing policies, plans and programmes. It will formulate acts, regulations, and create guidelines on population and the environment. It will carry out studies, research, surveys, publication of extension materials, and conduct training programmes. It will also function as a contact point and will coordinate with national and international organisations related to population and environmental matters.

This ministry is also mandated to work for the control of pollution, environmental conservation, and regular and periodic monitoring and evaluation of programmes implemented by other agencies. Another function is to develop human resources in the field of environment.



1871. The first of the year was a very dry one, and the crops were much injured by the drought.

The second of the year was a very wet one, and the crops were much injured by the rain.

The third of the year was a very dry one, and the crops were much injured by the drought.

The fourth of the year was a very wet one, and the crops were much injured by the rain.

The fifth of the year was a very dry one, and the crops were much injured by the drought.

The sixth of the year was a very wet one, and the crops were much injured by the rain.

The seventh of the year was a very dry one, and the crops were much injured by the drought.

The eighth of the year was a very wet one, and the crops were much injured by the rain.

The ninth of the year was a very dry one, and the crops were much injured by the drought.

The tenth of the year was a very wet one, and the crops were much injured by the rain.

The eleventh of the year was a very dry one, and the crops were much injured by the drought.

The twelfth of the year was a very wet one, and the crops were much injured by the rain.

The thirteenth of the year was a very dry one, and the crops were much injured by the drought.

The fourteenth of the year was a very wet one, and the crops were much injured by the rain.

The fifteenth of the year was a very dry one, and the crops were much injured by the drought.

The sixteenth of the year was a very wet one, and the crops were much injured by the rain.

The seventeenth of the year was a very dry one, and the crops were much injured by the drought.

The eighteenth of the year was a very wet one, and the crops were much injured by the rain.

The nineteenth of the year was a very dry one, and the crops were much injured by the drought.

The twentieth of the year was a very wet one, and the crops were much injured by the rain.

The twenty-first of the year was a very dry one, and the crops were much injured by the drought.

The twenty-second of the year was a very wet one, and the crops were much injured by the rain.

The twenty-third of the year was a very dry one, and the crops were much injured by the drought.

The twenty-fourth of the year was a very wet one, and the crops were much injured by the rain.

The twenty-fifth of the year was a very dry one, and the crops were much injured by the drought.

## 10. REVIEW OF ON-GOING PROJECTS IN HIGHLANDS NEPAL

In Nepal, biodiversity studies - studies of the natural ecosystems and the species therein, were initiated in the late 1960s concentrating mainly on Terai and Highlands areas. Notable studies were carried out by the Smithsonian Institute. Much valuable data on Nepal's biodiversity was collected at that time. Since then however projects have given little attention to the collection of further information and many gaps remain in the baseline data. This information is crucial for the full understanding and the proper design of management interventions to protect biodiversity.

The focus of donor funding has been on community development projects to provide for the daily needs of Nepal's mostly rural population improving their livelihood through the participatory management of natural resources. In the mid-1990s this is the main focus of donor input into the management of the Highlands natural and semi-natural habitats. Most projects and the majority of the funds focus on community development programmes with biodiversity work (species monitoring and inventories) as only usually a minor component. Detailed descriptions of these projects are given in Appendix 10-1.

A few projects with some emphasis on biodiversity are beginning to be implemented in the Highlands as the recommendations from UNCED are followed up on. These are listed below.

### **Biodiversity Conservation Programme:**

The Asia Network for Small-Scale Agricultural Biotechnologies (ANSAB) has started a project in Humla district to assist local communities with biodiversity conservation and natural resources utilization. The aim is to improve their economic condition through the sustainable use of the area's medicinal plant resource. This project is focusing on the management and processing of medicinal plants.

### **A Strategy for Management, Protection and Improvement of Shey-Phoksundo National Park:**

The project's objectives are to develop and manage the natural resources of the park and help elevate the living standards of the local people. The project's activities are to make inventories of wild flora and fauna; and conservation and development programmes for pasture management, eco-tourism, conservation education, alternative energy and infrastructure development. It commenced in January 1992 and will run up to June 1998.

### **Partnership for Quality Tourism:**

A UNDP funded project with the aim of developing eco-tourism and biodiversity conservation. Project activities in the Highlands have focussed on Langtang National Park. The project is in its final stages.

### **East Himalayan Programme for Collaboration in Biodiversity:**

This project executed by ICIMOD and financed by the MacArthur Foundation is seeking to improve biodiversity management through institutional collaboration and to develop sound agro-ecosystems around the periphery of a Highlands Park. The area under consideration is Langtang National Park.

### **Sagarmatha Pollution Control Project:**

The WWF funded Sagarmatha Pollution Control Project has been tackling the Sagarmatha National Park's waste disposal problem. This has been done mostly by organising disposal points (pits) and employing local people to manage the waste. Environmental education programmes have also been

run to give local people and especially lodge owners the awareness of how to manage this problem. The project has also given assistance for the protection of the local culture by promoting festivals, and monastery conservation.

**Nepal-Sagarmatha Forestry Project:**

This Himalayan Trust executed programme started in 1983 inside SNP. It focuses on afforestation programmes and the maintenance of nurseries for seedling distribution. This project receives financial support from the Sir Edmund Hillary Foundation. One of the early initiatives was to purchase and remove 400 goats from the park after which the grazing of goats in the park was banned. Goats were a major factor in preventing forest regeneration.

**Conservation of Kanchenjunga Region:**

This programme is funded by WWF USA and other agencies. It aims to protect the unique environment of the Kanchenjunga region and help the local communities improve their living conditions. The project is helping to prepare a conservation and management plan for the designation of the Kanchenjunga area as a Conservation Area Project. The project commenced in July 1995 and will run to June 1998. Its budget is US\$ 567 282.

**Nepal Conservation Research and Training Centre:**

This is a research and training centre of KMTNC based in Chitwan but with a remit to work throughout Nepal on Biodiversity Conservation research and monitoring. At present it is undertaking a UNDP, GEF Project for Tourism Development. BCN, WWF-USA and UNDP are the key donors. The budget is estimated at US\$ 188 000 per year and the project duration is from 1994 to 1997.

**Annapurna Conservation Area Project:**

The world famous Annapurna Conservation Area Project was launched in 1987 following on from the designation of Annapurna as a conservation area in 1986. The area is described in Chapter 5 with initiatives for tourism management in Chapter 7. The project run by the KMTNC manages the park through the full involvement of local people to benefit their living standards and mitigate the negative effects of tourism. ACAP commenced in 1986 with an annual budget of US\$ 1 000 000.

**Makalu-Barun National Park and Conservation Area Project:**

The MBNP/CA Project was created in 1988 to protect the biodiversity of the Makalu-Barun region of eastern Nepal. The conservation area is managed with the full involvement of local people through full consultation and the establishment of user groups. The main funding from the Government of The Netherlands, IDRC and other donors began from 1992 for the establishment of the protected areas.

**Wildlife People Project:**

This project runs in Makalu-Barun National Park and aims to develop new technologies as well as traditional methods to prevent crop and livestock depredation by wildlife. It will identify the main crop and livestock predator species and develop effective control measures. These include sowing unpalatable species of crops and preventive measures to avoid wildlife-livestock conflicts. Ecological studies of some of the species will be carried out. This is a pilot project and if successful, it shall be implemented in other protected areas. The budget is US\$ 80 000. The project will run from August, 1995 to July 1996 with DNPWC as the implementing agency.

**Musk Deer Breeding Programme:**

A project to study the feasibility of farming Musk Deer for their pods has been established by DNPWC and is at a preliminary stage. At the ten hectare site at Godavari, south of Kathmandu, comparative studies are being conducted on the behaviour of two other deer species - Chital and Barking Deer. It is planned in FY 1995/96 to bring Musk Deer to the research site and begin observations of their behaviour and studies on raising them by artificial insemination (DNPWC, 1995).

**Environment and Forest Enterprise Activity:**

As part of USAID/Nepal's Sustainable Income and Rural Enterprise Programme the Environment and Forestry Enterprise Activity will focus on increasing local control and sustainable management of natural resources to increase forest productivity. The programme is focusing its activities on Nepal's Mid-Western Development Region. The programme includes various activities for Shey-Phoksundo National Park and Dhorpatan Wildlife Reserve. For these two protected areas the project aims to accelerating the local control and management of natural resources and develop natural resource based micro-enterprises. Activities include NTFP identification and harvesting plans; pilot studies to develop appropriate value-added processing techniques; development of eco-tourism micro enterprises; to initiate user group based development efforts in the areas adjoining the two protected areas; and to enhance the extension activities of DNPWC field staff to develop and strengthen resource Conservation Committees through provision of training and technical assistance to Park Rangers and Game Scouts.

**Gorkha Development Project:**

The Gorkha Development Project is a comprehensive community development project working in Gorkha District, central Nepal. It is funded by the Federal Republic of Germany (GTZ). It began in 1991 and will run over a period of 12 to 15 years. The budget, although flexible, is around \$5.6 million per three year period. Programmes are extensive and include promoting eco-tourism, giving credit to small farmers, developing infrastructure at all levels, and promoting better management of the medicinal and aromatic plants harvesting and trade.

**University research programmes:**

The UK based Darwin Initiative is running the Biodiversity of the Himalayas Research Project. Led by the Institute of Hydrology (Wallingford, Oxford) this project is studying the status of Nepal's freshwater ecosystems. Through chemical and biological studies it is looking at the influence of different land uses on the status of freshwater streams.

Most projects stress biodiversity conservation through community participation. Very few of these projects have a main remit as to add to the base-line data on Nepal's species that was collected in the 1960s and 1970s. The main remit is of the Nepal Conservation Research and Training Centre is to collect this type of data but even this project is currently focusing on tourism development. The Shey Phoksundo and MBNP/CA projects are also collecting this sort of information. It is hoped that projects will emerge and the projects with a research component will work on facilitating the collection of data on Nepal's under and unrecorded species.

The first of these is the 'cultural' approach, which has been dominant in the study of the human mind since the 1950s. It is based on the idea that the human mind is a product of culture, and that the study of the human mind should be based on the study of culture.

The second approach is the 'biological' approach, which has been dominant in the study of the human mind since the 1960s. It is based on the idea that the human mind is a product of biology, and that the study of the human mind should be based on the study of biology.

The third approach is the 'cognitive' approach, which has been dominant in the study of the human mind since the 1970s. It is based on the idea that the human mind is a product of cognition, and that the study of the human mind should be based on the study of cognition.

The fourth approach is the 'evolutionary' approach, which has been dominant in the study of the human mind since the 1980s. It is based on the idea that the human mind is a product of evolution, and that the study of the human mind should be based on the study of evolution.

The fifth approach is the 'neuroscience' approach, which has been dominant in the study of the human mind since the 1990s. It is based on the idea that the human mind is a product of neuroscience, and that the study of the human mind should be based on the study of neuroscience.

The sixth approach is the 'psychology' approach, which has been dominant in the study of the human mind since the 2000s. It is based on the idea that the human mind is a product of psychology, and that the study of the human mind should be based on the study of psychology.

The seventh approach is the 'sociology' approach, which has been dominant in the study of the human mind since the 2010s. It is based on the idea that the human mind is a product of sociology, and that the study of the human mind should be based on the study of sociology.

The eighth approach is the 'anthropology' approach, which has been dominant in the study of the human mind since the 2020s. It is based on the idea that the human mind is a product of anthropology, and that the study of the human mind should be based on the study of anthropology.

The ninth approach is the 'philosophy' approach, which has been dominant in the study of the human mind since the 2030s. It is based on the idea that the human mind is a product of philosophy, and that the study of the human mind should be based on the study of philosophy.

The tenth approach is the 'religion' approach, which has been dominant in the study of the human mind since the 2040s. It is based on the idea that the human mind is a product of religion, and that the study of the human mind should be based on the study of religion.

The eleventh approach is the 'art' approach, which has been dominant in the study of the human mind since the 2050s. It is based on the idea that the human mind is a product of art, and that the study of the human mind should be based on the study of art.

The twelfth approach is the 'science' approach, which has been dominant in the study of the human mind since the 2060s. It is based on the idea that the human mind is a product of science, and that the study of the human mind should be based on the study of science.

The thirteenth approach is the 'technology' approach, which has been dominant in the study of the human mind since the 2070s. It is based on the idea that the human mind is a product of technology, and that the study of the human mind should be based on the study of technology.

The fourteenth approach is the 'space' approach, which has been dominant in the study of the human mind since the 2080s. It is based on the idea that the human mind is a product of space, and that the study of the human mind should be based on the study of space.

The fifteenth approach is the 'time' approach, which has been dominant in the study of the human mind since the 2090s. It is based on the idea that the human mind is a product of time, and that the study of the human mind should be based on the study of time.

The sixteenth approach is the 'energy' approach, which has been dominant in the study of the human mind since the 2100s. It is based on the idea that the human mind is a product of energy, and that the study of the human mind should be based on the study of energy.

The seventeenth approach is the 'matter' approach, which has been dominant in the study of the human mind since the 2110s. It is based on the idea that the human mind is a product of matter, and that the study of the human mind should be based on the study of matter.

The eighteenth approach is the 'information' approach, which has been dominant in the study of the human mind since the 2120s. It is based on the idea that the human mind is a product of information, and that the study of the human mind should be based on the study of information.

The nineteenth approach is the 'communication' approach, which has been dominant in the study of the human mind since the 2130s. It is based on the idea that the human mind is a product of communication, and that the study of the human mind should be based on the study of communication.

The twentieth approach is the 'consciousness' approach, which has been dominant in the study of the human mind since the 2140s. It is based on the idea that the human mind is a product of consciousness, and that the study of the human mind should be based on the study of consciousness.

The twenty-first approach is the 'unconscious' approach, which has been dominant in the study of the human mind since the 2150s. It is based on the idea that the human mind is a product of the unconscious, and that the study of the human mind should be based on the study of the unconscious.

The twenty-second approach is the 'self' approach, which has been dominant in the study of the human mind since the 2160s. It is based on the idea that the human mind is a product of the self, and that the study of the human mind should be based on the study of the self.

The twenty-third approach is the 'other' approach, which has been dominant in the study of the human mind since the 2170s. It is based on the idea that the human mind is a product of the other, and that the study of the human mind should be based on the study of the other.

The twenty-fourth approach is the 'world' approach, which has been dominant in the study of the human mind since the 2180s. It is based on the idea that the human mind is a product of the world, and that the study of the human mind should be based on the study of the world.

## 11. CONCLUSIONS

Nepal's High Mountains and High Himal are separate physiographic zones that cover the high altitude northern parts of the country. Included within this grouping are the Trans-Himalayan Valleys and Mountains. The High Mountains cover about 20% of Nepal whilst the High Himal (including the Trans-Himalaya) cover around 23%. The High Mountains are the foothills of the main Himalayan Range. They are bounded by the Midhills to the south with the separating point at around 3000 m. The High Himal are a landscape of rock, snow and ice and areas of sparse alpine vegetation. It includes the highest point in the world - Sagarmatha at 8848 m - and many peaks over 7000 m. The Himalaya are bisected by a number of rivers which have cut deep gorges dividing the Himalaya into a number of separate massifs. The Kali Gandaki gorge is one of the deepest gorges in the world with altitudes of only 1200 m below the 8000+ m high Annapurna and Dhaulagiri peaks.

Although the Highlands cover 43% of Nepal, only around 6% of the population is settled there. These areas are largely inhospitable for human settlement with steep slopes and low winter temperatures. The people of the Highlands are even more dependant on natural resources than those living in the Midhills. There are few employment and income earning opportunities. The high cost of goods brought in from outside necessitates the use of locally available materials. Although the population is sparse the per capita demands on the natural resources are greater.

Thirty-eight distinct ecosystems are found above 3000 m in the Highlands. These include those species associations within Alpine, Sub-alpine and North-West Steppic formations levels. Although many plant species occur across Nepal there are notable east-west differences. The Nepalese Himalayas are the meeting place of western and eastern floristic elements. Western (European) species are characterised in the Highlands by *Betula utilis* and *Cedrus deodara* with eastern (East Asian) species such as *Larix griffithiana* not found in western Nepal.

The altitudinal distribution of Highlands ecosystems splits the Highlands into three zones:

- Sub-alpine level between 3000 m and the tree-line
- Alpine level between the tree-line and the snow-line
- Nival level above around 4500 m with permanent snow cover

The Sub-alpine level occurs between 3000 and 4200 m in the west and around 3000 m in the east. This level is heavily forested and due to the sparser population its forests are still largely in good condition. Three main forest types are found. *Abies spectabilis* forest is associated in the west with *Quercus semecarpifolia* and occurs up to 4000 m. In central Nepal *Quercus semecarpifolia* forest occurs only up to 3500 m with an understorey of *Rhododendron* and *Acer* spp. In the east *Larix* spp. are found in association with *Abies*. Over most of Nepal *Betula utilis* forest, usually in pure stands with an understorey of *Rhododendron* and *Acer* spp., is the forest type that runs up to the tree-line. In wetter areas of the east, *Rhododendron* forest is found up to the tree-line with more than 25 species represented including, *R. campanulatum*, *R. thomsonii* and *R. campbellianum*.

The Alpine level is the area between the tree-line and the region of perpetual snow lies. The conditions here are too harsh for trees and the vegetation comprises rhododendron and juniper shrub.

Considerable areas of the Highlands in western Nepal lie to the north of the Himalayas. The main influence on the vegetation of these areas are the strong winds and the low level of rainfall caused

by the rain shadow effect of the Himalayas. These areas are characterised as steppic formations. The main species are low growing, drought resistant plants principally *Caragana* spp, with *Hippophae rhamnoides*, *Cotoneaster microphyllus* and *Salix* spp. In areas with between 350 and 500 mm of rainfall *Juniperus indica* steppe occurs. In areas with less than 250 mm *Caragana* steppe vegetation with low cushion plants formations is found.

The Highlands are the meeting place of two major zoogeographical regions of the world the Palearctic region to the north and the Indo-Malayan region to the south. The upper altitudinal range of the two important Endemic Bird Areas (EBA) fall within the Himalayan range of Nepal; the endemic species rich Eastern Himalaya (between 900 - 4000 meters) and the Western Himalaya (between 1600 - 3600m). The political border of Nepal touches the Eastern Himalaya EBA and most of the Nepal Himalaya falls within the Western Himalaya EBA.

The Highlands supports 39% of vertebrates (522 species) found in Nepal, considerably lower than the vertebrates found in the Midhills and Terai and Siwaliks (72 % or 965 species and 73.4 % or 983 species respectively). Over 30% of the threatened vertebrates of Nepal are found in the Highlands. Thirteen percent of the Nepal's butterfly species (82 species) have been recorded from the Highlands of Nepal. The distribution of twenty eight butterfly species are confined to the Highlands physiographic zones. One hundred and forty-two Nepali butterfly species are considered as threatened for their survival.

Three percent of Nepal's fishes (6 species) are found in the Highlands. Three fish species (all endemic) are confined to this physiographic zone. They have been recorded from Rara National Park (RNP). Nine amphibian species are recorded from Nepal's Highlands which accounts for 21 % of Nepalese species. Two (both endemic) of these are threatened species. The distribution of three species is Highlands' confined. Thirteen species of reptiles have been recorded from the Highlands which accounts to 13 % of Nepalese species. The majority of them are terrestrial species principally lizards and snakes; with none of the NRDB category occur in this zone. The distribution of two lizard species is confined to the Highlands. Four hundred and thirteen bird species have been recorded from the Highlands, accounting for nearly 50 % of all bird species found in Nepal. There are 76 threatened species and the distribution of 24 species confined to the Highlands only. Twenty-six bird species considered to be Under-recorded and Vagrant are recorded from this zone. Eighty one mammal species have been recorded from the Highlands, accounting for 45 % of the total for Nepal. Twenty seven species are considered threatened species and the distribution of thirty two species is confined to this zone. Ten threatened mammal species are confined to the Highlands, of those six species are legally protected.

Nine of Nepal's protected areas under the jurisdiction of DNPWC lie partly within the Midhills and partly in the Highlands physiographic zones. Most of the Highland's natural and semi-natural habitats are however national forests lying under the jurisdiction of the Department of Forests.

Five of the national parks and the one hunting reserve lie predominantly above 3000 m. Only the southern fringes and river valleys of these areas lie below this level. Twenty per cent of the Midhills KNP lies above 3000 m. Of the two conservation areas over half of Annapurna Conservation Area (ACA) and 70% of Makalu Barun National Park and Conservation Area (MBCA) lie below 3000 m. The total area of the Highlands is 63 090 km<sup>2</sup> of which 12 405 km<sup>2</sup> falls above 3000 m within 9 of HMGN's protected areas. Nepal's Highlands are well represented in the PAS with 19.6% of their area covered.

Two areas are under consideration for designation as Conservation Area. Work is well advanced for the creation of a new protected area - Kanchenjunga Conservation Area (KCA) - including Kanchenjunga Himal and its surrounding areas in the northern parts of Taplejung district. The new protected area will cover an area of over 2000 km<sup>2</sup>. It will adjoin the 850 km<sup>2</sup> Kanchenjunga National Park in Sikkim, India. The establishment of KCA would create nearly 3000 km<sup>2</sup> of trans-boundary protected area. The area would be the first representative part of the Eastern Himalayan Range to be included in a protected area in Nepal. Areas of *Larix griffiana* forest mixed with juniper species - a characteristic east Himalayan vegetation type - are found in the two main river valleys of this area. The other area under consideration by HMGN is Manaslu.

Three of Nepal's mountain protected areas are connected in the north to the huge Qomolangma Nature Reserve (QNR) in the Autonomous Region of Tibet. QNR covers three and a half million hectares mostly of Tibetan plateau areas with an average altitude of 4500 m. In Nepal, Langtang National Park (LNP), Sagarmatha National Park (SNP) and MBNP/CA adjoin. This contiguous protected area within Nepal adjoins QNR in the north. LNP is bounded to the north by the Xixibanga Core Protected Area of QNR. The three adjoining protected areas cover more than four million hectares ranging from the Sal forests in MBNP and LNP over the High Himal of SNP, MBNP and LNP to the vast expanses of the Tibetan Plateau in QNR and on down to sub-tropical areas in China.

National forests are those areas under the authority of the DoF and include grassland as well as forested areas. Although under the DoF's authority, hardly any of the extensive areas of national forest's grassland and forest in Nepal's Highlands are under active management by HMGN.

According to the LRMP study, 61% of the High Mountains (1 815 000 ha) and 6% of the High Himal (222 000 ha) was covered with forest in the late 1970s. This includes all forest areas from dense, undisturbed high forest through to heavily degraded coppice and shrub. The Siwaliks is the physiographic zone with the largest area of good condition forest. Nepal's High Mountains have the second largest area with over one and a half million hectares. Considerable areas of grassland are also found in the Highlands. Twenty six % of High Himal and 17% of High Mountains are grasslands covering over one million hectares.

The Highlands have large areas of forest, often remote from DFO Range offices in sparsely populated areas. HMGN does not have the resources or manpower to protect or manage its high altitude forests as protected forests or government managed forests. The longer the government waits to implement improved management the more degraded the Highland's forest resource will become. Community forestry is a management option for the Highlands, that can be implemented relatively cheaply, building on expertise of DFO staff in handing over forests in the Midhills.

There are three issues where high altitude forests present special difficulties: (i) settlements are widespread it is more difficult to accurately identify user group members; (ii) forests are often in good condition and a valuable resource. There is therefore the danger that the local elites hijack commercially valuable forest products for themselves; (iii) appropriate silvicultural applications may well be different for the high altitude forests where some forest types regenerate less easily than lower altitude forests. It is questionable, however whether community forestry is appropriate for most of the Highland's forests. Due to their remoteness, size, and commercial and ecological value a different model of forest management, possibly based on the Joint Forest Management system used in India, may be more applicable. This style of forest management would be participatory but with the government influencing management prescriptions more than is the case in community forestry.



Of the 38 ecosystems found within the Highlands, 30 of these are represented within the PAS. Of these three have areas of less than 1000 ha (10 km<sup>2</sup>). According to this data only eight ecosystems are not covered within the PAS, whilst three have only a small presence. Coverage of the Highlands ecosystems within the PAS is good. The only neglected grouping appears to be alpine grasslands. Some of the areas not included in the PAS have only a limited occurrence but no matter how small an area covered by any ecosystem each one provides a unique set of habitat conditions for fauna and flora. Studies using the latest techniques of satellite imagery and GIS systems await for a comprehensive mapping of Nepal's ecosystems.

Eco-tourism in the Highlands is centred on trekking in the mountains. The main destinations are the three protected areas ACA, SNP and LNP. The Annapurna area receives by far the most visitors of the Highlands protected areas. Over 45 000 entry permits were issued for ACA to foreigners in FY 1994/95 generating US\$ 550 000 in revenue. Annapurna is the main destination for trekkers in Nepal due to its spectacular mountain scenery and relative accessibility. In 1991 of all trekkers visiting Nepal, 55 % of them headed for the Annapurna area. Over 14 000 visitors to SNP and over 8400 to LNP purchased entry permits in the same year. Tourist destinations need effective management to prevent negative impacts. The economic benefits from tourism are considerable and should spur the government and local communities to implement management. A few initiatives are beginning to be taken for the management of tourism to alleviate any negative effects of tourism and increase benefits to the local people. A comprehensive management plan has been written for the Upper Barun valley of MBNP. The plan outlines nine recommendations to minimize and mitigate environment impact.

In Nepal, biodiversity studies were initiated in the late 1960s concentrating mainly on Terai and Highlands areas. Notable studies were carried out by the Smithsonian Institute. Much valuable data on Nepal's biodiversity was collected at that time. Since then however projects have given little attention to the collection of further information and many gaps remain in the baseline data. This information is crucial for the full understanding and the proper design of management interventions to protect biodiversity.

The focus of donor funding has been on community development projects to provide for the daily needs of Nepal's mostly rural population improving their livelihood through the participatory management of natural resources. In the mid-1990s this is the main focus of donor input into the management of the Highlands natural and semi-natural habitats. Most projects and the majority of the funds focus on community development programmes with biodiversity work (species monitoring and inventories) as only usually a minor component.

A few projects with some emphasis on biodiversity are beginning to be implemented in the Highlands as the recommendations from UNCED are followed up on.

Biodiversity is a far reaching concept included in the work of many governmental and non-governmental agencies. The DNPWC and the DoF are the main bodies. This report has recommended that a National Biodiversity Co-ordination and Information Centre is set up to co-ordinate activities with the major remit for the conservation of Nepal's biodiversity being given to the DNPWC.

## 12. RECOMMENDATIONS

Recommendations have been grouped into those which are applicable across Nepal (12.1) and those specific to the Highlands (12.2).

### 12.1 Nationwide recommendations

To ensure the effective implementation of biodiversity conservation programmes both inside and outside the PAS a number of management interventions are required to improve inter-agency co-ordination, HMGN staff capacity (human resources development), information exchange and income generation.

Previously the conservation of threatened species entailed the establishment of protected areas, guarded by the Royal Nepalese Army. This approach, although still largely applicable in the Terai, has been unsuccessful in many cases in the Highlands areas. Of the total budget of the DNPWC 80% goes for paying the army with only 20% for protected area management.

Nepal's efforts, to conserve biological resources can be strengthened through the participation of local people. New models of conservation area management, introduced in the Annapurna and Makalu-Barun areas, demonstrate opportunities to involve local people in conservation efforts by considering them as conservation partners. In these areas the aim is to conserve biodiversity whilst fostering sustainable economic growth to improve local people's living standards. This in turn will benefit the national economy. Conservation efforts should focus on the sustainable use of the biological resources and the equitable sharing of benefits. This approach will help Nepal to meet its obligations to the UNCED Biological Diversity Convention, CITES, the Ramsar Convention, and International Tropical Timber Organisation. It will help in meeting the (non-binding) provisions of the Rio Declaration's forestry principles and chapters 11, 12, 13 and 15 of Agenda 21 concerning the conservation of biological diversity. Article 6 of the Convention on Biological Diversity calls upon signatories to:

*develop national strategies, plans or programmes, or adapt existing ones, to address the provisions of the Convention; and to integrate biodiversity works into sectoral and cross-sectoral plans, programmes and policies.*

UNCED's Agenda 21 stresses the value of biological resources as a capital asset with great potential for yielding sustainable benefits. It highlights and emphasizes the need to build capacity to assess, study, evaluate and monitor biodiversity at the national level; whilst ensuring the full participation and support of local communities. Nepal is in the process of drafting a Biodiversity Action Plan (BAP). A number of recommendations which are discussed below will, no doubt, be elaborated in the BAP.

#### 12.1.1 National co-ordination

In Nepal biodiversity conservation activities are carried out by various government and non-governmental organisations with little co-ordination of their activities. HMGN should therefore establish a National Biodiversity Co-ordination and Information Centre (NBCIC) to:

- co-ordinate and monitor public and private sector activities that have an impact on

- biodiversity
- minimize duplication of works
- identify the priority areas for biodiversity conservation and direct scarce resources there.

In particular greater co-ordination is needed between the DoF and the DNPWC to draw upon each other's expertise. Currently the DoF has the greatest experience and well-established training programmes on how to involve local people in natural resource management whereas the DNPWC has the expertise in wildlife and habitat management.

It is recommended that the NBCIC be established under the Ministry of Forests and Soil Conservation. The Centre would be directed by a Board, with representation from all concerned institutions, with a mandate to look after all types of biodiversity conservation issues. A National Biodiversity Database System - the Master Database - should be maintained at the Centre, building upon the joint work carried out by The Mountain Institute and the Biodiversity Profiles Project. The database should involve close co-ordination with the DPR within whose remit falls the cataloguing of Nepal's plants. Between January and November 1995, 10 000 flora and fauna species records were processed and entered into this fledgling database (section 1.4).

#### **12.1.2 Policy and legal instruments**

Under the aegis of the DNPWC, specific policies and legislation has been enacted for the conservation of Nepal's biological diversity. In other policy areas - notably forestry, biodiversity conservation is also an important component. Nepal is party to a number of international conventions and agreements related to biodiversity conservation and its sustainable use. HMGN should consider initiating an extensive review of existing policies and legal provisions that relate to the conservation of biodiversity. The NBCIC, as proposed above, should be entrusted to identify gaps in policies and legislative provisions, and recommend legal instruments for biodiversity conservation across all types of ecosystems, to meet Nepal's obligations to various international conventions and agreements.

Only a few of Nepal's threatened species are currently legally protected. The schedules for species protected under the 1973 NPWC Act need urgent revision in line with the recommendations of the National Red Data Book for Fauna (BPP 1995i).

Some areas of policy are not clear and need clarifying. In the buffer-zone rules it is not clear whether or not the DFO will give up authority over the buffer-zone forests to the DNPWC once a buffer-zone has been established. A point in case is the recent petition of villagers in northern Sindhu Palchok whose forest lies adjacent to LNP. The villagers wanted their local forest handed over to them as a community forest. The District Forest Officer of Sindhu Palchok told them that it was not his concern as the forest fell in an area proposed as a buffer-zone for LNP. He referred them to the LNP office in Dhunche, two days bus ride away. Here the delegation was told that the forest is national forest and in fact lies under the authority of the DFO (B. Jackson, pers. comm.).

Policy confusion also exists on the ground among DFO and DNPWC staff concerning the difference between a "conservation area" and a "buffer-zone". Makalu-Barun Conservation Area was created as a buffer-zone of Makalu-Barun National Park before the creation of buffer-zones was allowed for in the legislation. Also the difference between "conservation areas" as established under the 1973

NPWC act and "protected forests" as defined in the 1993 Forest Act is not clear. The proliferation of a number of different designations without reference to existing ones can only lead to confusion and over-lapping responsibilities and conflicts between government agencies. The above designations need to be clarified.

There is a lack of clear management objectives for many of the protected areas. Of the Highlands protected areas only MBCA has an updated management plan, while the plan for SPNP is under preparation. Many of those produced for the Highlands protected areas date from the 1970s and 1980s (eg. Langtang 1976 and 1977; Rara 1976) and are largely out of date. Comprehensive management plans need to be prepared for all of Nepal's protected areas.

### 12.1.3 Strengthening of DNPWC

It is recommended that the government's capacity to deal with issues of biodiversity are largely focussed within the DNPWC. It may confuse both the public and the donor community if other government agencies create biodiversity sections or divisions.

The Department of National Parks and Wildlife Conservation requires strengthening of its management practices if the new dual mandate of conserving Nepal's biological diversity whilst encouraging community development is to be carried out. Policy and legal instruments alone will not be sufficient to protect biodiversity if the government lacks adequate, competent staff. Although it oversees the management of 14% of Nepal's land area, DNPWC has only 22 technicians at headquarters and less than 1000 nationwide. By 1994 only 37 gazetted officers remained after a rigorous trimming of HMGN's government apparatus due to budget constraints. There are now 10 200 technical and non-technical posts in MFSC, of which 6958 (nearly 70%) are attached to the DoF. DNPWC is severely impeded by a lack of manpower, and financial and technical resources - a common problem for government agencies in resource poor developing countries such as Nepal. Furthermore DNPWC's manpower is depleted by vacancies, deputations and long term staff training overseas. SNP with over 50 000 (foreign and Nepali) visitors, has only 38 staff (one gazetted officer), compared to a large number of soldiers of the Royal Nepalese Army Park Protection Force posted there. This same staffing deficiency applies to all protected areas. Due to lack of logistic support and incentives, staff absenteeism in remote protected areas is common. DNPWC field based staff are among the least trained and the most inadequately funded among HMGN agencies (UNDP, 1994).

For improved protected area management it is necessary to:

- increase both technical and non-technical staff at HQ and at field level
- provide training and re-orientation programmes for staff working on both policy and implementation
- provide in-service training for junior park managers to acquaint them with wildlife and protected area management
- enlist professionals from diverse backgrounds including zoologists, botanists and socio-economists. Zoologists and botanists are needed to conduct zoological and botanical surveys and to monitor endangered species. Socio-economists are needed to assist local communities to express their needs and accept compromises in solving the wildlife-people conflict found around most protected areas (Table 12-1)

- provide DNPWC field-based staff with efficient communication equipment (walkie talkies); field gear (camping equipment, binoculars); and transport (four-wheel drive vehicles and motorbikes - to control illegal activities such as poaching and timber smuggling.

**Table 12-1 Proposed additional technical staff for DNPWC**

Zoologists (mammologists, ornithologists, ichthyologists, herpetologists) Ecologists (terrestrial and aquatic) Assistant ecologists (for all the parks and at the Head office) GIS specialists Socio-economists Computer programmers Assistant computer programmers Data processors
--

DNPWC staff should play a key role in staffing NBCIC. As NBCIC's mandate will include the monitoring of biodiversity, trained manpower in the use of database and GIS systems will be needed. Although a few DNPWC staff have been trained in GIS, further training is necessary to acquaint staff with continuing developments.

#### 12.1.4 Inventories

Keystone species are those crucial to the functioning of an ecosystem (Fiedler and Jaine, 1992). The loss of such species from an ecosystem causes drastic changes in species composition and often leads to a rapid increase in less important species. The Indian Rhino and Indian Elephant are keystone species in the Terai and have been relatively well studied. Elsewhere it is not known which are the crucial animal and plant species. Studies are urgently needed to identify the keystone species to prioritise species protection. They should include ecological studies of felids such as Lynx and Snow Leopard.

As detailed in section 1.2.3, Nepal's biodiversity has not been comprehensively studied both in terms of coverage across Nepal and investigations within the faunal and floral taxa. Recent biodiversity assessments executed by BPP have yielded a wealth of new information including a number of species newly recorded for Nepal. The challenge of making an overall inventory of Nepal's biodiversity is formidable. The government agencies (DPR and DNPWC) mandated with conducting flora and fauna studies are under-resourced and under-staffed. Whether or not inventories are carried out depends largely on the interest of donor agencies to invest in field studies. As shown in Chapter 10, donors are currently more concerned with funding community development and buffer-zone projects than biodiversity inventories. As per the recommendations from the Rio conference, donors need to appreciate the importance of and allocate funds for taxonomic work at both the ecosystem, species and within species levels as a crucial strategy to conserve biodiversity.

Due attention should be given to support the work of specialized national NGOs including the Ecological Association of Nepal, the Biodiversity Institute, and Resources Nepal to assist them in their biodiversity inventory work.

The NBCIC should promote co-ordinated scientific research projects that expand the understanding of the distribution, status, ecology and behaviour of threatened and rare species. In addition an up to date survey of Nepal's ecosystems is urgently required. This study should use aerial photography and GIS techniques to improve on the pioneering work done by Dobremez and his colleagues.

Facilities to house expanding national specimen collections are insufficient and the annual budgets for their upkeep inadequate. Biodiversity studies covering both flora and fauna taxa are required for the Highlands and in particular for the taxa and areas of the country inadequately covered to date.

#### **12.1.5 Information exchange**

The exchange of information on biodiversity within Nepal is not well established. There is for example little access to the results of other scientist's studies often published in journals not available in Nepal and often in languages other than Nepali or English. There is also an inadequate flow of information which often leads to duplication of work. A mechanism needs to be developed to strengthen the existing information and network facilities, and to make the information user-friendly. The proposed NBCIC Board should be entrusted to facilitate this.

At least 11 biodiversity database systems are in operation in Nepal with data input from different conservation organisations (Shrestha, 1994). A number of these duplicate each other's efforts. It is recommended that the NBCIC will give adequate follow up to the outcome of the expert meeting on "Biodiversity Information System", convened by IUCN and DNPWC in November 1995. The meeting established a protocol for data exchange between the users of various database systems. NBCIC should develop a system to ensure that all scientists enter new species records and reports into a Master Database. Foreign scientists are given permission to study in Nepal on condition that they report their findings to the concerned Nepalese authorities. This condition should be strictly enforced and any new records or reports collected by foreign scientists must be sent in to the Database and NBCIC.

Equally the reports produced by BPP provide a foundation for the further study of Nepal's biodiversity. A mechanism should be established whereby the enumerations of the various animal and plant groups produced both by BPP and other scientists can be updated in line with additions to the Master Database. If this mechanism becomes well-established then foreign and national scientists will be encouraged to co-operate in communicating with a clearing house for this sort of base-line information.

The rapid spread of worldwide computer access to information through the Internet offers many opportunities for the exchange of information. As foreign scientists will continue to have a central role in mapping Nepal's biodiversity their co-ordination and the communication of new records can happen through the Internet.

#### **12.1.6 *In-situ* conservation**

Article 8 of the Global Biodiversity Convention spells out the responsibilities of each Contracting Party towards the conservation of plants and animals in their wild state. DNPWC is not the only stakeholder to ensure that the requirements of Article 8 are met; other government departments,

commercial interests, and landowners and farmers have an interest in avoiding land management interventions and land use changes harmful to threatened species. *In-situ* conservation involves both the setting aside of areas as nature reserves and management initiatives to ensure that threatened wild species can survive in managed habitats such as plantations and forests. It is recommended that management prescriptions for the conservation of biodiversity be a central part of national forest management plans.

A variety of initiatives are needed for the effective conservation of threatened species including specifically an extension in the number of species legally protected and the further study of species distribution and habitat needs. Certain areas outside the PAS that serve as habitats with crucial importance for threatened populations must be protected.

**i) Species action plans**

Endemic and endangered species of flora and fauna, should be selected for species-specific action plans. Such plans should aim to increase the populations of highly valued and threatened species. As an initiative to highlight the economic benefits of the conservation of certain species, a plan should be developed for the Musk Deer. Similarly, action plans should be developed and implemented for NRDB critically endangered and endangered wildlife including: Snow Leopard, Lynx, Tibetan Sand Fox, Wild Yak, Great Tibetan Sheep, and Tibetan Antelope.

Species actions plans serve the following purposes:

- to identify action needed for conserving priority species by the detailed examination of research data and, if required, by initiating further ecological studies
- to provide a strong scientific basis for, and a consensus amongst all those concerned, as to the initiatives needed
- to set objectives and targets against which the success of action can be measured
- to initiate the initiatives including: aspects of policy and legislation, land acquisition and reserve management; research; species monitoring, management and protection; and communications and publicity.

**ii) Re-establishment programmes for endangered wildlife species**

Successful re-introduction programmes have been carried out in Nepal for the One-horned Rhino into RBNP. Re-establishment programmes are required for a number of mammals in the Highlands PAS. DNPWC should consider the re-introduction of Snow Leopard and Lynx. Any translocations must be very carefully planned and executed.

**12.1.7 Ex-situ conservation**

*Ex-situ* conservation is the conservation of species away from their natural habitats. This may be required where *in-situ* conservation is insufficient to maintain genetic stocks or because of rarity, with natural habitats seriously threatened. *Ex-situ* conservation should be viewed as complementary to *in-*

*situ* conservation when:

- populations are severely threatened and their survival cannot be guaranteed in the wild
- to maintain existing genetic stocks as an 'insurance' policy for future needs
- for use in environmental education programmes.

*Ex-situ* conservation activities are carried at the Central Zoo and the National Herbarium and Plant Laboratory.

i) **Central Zoo**

Nepal's one zoo is located in Kathmandu. It should be promoted for the *ex-situ* conservation of endangered and endemic wildlife species. The functions of a zoo are:

- to provide conservation education opportunities focussed around both common and rare native species of wildlife
- to provide study facilities for research on animal behaviour and genetic diversity
- to provide breeding opportunities for endangered wildlife species.

The Zoo has been successful in breeding the endangered Black Buck and now houses 25 males, 27 females and three newly born bucks (Maskey and Baral, 1995). However none of the rehabilitation attempts in the wild have been successful.

HMGN should consider opening breeding stations in the Highlands for Snow Leopard, Lynx, Brown Bear and other endangered species. The breeding stations should fall under the management of the Central Zoo Executive Director. Snow Leopards are promising as they breed well in captivity (Schaller, 1977).

The Central Zoo holds many exotic and native species of animals. It however has no living exhibits of invertebrates. Details of individuals especially the endangered species, should be sent for recording into the global zoo databases - principally the International Zoo Yearbook and the on-going inventories of the International Species Information System (ISIS). The Zoo is severely under-resourced and under-staffed and has been unable to maintain breeding programmes and stud books for endangered species such as Wild Buffalo.

ii) **National Herbarium and Plant Laboratory**

It is recommended that an Arboretum be established in the Highlands (Langtang National Park being a good location), that botanical gardens be established in each of the five Development Regions; that inventories be carried out on lower plant species and that a germ plasm centre be founded for high altitude plants. Finally, strengthening of cytology and seeding sections is required (A.V. Upadhyay, pers comm.). The Plant Laboratory should consider the use of tissue culture technology to increase the populations of endangered and endemic flora. This technique favours the domestication and commercial farming of highly valued plant species, thereby reducing the pressure on the wild populations.



**iii) Natural History Museum**

The Natural History Museum has the dual role of natural history education and collecting base-line information on Nepal's fauna. It is woefully under-resourced to carry out either of these. Although it has a good range of specimen they are poorly displayed. Plans to improve the appeal of the museums displays need to be developed and investments made. Use should be made of the know-how of foreign museums where many successful initiatives to improve the appeal of museums have been made over the last two decades.

Of the museum's annual budget of 10 Lakh (approximately) \$18 500 only Nrs 50 0000 (\$925), is for research and travel allowances, including overseas visits. The Natural History Museum has some 10 technical staff who are therefore allocated only \$92 a year each for research and travel purposes. This effectively means that except by joining foreign expeditions the staff can carry out only hardly any field studies. The budget available for field studies urgently needs increasing. The Museum is particularly keen to carry out studies on insect groups and on ecological studies of mammals.

**iv) Conservation education**

The Godavari Botanical Garden, the Natural Herbarium, the Natural History Museum and the Central Zoo receive a large number of visitors. These institutions provide an important educational resource to promote Nepal's natural heritage and to show the importance of biodiversity conservation especially to young people on school visits. The educational facilities of these three institutions are however very poor and require major financial and technical support if they are to fulfil their potential.

Local authorities and local people should be educated about the importance of conserving biodiversity and informed how it is in their long term interests to do so. The DoF in collaboration with the DNPWC should produce and publish material on conservation education and natural resource management.

An existing successful initiative has been the IUCN's Conservation Camps for Environmental Awareness for young people. These have encouraged many young people to take a greater interest in natural history studies and the promotion of a safe environment for animals and humans to live in.

**12.1.8 Promotion of NGOs**

An increasing number of NGOs working both at the national and local level are involved in initiatives for biodiversity conservation. Some of these NGOs are more effective in their work than government agencies. Many however are not genuine and increased monitoring and control of NGOs is needed by the Social Welfare Council. Examples of outstanding NGOs include KMTNC, ECCA, Leaders Inc. Nepal, and the Nepal Forum for Environmental Journalists. The latter two have a crucial role as pressure groups to prompt government agencies to carry out their mandates. In the western world NGOs such as Greenpeace have played a crucial role in prompting governments to enact legislation and ensuring that they carry out existing obligations to prevent environmental damage. Encouragement should be given to NGOs that are genuinely working for the conservation of biodiversity by funding their work and allocating them projects. Also a number of INGOs have their national representation in Nepal such as WWF and IUCN.

## **12.2 Highlands specific recommendations**

A number of recommendations are made below specific to the Highlands. Recommendations are made for improving the management of a number of Highlands protected areas and for extending the current system of protected areas. Suggestions are made as to how the local people and the country as a whole can benefit economically from the conservation of biodiversity. Recommendations are also made on the need for the best strategies for managing the large areas of national forests and in particular management prescriptions that conserve the biodiversity of Highlands forests.

### **12.2.1 Improved management of Highlands protected area system**

#### **i) Livestock grazing inside protected area system**

One of the most serious threats to the ecological integrity of the Highlands PAS is the level of livestock grazing within the protected areas. Livestock grazing is practised in all Highlands and Midhills protected areas and several authors (Yonzon, 1991; Yonzon *et al.*, 1993; Prieme and Oksnebjerg, 1995; BPP, 1995b) have noted that grazing pressure leads to serious habitat deterioration, and erosion problems. Grazing may also contribute to the local extinction of threatened species such as is happening with Red Panda in LNP. Yonzon (1991) recommended that a management policy recognizing traditional but sustainable grazing rights be developed to protect the Red Panda.

Currently management responsibility for the northern rangelands is unclear. As national forest areas it should be the DoF who controls rangeland use. However the utilisation of these areas for livestock husbandry implicitly leaves the responsibility to the Ministry of Agriculture. *De facto* use however lies with local communities. Within the Highlands PAS, rangelands fall under the direct jurisdiction of DNPWC. It is recommended that DNPWC re-examine their current policy of allowing grazing inside Highlands PAS. Bauer and Paudyal (1988) contended that a Highland park can only represent intact mountain ecosystems if alpine meadows are grazed by mountain ungulates. Jackson and Ahlborn (1987) noted that the presence or absence of mountain ungulates is a primary predictor of snow leopard presence and their numbers. Snow Leopards have not been sighted recently in any of the Highlands parks with the exception of SPNP (Heinen and Yonzon, 1994).

In spite of the importance of livestock raising to the Highlands economy BPP could not find any projects working in the development of pasture management. It is recommended that initiatives to encourage the sustainable management of Highlands pastures outside the Highlands PAS be encouraged. Outside Highlands PAS pasture productivity can be significantly improved through measures such as, reseeding, bush clearing, and fertilizing (Rai and Thapa, 1993). Such programmes must however consider the traditional systems of pasture management and take into account the impact of any interventions on the fragile ecology and valuable biodiversity of these areas. The MoA and MFSC/DNPWC should jointly address the issue of rangeland management and in line with NEPAP develop appropriate management strategies in consultation with users' groups (HMGN, 1993).

**ii) Control of poaching**

Poaching is a serious problem in most Highlands PAS despite the presence of the army. It should be noted that ACA and MBNPCA have no army protection force. Poaching of wildlife is a recurrent issue in all Highlands protected areas. The worst depredations occurred in the 1960s and 1970s when the Tibetan Khampa guerillas with automatic weapons killed numerous wild animals. Although not on the scale of those times serious losses continue. In the Highlands the local people largely follow the Buddhist traditions. Buddhist traditions precludes hunting out of reverence for life. In the Shey-Phoksundo and Sagarmatha National Parks area most poaching is carried out by the ethnic groups who live outside the protected areas at lower elevations. Species highly affected by hunting are Musk Deer, Himalayan Black Bear and Goral. Although some hunting is carried out for protein consumption or for medical and religious purposes, most is based upon organised efforts to provide high value animal products for export. Prieme and Oksnebjerg (1994) reported organised poaching by hunters paid through Tibetan middlemen in SPNP.

To deter wildlife hunting poachers should be firmly prosecuted and fined. This can only be achieved if HMGN is determined to step up its law enforcement measures concerning illegal trade in endangered species. DNPWC staff posted in Highlands PAS should receive adequate facilities to facilitate swift communication between out-lying areas and Park HQ and the army.

The main incentive for poaching is the high prices fetched by animal parts. The main market for these parts is for use in traditional medicines in the Chinese and South East Asian countries. Another market is for fur coats. Until recent years fur coats made from endangered animals such as Snow Leopard and Lynx were on open sale in Kathmandu's tourist centres (Heinen and Leisure, 1993). Although measures have been taken to prevent this illegal trade no doubt the determined buyer can still find these coats for sale. The sale of items made from poached threatened animals must be strictly prevented with heavy penalties for those involved in the trade.

**iii) Improved habitat management**

In line with recommendations by Inskipp and Inskipp (1994) concerning habitat protection and management of important forests for birds DNPWC should improve protective measures inside *Betula/Rhododendron* forests in SNP. These measures also include improved protection of the forest under-storey to ensure that some areas of forest floor remain untouched.

**iv) Role of the Royal Nepalese Army**

With the exception of ACA and MBNPCA, the Royal Nepalese Army (RNA) has a large force placed in the Highlands PAS. RNA's role is principally that of law enforcement. In addition RNA has made contributions to afforestation, and soil conservation programmes. The army's operations are paid from DNPWC's annual budget and absorbs 80% of its budget. The role of the army needs to be reviewed and reconsidered. In the Terai, due to high population pressures surrounding the protected areas and high levels of encroachment on national forests, the army has a continuing role to prevent illegal activities inside the protected areas. In the Highlands, however the army seems to be less effective and wildlife poaching continues due to ineffective enforcement of DNPWC rules.

**v) Restrictions on the use of firewood for lodge owners inside PAS**

Tourist lodge owners inside Highlands PAS should be encouraged to use kerosene for cooking and heating instead of firewood. Visual inspection of firewood piles of lodge owners along the Namche Bazaar - Gokyo trail in SNP in October 1995 showed that most lodges relied solely on firewood most of it cut as green wood supplies, piled up outside the lodges. Whereas construction material is procured outside the park area, most of the firewood is obtained from the forests near Namche Bazaar. Depots need to be established to ensure that kerosene is available. Although the recently opened hydro-power plant is now supplying Namche and a number of adjacent villages with power the villages and lodges on the main tourist trail to Everest Base Camp still rely on firewood collected from forests within SNP.

**vi) Tourism management and entrance fees to Highlands PAS**

There is a widespread agreement that excessive levels of unmanaged tourism are having a detrimental impact on Nepal's protected areas. This is especially the case in Highlands PAS which have fragile ecosystems easily disturbed by human activity. Tourism management plans have already produced for MBNP and ACA and should be drafted for all other Highlands PAS. The management plans should devise strategies and regulations to mitigate and minimize negative impacts and identify necessary infrastructure.

The governments should consider raising the current protected areas entrance fee. This fee is currently expressed in the depreciating Nepal rupee rather than in US dollars. It was last increased in November 1992 to NR 650.

**12.2.2 Extending the current system of protected areas in Highlands**

Additional priority Highlands protected areas have been identified and are detailed below.

**i) Kanchenjunga**

Mount Kanchenjunga is Nepal's second highest peak, and the third highest peak worldwide. This remote area harbours a rich fauna with good populations of large ungulates, most notable Goral and its predator, the Snow Leopard. The area comprises the only extensive stands in Nepal of the larch, *Larix griffithiana*. A joint WWF/DNPWC team carried out a feasibility study in 1994 and a proposal has been submitted for the designation of 2000 km<sup>2</sup> as Conservation Area. The team has worked out a proposal for Kanchenjunga Conservation Area Project along the lines of ACAP.

**ii) Manaslu**

It is recommended that the Manaslu region, comprising an area of some 400 000 ha, centred around Manaslu Himal - the world's seventh highest summit, be designated as Conservation Area. The area has a rich biodiversity; fauna elements include Snow Leopard and Red Panda. A comprehensive management plan to protect and wisely use these resources needs to be formulated.

### **12.2.3 Buffer-zones**

With the imminent passing of the Buffer-zone Rules by HMG, the periphery of protected areas can be designated as buffer-zones. These areas are to be managed for community development to relieve pressure on the natural resources of the core protected areas. Buffer-zones have been recommended for a number of Nepal's protected areas including Khaptad National Park (BPP 1995j).

In Nepal the designation of buffer-zones is concentrating on the Terai protected areas as the areas most under threat from park-people conflicts. Programmes should also be initiated to manage the areas around the Highlands protected areas for the dual benefit of the local people and for biodiversity conservation.

It is particularly crucial that small protected areas are surrounded by buffer-zones. Small protected areas have a large area of "edge" in proportion to the core. The edge effect, although perhaps increasing the diversity of habitats, downgrades the value of a core protected area for most threatened species chiefly by increasing the risk of human disturbance. Within the Highlands PAS this applies foremost to Rara National Park, Nepal's second smallest protected area. Expansion south of the park area as proposed by Upreti (1989) should be given due consideration.

### **12.2.4 Trans-boundary protected areas**

Priority should be given to the setting up of new protected areas adjoining existing ones in neighbouring countries. The total contiguous areas protected, be it in separate protected areas (eg. SNP and MBNP) or in separate countries is crucial to maintain healthy populations of large mammal species. KCA and MBNP are recommended for management as part of a trans-border Conservation Area along with the already protected forest in the adjoining Kanchenjunga National Park in Sikkim and Qomolangma Nature Reserve in Tibet. The establishment of KCA as a protected area alongside KNP should entail the drafting and implementation of joint management plans taking into account cross-border wildlife and habitat management. Such agreements would include allowing the free movement of wildlife between the two countries and co-ordinated efforts to control wildlife poaching and timber smuggling.

### **12.2.5 Economic benefits of biodiversity conservation**

Brief recommendations are given here for the increased economic benefit that will derive from the promotion of eco-tourism and the better management of non-timber forest products harvesting and trade.

#### **i) Eco-tourism**

Trekking eco-tourism has a growing potential in Nepal's Highlands. It is noted in Chapter 5 that new protected areas such as Kanchenjunga and Manuslu are only feasible if there is potential for jobs creation and income generation from tourism. Once feasibility studies and tourist development programmes are established for these two areas, loans and technical advice should be made available for entrepreneurs wishing to establish facilities.

Sagarmatha, Annapurna and Langtang are major tourist destinations in Nepal. The benefits from tourism are not however well-distributed. It is often the traditionally well-off local people or investors from Kathmandu who have the money to develop good standard lodges and who benefit most (Heinen and Kattel, 1992b).

It is therefore recommended to:

- encourage the development of local government and local NGOs to vocalise the needs and aspirations of the local people
- encourage the more equitable spread of benefits by using revenues generated from the protected areas for community development projects. Those profiting from the Park should also contribute not just relying on central government funds and foreign aid
- address the depletion of forests for firewood collection by encouraging the use of alternative energy sources
- build visitor centres as a focus for educating visitors on how to lessen their impact and also as conservation education centres for local people
- better provision of information for trekkers in Kathmandu as they purchase their trekking permits at the Department of Immigration.

Training of local people, DoF and DNPWC staff is one crucial element for the better management of tourism. ACAP trains lodge owners in sanitation and food preparation. The DNPWC needs to establish either its own training centres or else use the existing Forestry Training Centres located in each of Nepal's five Development regions. These Training Centres already have a considerable expertise in training DoF staff in how to facilitate the management of local resources through people's participation. DoF staff are also trained in extension methods. Thousands of DoF staff and local people are trained both in these centres and at district level. Methods and syllabi for training in wildlife management need to be developed.

In ACA, Lodge Management Committees have been set up to ensure the proper management of lodges and to liaise with the Conservation Area authorities on how to improve facilities and the benefits for local people without negative effects on nature conservation. Such initiatives need to be established in all protected areas.

One of the most innovative initiatives for the development of eco-tourism in Nepal is the development of the Ghalegaun-Siklas trekking route by ACAP as a model trek route (Gurung and De Coursey, 1994). This seven day trek passes through the altitude ranges of 1200-3000 m and is described in the Midhills Biodiversity Profile (BPP, 1995j). The project aims to develop this route with minimum negative impact on the environment together with maximum benefits for the local people. Upto FY 1993/94 (KMTNC, 1994) a kerosene supply depot had been established, bridge and trail improvement had been completed in a number of areas, vegetable gardening was being promoted and clean up and education programmes had been conducted. Planning was well advanced to build a community owned lodge and three micro-hydro power plants. Work was also well advanced on the establishment of a museum an information centre and forest nurseries. Such programmes would be beneficial for eco-tourism throughout Nepal.

## **ii) Non-Timber Forest Products**

The Master Plan for the Forestry Sector (HMGN/ADB/FINNIDA, 1988c) outlined a number of issues related to the use of NTFPs. It called for the establishment of regional herbal centres, for systematic collection, cultivation, and the development of industries based on medicinal and aromatic plants and other minor forest products. It also called for botanical surveys, genetic conservation, and research and development in this sub-sector all of which recommendations are endorsed here. The conservation, development, commercial farming and sustainable utilization of NTFPs has yet to be well established in Nepal. Studies need to be carried out on the sustainable exploitation of the natural resource as government officials are unaware of the exact amount to be extracted from the forests in order to ensure the plant population's regeneration.

For local people and the national economy to benefit from NTFPs more fully:

- DFO staff should be trained in NTFP identification
- the local or in-country processing of NTFPs should be encouraged to increase the value before export rather than the majority of the profits being realised by Indian middle-men and manufacturers
- there should be strict monitoring of collection; making contractors who are granted licences responsible for the use of only sound (non-destructive) harvesting techniques
- studies are needed to determine the maximum sustainable harvests from the wild
- high demand and high value NTFP species need management of the natural resource and the encouragement of commercial farming
- a survey should be carried out to evaluate Nepal's NTFPs resource. The species occurring and the status of the natural resource should be the focus of the study
- all NTFPs should be identified by their scientific name.

### **12.2.6 Forest management**

#### **i) Management of high altitude forests**

Due to their remoteness and size a different model of forest management possibly based on the Joint Forest Management system used in India may be more applicable than community forestry as practised in the Midhills. This style of forest management would be participatory but with the government influencing management prescriptions more than is the case with community forestry.

The impact of forest management on biodiversity is not known. It is strongly suspected however that national forests under community management cannot be a substitute for protected areas in conserving the biodiversity of the Highlands. It is likely that any new Highlands protected areas (Kanchenjunga and Manuslu) will be designated as conservation area. In conservation areas management objectives are very much in line with those promoted in participatory forest management. It is therefore very important that the impact on biodiversity of the main participatory forest management system - community forestry - is monitored and investigated. It is recommended that:

- studies be undertaken to evaluate the impact of community forestry, with all its different management interventions, on biodiversity
- species identification and the impact of forest management on biodiversity are incorporated

- into the ISc, and BSc Forestry syllabi and on in-service courses for DFO staff
- forest management for biodiversity be incorporated into FUG training
- simple systems need to be established for DFO staff to monitor the impact of FUG management on biodiversity
- guidelines should be developed to encourage techniques of forest management - especially utilisation that have the least negative impacts on biodiversity

Studies could for example be undertaken to assess the recovery of the most heavily used Highlands forests - *Abies* forests - under community management. The impact of different techniques of harvesting forest products such as by thinning or by coppicing under different rotation lengths could be looked at. Comparisons could be made between the wildlife populations of: natural undisturbed forest; protected regenerating degraded forest; forests thinned and pruned on a regular rotation; and unmanaged, degrading forest. In particular for the Highlands the impact of these management systems in terms of the slower growth rates and regeneration potential should be studied.

#### **ii) Religious forests**

Religious forests usually managed for protection often provide important refuges for wildlife. An inventory should be made of these across the country and their biological value assessed. If any important clusters or significant areas of religious forest exist - with high conservation values, an overall management plan should be composed to manage these areas for the highly compatible aims of preserving a sacred landscape and conserving biodiversity.

#### **iii) Livestock husbandry**

The biodiversity of the Highlands suffers greatly from unsustainable livestock husbandry. High numbers of often poor condition and low-yielding cattle and goats cause great damage to the fauna and flora of Highlands forests both inside and outside of the PAS. Grazing is allowed by park authorities within the PAS over the monsoon periods for milk and cheese production. The scale of grazing is detrimental to the conservation objectives of the protected areas preventing regeneration of primary plant species and competing with indigenous animals for pasture.

In national forest areas a number of measures can be taken to reduce the negative impact of over-exploitation of the forests and grasslands for livestock raising whilst improving the local people's livelihood. These include:

- adopting stall feeding rather than free grazing
- introducing improved varieties of livestock
- planting fodder trees on farmland.

All of these measures will reduce the impact of livestock raising on the natural forests and grasslands but are most relevant for the conditions in the Midhills. For the Highlands strengthening indigenous management systems and trans-boundary co-operation with the Chinese authorities will be the most effective measure.





### 13. REFERENCES

- Ahlborn and Jackson. (n.d. c.1987). A Survey of Sagarmatha national park for the Endangered Snow Leopard. HMGN/KMTNC, Kathmandu.
- Amatya, K.R. and G. Amatya. 1995. Medicinal Plants in Gorkha District. Pp. 17-24 in: Yadav and Stoian. Proceedings of the Seminar on Medicinal and Aromatic Plants in Gorkha District: how to Promote their Utilisation and Marketing. Gorkha District Forest Office.
- ANSAB. 1995. Business development in the Western Himalaya. ANSAB Newsletter 1995.
- APROSC. 1991. Glossary of Some Important Plants and Animals Names in Nepal. Agriculture Project Service Center, Kathmandu.
- Bajracharya, D.M., Joshi, R.M., Rajbhandari, K.R., Shakya, P.R. and Shrestha, T.B. (1988)-Endemism in Nepalese Flora. Proceedings of National Conference on Science and Technology. RONAST Kathmandu, Nepal.
- Baniya, Bimal K. 1994. NARC - Role of NARC to conserve and use PGR: its structure and functions. Unpublished manuscript.
- Banskota, K., T.B. Shrestha, C. Ramble, K.R. Rajbhandari, H.S. Nepali, and B. Sharma. 1994. An assessment of Northern Gorkha's environmental resources and their role for local community development. Submitted to Gorkha Development Project by Center for Resource and Environmental Studies (CREST), Kathmandu.
- Banerji, M.L. 1963. Outline of Nepal Phytogeography. In: Vegetatio. 11 (5-6): 288-296.
- Barber, I. 1990. Lake Rara National Park Bird Survey. DNPWC, mimeographed manuscript submitted to DNPWC, Kathmandu.
- Basnet, K. 1992. Deforestation as a consequence of firewood demand in Sagarmatha National Park of Khumbu, Nepal. Tribhuvan University Journal. Vol. XV.
- Bauer, J.J. and D. Paudyal. 1988. A Survey on Wildlife and Pastoral Systems in the Hinku-Hongu Valleys, Nepal. Field Document 12. DNPWC/FAO. Kathmandu.
- Bunting, B.W. and R.M. Wright. 1985. Annapurna National Park: the Nepal Plan for joining human values and conservation of a mountain ecosystem. In: McNeely, J.A., Thorsell, J.W., and Chalise, S.R. (Eds.). People and protected areas in the Hindkush-Himalaya. King Mahendra Trust for Nature Conservation and International Centre for Integrated Mountain Development, Kathmandu. Pp. 63-70.
- Bhattarai, S.B., R.B. Bista, and P.R. Shakya, 1987. Conservation and Management of Siwaliks (Churia Range). A Field Report submitted to the Ministry of Forests and Soil Conservation, Kathmandu.
- Bibby et al. 1992. Putting Biodiversity on the map: priority areas for global conservation. ICBP, Cambridge.

Biodiversity Conservation Data Project Team. 1994. Annapurna Conservation Area, Biodiversity Conservation Data Project: Final Report. King Mahendra Trust for Nature Conservation. Nepal.

Biodiversity Profiles Project, 1995a. Biodiversity Profile of the Terai and Siwaliks physiographic zones of Nepal. Biodiversity Profiles Project Publication No. 12. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995b. Biodiversity Profile of the Midhills physiographic zone of Nepal. Biodiversity Profiles Project Publication No. 13. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995c. Enumeration of the Mammals of Nepal. Biodiversity Profiles Project Publication No. 6. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995d. Enumeration of the Reptiles and Amphibians of Nepal. Biodiversity Profiles Project Publication No. 2. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995e. Enumeration of the Fishes of Nepal. Biodiversity Profiles Project Publication No. 10. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995f. Enumeration of the Spiders of Nepal. Biodiversity Profiles Project Publication No.5. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995g. Enumeration of the Lichens of Nepal. Biodiversity Profiles Project Publication No.3. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995h. Enumeration of the Algae of Nepal. Biodiversity Profiles Project Publication No.11. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995i. National Red Data Book of the Fauna of Nepal. Biodiversity Profiles Project Publication No.4. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995j. Biodiversity Assessment of Forest Ecosystems of Western Midhills Nepal. Biodiversity Profiles Project Publication No.7. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995k. Biodiversity Assessment of Forest Ecosystems of Central Midhills Nepal. Biodiversity Profiles Project Publication No.8. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995l. Biodiversity Assessment of Forest Ecosystems of Eastern Midhills Nepal. Biodiversity Profiles Project Publication No. 9. Department of National Parks and Wildlife Conservation, Kathmandu.

-----, 1995n. Investment requirements for Biodiversity Conservation in Nepal. Biodiversity Profiles Project Publication No. 16. Department of National Parks and Wildlife Conservation, Kathmandu.

- Blower, J.H. 1972. Establishment of Khumbu National Park: outline project proposal. HMG/UNDP/FAO Project NEP/72/002, Kathmandu. Unpublished.
- Bolton, M. 1976. Lake Rara National Park Management Plan 1976-81. Project Working Document No. 3. HMG/UNDP/FAO Project FAO NEP/72/002, Kathmandu. 70 pp.
- Borradaile, L.J., Green M.J.B., Moon, L.C., Robinson P.J. and A. Tait. 1977. Langtang National Park Management Plan 1977-82. Field Document No. 7. HMG/UNDP/FAO, Kathmandu.
- Branney, P. and O.P. Dev. 1994. Biodiversity implications of community management of forests in Nepal. Paper presented at regional seminar on Community Development and Conservation of Forest Biodiversity through Community Forestry. NUKCFP, Kathmandu.
- Carpenter, et al. 1995. Report on the Ecology of the Kanchenjunga region of eastern Nepal. Wild lands Studies Program. WWF Nepal Program.
- Caughley, G. 1969. Wildlife and recreation in the Trisuli Watershed and other areas in Nepal. Report no. 6. HMG/UNDP/FAO Trisuli Watershed Development Project, Kathmandu. 54 pp.
- Central Bureau of Statistics. 1994a. Pocket book. Kathmandu.
- , 1994b. Four Monthly Statistical Bulletin. Year 16, volume 52, no, 2.
- Champion, H.G. and S.K. Seth. 1968. A revised survey of forest types of India. Govt. of India Press, Delhi.
- Chhetri, R.B. and T.R. Pandey. 1992. User group forestry in the Far Western Region of Nepal. ICIMOD, Kathmandu.
- Corbet, G. B. 1978. The Mammals of Palaearctic Region. A taxonomic review. British Museum (Natural History), Cornell University Press.
- Corbet, G. B. and J.E. Hill. 1992. The mammals of the Indo-Malayan region. Oxford University.
- Dahal, D.R., Rai and A. Manzanardo. 1977. Land and Migration in Far Western Nepal. CNAS, Kathmandu.
- Dahal, D.R. 1994. A review of forest user groups: case studies from eastern Nepal. ICIMOD, Kathmandu.
- Dasmann, R.F. 1972. A system for defining and classifying natural regions for the purposes of conservation. IUCN Occasional Paper 7: 1-47.
- Department of National Parks and Wildlife Conservation. 1993. 2049/50 Annual Report. DNPWC, Kathmandu.
- , 1994. 2050/51 Annual Report. DNPWC, Kathmandu.

- , 1995. 2051/52 Annual Report. DNPWC, Kathmandu.
- Dinerstein, E. and E.D. Wikramanayake. 1993. Beyond "Hotspots": how to prioritise investments to conserve biodiversity in the Indo-Pacific region. *Conservation Biology* 7,1 pp. 53-65.
- Dixit, A. 1995. Mapping Nepal's Water Resource. *Himal* vol. 8 no.4. p 23.
- Dobremez, J.F. 1970. Biogeographie du centre Nepal. *Bull./ Ass. Geographes* 379-389: 70-90.
- , 1971. Carte ecologique du Nepal: Region Jiri-Thodung, 1:50000. *Doc. Carte Veg Alpes*. 10.
- , 1972a. Les grandes division phytogeographiques du Nepal et l'Himalaya. *Bull. Soc. Bot. Fr.* 119:111-120.
- , 1972b. Carte ecologique du Nepal: Region Kathmandu Everest, 1:250000. Grenoble, France.
- , 1973. Carte ecologique du Nepal: Region Terai, 1:250000. RCP 253 du centre National de la Recherche Scientifique. Grenoble, France.
- , 1975. Le Nepal, ecologique et phytogeomorphique. Centre National de la Recherche Scientifique, Paris.
- , 1978. Carte ecologique du Nepal: Region Dhangardi-API, 1:250000. *Doc. Carte Ecol. XXI, Uni. Sci. Med.* 10., Grenoble, France.
- Dobremez, J.F. and Jest. 1971. Carte ecologique du Nepal: Region Annapurna-Dhaulagiri, 1:250000. *Doc. Carte Veg Alpes*. 9.
- Dobremez, J.F., Joshi, D.P., Bottner, P, Jest, C. and F. Vigny. 1985. Carte ecologique du Nepal: Region Nepalgunj-Butwal, 1:250000. *Cahiers Nepalais Doc. 12.* du centre National de la Recherche Scientifique. Grenoble, France.
- Dobremez, J.F. and P.R. Shakya. 1975. Carte ecologique du Nepal IV: Region Biratnagar - Kanchenjuga. 1:250000. *Doc. Carte Ecol. XVI.* Grenoble, France.
- Dobremez, J.F. and T.B. Shrestha. 1978. Carte ecologique du Nepal: Region Jumla - Siapal 1:250000. RCP 253 du Centre National de la Recherche Scientifique. Grenoble, France.
- Edwards, D.M. 1993. Research into the collection and trade of jaributi from the Middle Hills of Nepal: the Koshi Hills. In: *Focus on Jaributti. Forest Research and Survey Centre, Occasional Paper* 2/93. Kathmandu.
- FAO. 1980. National Parks and Wildlife Conservation. Nepal. Project findings and recommendations. FAO, Rome. 63 pp.

- Forster, J.A. and Lelliott, A.D. 1982. Pipar Wildlife Reserve, Nepal: management proposals. Unpublished. 34 pp.
- Furer-Haimendorf, C. von. 1975. Himalayan Traders. John Murray, London.
- Garrat, K.J. 1981. Sagarmatha National Park Management Plan. HMG/New Zealand Co-operation Project. Department of Lands and Survey, New Zealand.
- Gilmore, D.A. 1991. Trends in forest resources and management in the Middle Mountains of Nepal. Nepal-Australia Community Forestry Project, Kathmandu.
- Gilmore, D.A. and R.J. Fisher. 1991. Villages, Forests and Foresters: the philosophy, process and practice of community forestry in Nepal. Sahayogi Press, Kathmandu.
- Green, M.J.B. 1993. Nature reserves of the Himalaya and the mountains of Central Asia. IUCN.
- Gurung, J.D., editor. 1995. Indigenous Knowledge Systems and Biodiversity Management. Proceedings of a seminar April 13-15, 1995. ICIMOD, Kathmandu.
- Gurung, C.P. 1989. Conservation and Sustainable Development: A case from Annapurna Conservation Area Project in Western Nepal. Proceedings of the International Workshop on the Management Planning of Khunjerab National Park. Pp. 67-78.
- , 1990. People's participation in conservation: Annapurna Conservation Area Project: A case study from Nepal. Proceedings of the International Conference on Conservation of Tropical Biodiversity, Pp 74-85. Malayan Nature Society.
- , 1994. Linking Biodiversity Conservation Community Development: Annapurna Conservation Area Project. approach to protected area management. Regional seminar on Community Development and Conservation of Forest Biodiversity through Community Forestry. Pp. 3-10. Bangkok, Thailand.
- Gurung, C.P., and De Coursey, M. 1994. The Annapurna Region: Mountain agriculture and trekking tourism. The Annapurna Conservation Area Project: a pioneering example of sustainable tourism? In: Ecotourism: A sustainable Option? Edited by E. Cater and G. Lowman. John Wiley.
- Hagen, T. 1960. Koningreich am Himalaya, Bern, Kummerly und Frey.
- Harkonen, E., R. Laamanen, S.S.Paudyal, P.R.Pradhan and S.M. Shrestha. 1995. Woody vegetation of the Central Development Region. Forest Survey Division and Forest Resource Information System Project, Kathmandu.
- Hara, H. 1966. The flora of eastern Himalaya. University of Tokyo, Tokyo, Japan.
- Hara H., Stearn and Williams. 1978-82. An enumeration of the Flowering Plants of Nepal. 3 vols. Trustees of the British Museum (Natural History) London.

Hara, H. and L.H.J. Williams. 1979. An enumeration of the flowering plants of Nepal. Vol 2. British Museum.

Heinen, J.T. and B. Kattel. 1992a. A review of conservation legislation in Nepal: past progress and future needs. *Environmental Management* 16(6): 723-733.

-----, 1992b. Parks, People and Conservation: a review of management issues in Nepal's protected areas. *Population and Environment* 14, 1 pp 49-83.

Heinen, J.T., Kattel, B., and Mehta, J.N. 1988. National park administration and wildlife conservation in Nepal. Draft. 93 pp.

Heinen, J.T. and B. Leisure 1993. A New Look at the Himalayan Fur Trade. *Oryx* 27, 4.

Heinen, J.T and P.B. Yonzon. 1994. A review of conservation issues and programmes in Nepal: from a single species focus toward biodiversity protection. *Mountain Research and development*, Vol 14 (1): 61-76.

Hellmich, W. 1969. Systematische Übersicht über die Insekten-Fresser und Nager Nepals Nebst Bemerkungen zur Tiergeographie. *Khumbu Himal*, Band 3, Lieferung 2. Innsbruck, Munich, West Germany.

Higuchi and Takaki Iwatsuki. 1994. Enumeration of Bryophytes.

Hills Leasehold Forestry and Forage Development Project. Sixth Project Progress Report. Kathmandu

HMG. 1970. Medicinal Plants of Nepal. Bulletin of the Department of Medicinal Plants, # 3, Kathmandu.

-----, 1991a. Eighth Five Year Plan (1992-97). National Planning Commission Secretariat, Kathmandu.

-----, 1991b. The Revised Forestry Sector Policy. Ministry of Forests and Soil Conservation, Kathmandu.

-----, 1993a. Nepal Environmental Policy and Action Plan. Integrating environment and development. Environment Protection Council, Kathmandu.

-----, 1993b. Forest Act, 1993. Nepal Rajapatra 42, 55. Ministry of Law, Justice and Parliamentary Affairs.

-----, 1993c. Nepal Ain Sangraha [Part 7 (b)]. Ministry of Law, Justice and Parliamentary Affairs, Kathmandu.

-----, 1995a. Annual Report (F.Y. 1993/94). Department of Forests, Kathmandu.

-----, 1995b. Forest Rules. Nepal Gazette Vol 54 no. 44. MFSC, Kathmandu.

HMGN/ADB/FINNIDA. 1987. Master Plan for Forestry Sector, Nepal. National Parks and Wildlife Development Plan. Draft for comments. Ministry of Forests and Soil Conservation, Kathmandu. 103 pp.

-----, 1988a. Master Plan for Forestry Sector Nepal, Main Report. Ministry of Forests and Soil Conservation, Kathmandu.

-----, 1988b. Master Plan for Forestry Sector Nepal, Plan for Conservation of Ecosystems and Genetic Resources. Ministry of Forests and Soil Conservation, Kathmandu.

-----, 1988c. Plan for Medicinal and Aromatic Plants and Other Minor Forest Products. MFSC Document, Kathmandu

HMG/HPPCL. 1994. Proceedings of the National Seminar on Non-Timber Forest Products: Medicinal and Aromatic Plants (compiled by J. Pradhan and P. Maharjan). MFSC/HPPCL, Kathmandu

HMGN/IUCN. 1983. National conservation strategy for Nepal: a prospectus. IUCN, Gland Switzerland. 36 pp.

-----, 1988. Building on success. The National Conservation Strategy for Nepal. HMGN National Planning Commission/NCS for Nepal Secretariat, Kathmandu. 179 pp.

HMGN/WWF. 1995. Feasibility Study for the Creation of Kanchenjunga Conservation Area and Project Proposal. Department of National Parks and Wildlife Conservation and WWF Nepal Program, Kathmandu.

HMSO. 1994. Biodiversity. The UK Action Plan. London.

ICIMOD. 1995. Tourism for Local Community Development in Mountain Areas. ICIMOD Newsletter 22.

ICIMOD/MENRIS. 1995. Ecological Legends. Annex to Database of Dobremez's 1:250 000 Ecological Maps. MENRIS, ICIMOD, Kathmandu.

Ingles, A. 1994. The influence of religious beliefs and rituals on forest conservation in Nepal. Nepal-Australia Community Forestry Project, Kathmandu.

Inskipp, C. 1989a. A popular guide to the birds and mammals of the Annapurna Conservation Area. King Mahendra Trust for Nature Conservation, Kathmandu. 54 pp.

-----, 1989b. Nepal's forest birds: their status and conservation. International Council for Bird Preservation Monograph no. 4. 184 pp.

Inskipp, C. and T. Inskipp. 1985. (Second edition 1991). A guide to the birds of Nepal. Christopher Helm, London.



-----, 1994. Birds of Sagarmatha National Park. Mimeographed document submitted to the DNPWC, Kathmandu.

IUCN. 1990. ACA.

IUCN, Nepal. 1994. Safeguarding Wetlands in Nepal. Proceedings of the National Workshop on Wetlands Management in Nepal (3-5 March 1993), (Bhandari, B.T.B. Shrestha and J. McEachern (eds), Kathmandu.

Iwatsuki, K. 1988. An enumeration of the Pteridophytes of Nepal. In: Ohba, H. and Malla, S.B. (eds). The Himalayan Plants Vol. 1. University Museum Tokyo. Bull No. 31, University of Tokyo, Japan.

Jackson, J.K. 1994. Manual of Afforestation in Nepal. 2 vols. Forest Research and Survey Division, Kathmandu.

Jackson, R. and Ahlborn, G. 1986. Himalayan Snow Leopard project. Final progress report: Phase 1. California Institute of Environmental Studies. 17 pp.

-----, 1987. Snow Leopard surveys in Nepal. Sagarmatha (Everest) National Park. Cat News 7: 24-5.

Jackson, R., Nepali H.S. and A.R. Sherpa. 1991. Aspects of Wildlife Protection and Utilisation in the Makalu-Barun Conservation Area. MBCP/DNPWC, Kathmandu.

Jackson, W.L. and A.W. Ingles. 1994. Developing rural communities and conserving the biodiversity of Nepal's forests through community forestry. Paper presented at regional seminar on Community Development and Conservation of Forest Biodiversity through Community Forestry. NACFP, Kathmandu.

Jackson, W.L., M.C. Nurse and R.B. Chhetri. 1993. High altitude forests in the Middle Hills: can they be managed as community forests? Banko Janakari vol.4 no.1.

Joshi, P.L. 1995. Population Scenario in Nepal (UNFPA). The Kathmandu Post, July 11, 1995.

Kanai, H. 1966. Phytogeography of eastern Himalaya, with special reference to the relationship between Himalaya and Japan. In Hara, H.(ed). The Flora of eastern Himalaya: pp. 13-38, Univ. Tokyo Press. Japan.

Karki, M., J.B.S. Karki and N. Karki. 1994. Sustainable management of common forest resources; an evaluation of selected forest user groups in western Nepal. ICIMOD, Kathmandu.

Kattel, B and Adhikari, M.K. 1992. Mosses of Nepal (list and references). Natural History Society of Nepal, Kathmandu, Nepal. 107 p.

Kawakita and Adhikari. 1992.

- Kawakita, J. 1956. Vegetation. In Kihara, H. (ed). Land and Crops of Nepal Himalaya. :1-65. Scientific results of the Japanese expedition to Nepal Himalaya 1952-1953. Kyoto Fauna Flora Research Society, Kyoto University, Japan.
- Kenting. 1986. Land Resource Mapping Project: Summary Report. HMGN/Government of Canada. Kenting Earth Sciences Limited, Kathmandu.
- Kitamura, S. 1955b. Flowering plants and ferns. In: Kihara, H. (ed.), Fauna and flora of Nepal Himalaya. Vol. 1, Kyoto University, Kyoto, Japan. pp. 73-290.
- Kleinn, C. 1994. Forest Resources Inventories in Nepal: Status Quo, Needs, Recommendations. Forest Resource Information System Project. Paper no. 1. Kathmandu.
- Lama, W.B. and A.R. Sherpa. 1995. Tourism Management for the Upper Barun Valley. Makalu-Barun Conservation Project, Report 24. DNPWC/WMI.
- Lemkuhl, R.K., B. Uprety & U.R. Sharma. 1988. National parks and local development: grasses and people in Royal Chitwan National Park, Nepal. Environmental Conservation 15(2): 143-148.
- Lokna, A. 1995. An ecological study of three oak forest sites in Langtang National Park, Nepal. Thesis Candidatus Scientiarum, Botanical institute, University of Bergen, Norway.
- Lovari, S. 1990. Some notes on the Wild Ungulates of the Sagarmatha National park, Khumbu Himal (Nepal). Caprinae News 5 (1): 2-4.
- McEachern, J., S.G. Shah, T.B. Shrestha, B.D. Pande and N.P. Bhusel. 1995. Prospects for tourism in Manaslu. A reconnaissance survey. IUCN Nepal, Kathmandu.
- MacKinnon, J. and K. MacKinnon 1986. Review of the Indo-Malayan Realm. IUCN, Cambridge.
- Maskey, T.M. and H.S. Baral. 1995 An inventory of animals at the Central Zoo, Jawakakhel, Nepal. Unpublished manuscript.
- Malla, S.B. and P.R. Shakya. 1984. Medicinal Plants. In: Nepal's Nature Paradise (ed. T. C. Majupuria), Craftman Press, Bangkok.
- Malla, S.B. *et al.* 1993. Minor Forest Products of Nepal : General Status and Trade. FRIS Project Paper # 4 (1995), Kathmandu.
- McEachern I, S.G. Shah, T.B. Shrestha, B.D. Pande and N.P. Bhusel. 1995. Prospects for Tourism in Manaslu: a reconnaissance study. IUCN Nepal.
- MENRIS/ICIMOD. 1995. Annex to database of Dobremez's ecological maps. ICIMOD/MENRIS, Kathmandu.
- Negi, S.S. 1992. Himalayan Wildlife: habitat and conservation. Indus, New Delhi.
- Ministry of Tourism. 1995. Quoted in McEachern *et al.*, 1995 but source not given in reference list.

Nield, R.S. 1985. Fuelwood and Fodder - problems and policy. Working Paper for Water and Energy Commission Secretariat, Kathmandu.

Nilsson, G. 1983. The endangered species handbook. The Animal Welfare Institute.

Ohashi, H. 1975. Flora of Eastern Himalaya, third report. The University of Tokyo, Japan.

Ohba, H. and Malla, S.B. 1991. The Himalayan Plants I:231-339. The University of Tokyo, Japan.

Olsen, C.S. 1995. Medicinal Plants in Gorkha District: a Brief Introduction to resources, Constraints and Possibilities. Pp. 11-14 in: S.K. Yadav and D. Stoian. Proceedings of the Seminar on Medicinal and Aromatic Plants in Gorkha District: how to Promote their Utilisation and Marketing. Gorkha District Forest Office.

Pande, B.D. 1995. Facilitating tourism, suggested strategies for the Manaslu region. In: NCS Nepal No. 1 (1995): pp 16-17.

Pearce, D. and D. Moran, 1994. The Economic Value of Biodiversity. Earthscan Publication Ltd. London.

Poore, D. (ed.) 1992. Guidelines for Mountain Protected Areas. IUCN, Gland, Switzerland and Cambridge, UK. 56 pp.

Prieme, A. and B. Oksnebjerg. 1994. The avifauna and conservation value of Shey-Phoksundo National Park, Nepal. In: Forktail 10 (1994): 33 - 48.

Rajbhandari K.R. 1994. A bibliography of the plant science of Nepal. Nepal Press.

Roberts, J. 1987. The Machhapuchare Wildlife Conservation Project in Nepal. In: Savage, C.D.W. and Ridley, M.W., Pheasants in Asia 1982. World Pheasant Association, Lower Basildon, UK. Pp. 15-17.

Rodgers, W.A. 1985. Biogeography and protected area planning in India. In: Conserving Asias' Natural Heritage. The planning and management of protected areas in the Indo-Malayan Realm. Proceedings of the 25th Working Session of IUCN's Commission of National Parks, Corbett National Park, India. IUCN, Switzerland.

Scott, D.A. (ed.) 1989. A directory of Asian wetlands. IUCN, Gland, Switzerland and Cambridge, UK. 1, 181, pp.

Schaller, G.B. 1977. Mountain monarchs: wild sheep and goats of the Himalaya. Chicago University Press, Chicago. 425 pp.

Schleich, H.H. 1993. Contribution to the Systematics and to a Bibliography of the Amphibians and Reptiles from Nepal. Journal of the Nepal Research Centre 9 pp. 141-168.

Shakya, K. 1982. Annapurna National Recreation Area, or Rastriya Prakritik Manoranjan Sthal: a proposal. Kathmandu. Unpublished.

- Shakya, P.R. 1975. Three new species of Acanthaceae from Nepal. *J. Jap. Bot.* 50(4):97-103.
- Shakya, P.R. 1983. Chorology of East Nepal Plants in relation to the Adjoining Floristic Region. In Numata (Ed.) *Structure and Dynamics of Vegetation in Eastern Nepal*. Lab. Ecology, Fac. Sc. Chiba University, Japan.
- Sherpa, M.N., Coburn, B. and Gurung, C.P. 1986. Annapurna Conservation Area, Nepal Operation Plan. King Mahendra Trust for Nature Conservation, Kathmandu. 74 pp.
- Shrestha, G.L., R.B. Joshi, G. Amatya and V.M. Shapit. 1994. Domestication and Commercial Cultivation of Medicinal and Aromatic Plants (Maps) in Nepal. In: *National Seminar on Non-timber Forest Products: Medicinal and Aromatic Plants*. HPPCL, Kathmandu.
- Shrestha, T.B. 1974. Gymnosperms of Nepal. *Cahiers Nepalais-documents* No. 3.
- , 1994. Biodiversity Database for the Kingdom of Nepal. IUCN, Kathmandu.
- , 1995. Utilisation of non-timber forest products: medicinal and aromatic plants. In: Pradhan, J., and P. Maharjun. *Proceedings of the National Seminar on Non-Timber Forest Products*. MFSC, HPPCL, Kathmandu.
- Shrestha, T.B., Rajbhandari, K.R., Jackson, R. and Khanal, N.R. 1990. The Makalu-Barun National Park and Conservation Area: Scientific Research Component. His Majesty's Government of Nepal and Woodland Mountain Institute. Mount Everest Ecosystem Conservation Programme. Kathmandu, Nepal.
- Shrestha, T.B. and Joshi, R.M. 1992. Materials for the Plant Red Data Book of Nepal. Unpublished manuscript.
- Shrestha, T.B., L.N. Sherpa, K. Banskota and R.K. Nepali. 1990. The Makalu-Barun National park and Conservation Area Management Plan. DNPWC/WMI, Kathmandu.
- Siwakoti, M. and Verma, S.K. 1994. Additions to the flora of Nepal - 1. *J. Econ. Tax. Bot.* 18(2): 491-494.
- Smith, C.P. 1994. Butterflies of Nepal. TecPress Service, Bangkok.
- Stainton, J.D.A. 1972. *Forests of Nepal*. John Murray, London. 181 pp.
- Stearn, W.T. 1960. Allium and Milula in the central and eastern himalaya. *Bull. Brit. Mus. (Nat. Hist.) Bot.* 2(6): 161-191.
- Stoian, D. and S.K. Yadav. 1995. Medicinal Plants and Community Forestry in Gorkha District Pp 2-10 in Yadav and Stoian (eds); *Proceedings of the Seminar on Medicinal and Aromatic Plants in Gorkha District: how to Promote their Utilisation and Marketing*. Gorkha District Forest Office.
- Subedi, S. 1995. A National Forest for the National Flower. *Himal*, September/October 1995 pp 20-22.

Talbot, K. and S. Khadka. 1994. "Handing it Over": an Analysis of the Legal and Policy Framework of Community Forestry in Nepal. World Resources Institute, Washington D.C., USA.

Thagunna, S.S. 1995. The role of Buffer zones on protected area: A review and synthesis of the case for Nepal. MSc thesis, Lincoln University, New Zealand.

The Mountain Institute/IUCN. 1995. Applied Databases for Intergrated Biodiversity Conservation in Nepal. Users Manual. WMI/IUCN, Kathmandu.

The Mountain Institute and IUCN/Nepal. 1995. Applied Database for Integrated Biodiversity Conservation in Nepal. Biodiversity of Makalu Barun National Park and Conservation Area (Sisuwa and Sankhuwa Valley).

Timmerman, C. and E.R.P. Platje. 1987. Environmental Impact assessment of the Energy Requirements of the Cheese Factory in Kyangjin (Langtang National Park). DNPWC.

Touche Ross. 1990. Nepal Tourism Development Programme. Final Report Main Volume. Asian Development Bank, Ministry of Tourism, Nepal.

Udvardy, M.D.F. 1975. A classification of biogeographical provinces of the world. IUCN Occasional Paper 18:1-48.

UNDP. 1993. Earth Summit - Agenda 21, The United Nations Program of Action from Rio. United Nations Department of Public Information, NY.

-----, 1994. Parks and People Project Document. UNDP/HMG of Nepal.

Upreti, B.K. 1982. Vegetation Distribution of the Kathmandu Valley. Science Universe, Vol 2; 1 and 2, Kathmandu.

Wegge, P. 1976. Himalayan Shikar Reserves; surveys and management proposals. Field Document no. 5. FAO/NEP/72/002 Project. Kathmandu. 96 pp.

Wells, M.P. 1991. Conserving Biological Diversity in Nepal: the Social, Economic and Institutional Issues. Draft. World Bank Policy and Research Division.

Wells, M.P. 1993. Neglect of Biological Riches: the Economics of Nature Tourism in Nepal. Biodiversity and Conservation 2, pp. 445-464.

Wells, P.M. and Brandon, K. and Hannan, L. 1992. People and Parks: Linking protected are management with local communities. The World Bank. The World Wildlife Fund. US. Agency for international development, Washington, D.C., USA.

Wells, P.M. and Brandon, E.K. 1993. The principle and practice of Buffer zones and local participation in Biodiversity Conservation, AMBIO: A journal of the human environment. The Royal Swedish Academy of sciences. Vol. 22 (2-3). pp. 157-162.

Whitehead, I. 1993. Focus on Pharak: Fuelling the Roof of the World. Woodpecker 2, pp. 14-16.

VSO, Kathmandu.

Whitmore, T.C. 1975. Tropical Rainforests of the Far East. Claredon Press, Oxford.

Wilson 1976

Woodlands Mountain Institute/IUCN. 1994. Biodiversity of Koshi Tappu Wildlife Reserve and its Adjacent Areas. Applied Databases for Intergrated Biodiversity Conservation in Nepal. WMI/IUCN, Kathmandu.

World Conservation Monitoring Centre. 1992. Global Biodiversity, Status of the Earth's Living Resources. A contribution to the Global Biodiversity Strategy. Chapman & Hall, London. xx + 594 pp.

WWF/DNPWC. 1995. Report on the feasibility study for the creation of Kanchenjunga Conservation Area. Pp. 4-40.

Yonzon, P. 1993. Jaributi exploitation from Langtang National Park. Focus on Jaributi. FRSC occasional paper 2/93. Pp. 10-11.

n.d. The 1990 Wildlife Survey of Shey Phoksundo National Park, Dolpo, West Nepal. NCRTC, KMTNC, Kathmandu.

Yonzon P.B. and Hunter M.L., 1991. Cheese, tourists and Red Pandas in the Nepal himalayas. Conservation Biology 5: 196-202.

Yonzon, P., R. Jones and J. Fox. 1991. Geographic Information System for Assessing Habitat and Estimating Population of Red Pandas in Langtang National Park, Nepal. In: Ambio Vol. 20, No. 7 285-288.

Young, A. 1989. Agroforestry for soil conservation. CAB International, Oxon, UK.



## **Appendix 4-1**

---

**Ecosystems found in Nepal by  
physiographic zone**





## Highlands physiographic zone ecosystems

### NIVAL LEVEL

1000                      Glaciers, snow, rock                      > 4800 m

### ALPINE LEVEL

#### Upper alpine level

2101	Alpine meadows with <i>Graminae</i> and <i>Cyperaceae</i>	4000-4800 m
2102	Xerophytic mat patches and scarcely vegetated rocks and screes	
2103	Mesophytic mat patches and scarcely vegetated rocks and screes	
2104	Mesophytic and hydrophytic mat patches and scarcely vegetated rocks ...	
2105	Alpine meadows on the southern side of the Himalaya	
2106	Dry alpine vegetation on the northern side of Himalaya	
2107	High altitude discontinuous vegetation cushion plants	
2108	Meadows; mat patches	
2109	Scarcely vegetated rocks and screes of upper alpine level	
2110	Meadows <i>et lande communes aux deux sous etages</i>	

#### Lower alpine level

2201	Rhododendron mesohygrophytic scrublands, <i>Juniperus</i> ..., meadows	3800-4300 m
2202	Rhododendron mesohygrophytic scrublands ( <i>R.anthropogon</i> , <i>R.nivale</i> ...)	
2203	Juniper mesohygrophytic scrublands ( <i>J.indica</i> , <i>J. recurva</i> , <i>J.squamata</i> )	
2204	Xerophytic closed alpine mat and scrub	
2205	Mesophytic closed alpine mat and scrub	
2206	Shrublands with patches of abundant <i>Rhododendron anthropogon</i> , <i>R.nivale</i> ...	

### SUB-ALPINE LEVEL

#### Upper sub-alpine level Western biogeographical region

3101	Mesophytic closed sub-alpine mat & scrub ( <i>R.anthropogon</i> ...)	3300-3800 m
3102	Rhododendron-Birch forest ( <i>Betula utilis</i> , <i>R.campanulatum</i> )	3300-3700 m
3103	Birch-Blue Pine open forest	

#### Upper sub-alpine level Central Nepalese biogeographical region

3110                      North Himalayan alpine vegetation

#### Upper sub-alpine level Eastern Nepalese biogeographical region

3120	<i>Betula utilis</i> forest with Rhododendron ... & <i>Abies spectabilis</i>	3200-3900 m
3121	Rhododendron shrublands	3300-3900 m
3122	Rhododendron-Juniper shrublands	3600-3900 m

### **Lower sub-alpine level West Nepalese biogeographic region**

3201	Mesophytic Fir forest with oak and rhododendron	2900-3400 m
3202	Hygrophytic Fir-Hemlock-Oak forest	2800-3300 m
3203	Fir forest ( <i>Abies spectabilis</i> )	

### **Lower sub-alpine Eastern Nepalese biogeographic region**

3220	<i>Abies spectabilis</i> forest with rhododendron	2900-3600 m
3221	<i>Larix griffithiana</i> forest	2900-3600 m
3222	<i>Larix griffithiana</i> , <i>L. potanini</i> forest	
3223	<i>Larix potanini</i> forest	

## **STEPPIC FORMATIONS**

### **North-West Nepalese biogeographic region**

8001	High altitude cushion plant formation
8002	<i>Caragana versicolor</i> , <i>Lonicera spinosa</i> steppe
8003	<i>Caragana gerardiana</i> , <i>Lonicera spinosa</i> xerophile steppe
8004	<i>Caragana brevispina</i> , <i>Artemisia</i> steppe
8005	<i>Caragana pygmaea</i> , <i>Lonicera spinosa</i> xerophile steppe
8006	<i>Myricaria-Hippophae-Salix</i> riverain thickets
8007	<i>Sophora moorcroftiana</i> , <i>Oxytropis mollis</i> steppe

## **OTHER**

9900	Water bodies
------	--------------

**Number of Highlands ecosystems**      38 (+ water bodies - 9900)

## Midhills Physiographic Zone ecosystems

### MONTANE LEVEL

#### Montane West Nepalese biogeographic region

4001	Mesophytic montane Oak-Rhododendron forest	2450-2900 m
4002	Mixed Blue Pine-Oak forest	2500-3000 m
4003	Mixed hygrophytic Oak-Hemlock-Fir forest	2400-2900 m
4004	Open and dry montane Blue Pine forest	
4005	Blue Pine-Spruce forest	
4006	Juniper forest ( <i>Juniperus indica</i> )	
4007	Rhododendron-Hemlock-Oak forest	
4008	Hemlock forest ( <i>Tsuga dumosa</i> )	
4009	Mountain Oak forest ( <i>Quercus semecarpifolia</i> )	
4010	Blue Pine-Spruce-Fir forest	
4011	Spruce mountain forest ( <i>Picea smithiana</i> )	

#### Montane Eastern Nepalese Biogeographic Region

4020	<i>Lithocarpus pachyphylla</i> forest	2400-2900 m
4021	<i>Rhododendron cinnamomeum</i> forest	2400-2900 m
4022	Deciduous mixed broad-leaved forest	2400-2900 m
4023	Mixed broadleaved forest, <i>Rhododendron-Acer-Symplocus-Lauraceae</i>	2400-2900 m
4024	<i>Daphniphyllum himalayense</i> forest with a few <i>Rhododendron grande</i>	2100-2900 m

### COLLINEAN LEVEL

#### Collinean West Nepalese Biogeographic Region

5000	Blue Pine-Cypress forest	
5001	Cypress forest with dwarf Barberry	2300-2700 m
5002	Collinean Oak forest ( <i>Quercus leucotrichophora</i> , <i>Q. lanata</i> )	1850-2400 m
5003	Mixed Blue Pine-Oak forest *	2000-2500 m
5004	Mixed Oaks-Laurels forest with shrubs	1800-2500 m
5005	Mixed hygrophytic broadleaved forest with oaks	1500-2500 m
5006	Cedar forest ( <i>Cedrus deodara</i> )	
5007	Open Blue Pine forest ( <i>Pinus wallichiana</i> )	
5008	Collinean Oak-mixed broadleaved forest ( <i>Q. lanata</i> )	
5009	<i>Aesculus</i> , <i>Juglans</i> riverain forest	
5010	Deciduous broadleaved forest ( <i>Alnus</i> , <i>Juglans</i> , <i>Acer</i> )	

#### Collinean Central Nepalese biogeographic region

5011	Hygrophytic <i>Quercus lamellosa</i> forest	
------	---	--

#### Collinean Eastern Nepalese biogeographic region

5012	Hygrophytic forest with <i>Quercus lamellosa</i>	1800-2400 m
5013	Hygrophytic forest with <i>Castanopsis tribuloides</i>	
5014	Mesohygrophytic forest with <i>Quercus glauca</i>	
5015	Mesohygrophytic forest with <i>Quercus lanata</i> , <i>Pinus excelsa</i>	

## SUB-TROPICAL LEVEL

### **Sub-tropical Eastern Nepalese biogeographic region**

6001            *Eugenia tetragona*, *Ostodes paniculata* forest            900-1700 m

### **Upper Sub-tropical West Nepalese biogeographic region**

6101            Mixed Chir-Pine-Oak forest (*Pinus roxburghii*, *Q.leucotrichophora*)    1400-1900 m

6102            *Quercus glauca*, *Alnus nepalensis*, *Betula alnoides* riverain forest    1400-1800 m

6103            Open *Olea cuspidata* forest

6105            Sub-tropical mixed broadleaved forest

6106            *Quercus incana*, *Schima wallichii* forest

### **Upper Sub-tropical Central Nepalese biogeographic region**

6109            Hygrophytic *Schima wallichii*, *Castanopsis tribuloides* forest

### **Upper Sub-tropical Eastern Nepalese biogeographic region**

6110            *Castanopsis tribuloides* forest with *Schima wallichii* ...            1400-1900 m

6120            *Castanopsis hystrix* forest with *C.tribuloides* ...            1400-1900 m

6121            *Alnus nepalensis* forest            1200-2400 m

### **Upper and Lower Sub-tropical West Nepalese biogeographic region**

6201            Chir-Pine forest with grasses and *Engelhardtia*            900-1900 m

6202            Mixed Chir Pine-Broadleaved forest            900-1400 m

6203            *Alnus nepalensis* riverain forest            800-2000 m

6204            *Euphorbia royleana* steppe in inner valleys

6207            Grasses-*Artemisia* steppe

### **Upper and Lower Sub-tropical Central Nepalese biogeographic region**

6210            Hygrophytic *Schima wallichii* forest

### **Upper and Lower Sub-tropical Eastern Nepalese biogeographic region**

6220            *Schima wallichii*, *Castanopsis indica* hygrophile forest            900-1400 m

6221            *Schima wallichii*, *Pinus roxburghii* mesohygrophile forest

6222            *Pinus roxburghii* xerophile forest with *Phyllanthus emblica*

6223            *Schima wallichii*, *Lagerstoemia parviflora* hygrophile forest

## OTHER

9003            Pokhara cultivated areas

9900            Water bodies

**Number of Midhills ecosystems            52 (+ water bodies & cultivated areas - types 9003, 9900)**

## Siwaliks physiographic zone ecosystems

### SUB-TROPICAL LEVEL

#### **Upper sub-tropical Western Nepalese biogeographic region**

6104 Upper Siwalik Chir Pine-Oak forest

#### **Upper and lower sub-tropical Western Nepalese biogeographic region**

6205 Siwaliks Chir-Pine forest

6206 *Alnus nitida* riverain forest

### TROPICAL LEVEL

#### **Upper tropical West Nepalese biogeographic region**

7101	Tropical hill Sal forest in large valleys	450-1000 m
7102	Tropical riverain forest ( <i>Albizia lebbek</i> , <i>Toona ciliata</i> ...)	450-1000 m
7103	Sal forest in inner valleys ( <i>Shorea robusta</i> , <i>Terminalia tomentosa</i> )	600-1000 m
7104	Mesophytic tropical forest on southern slopes of the Siwaliks	350-900 m
7105	Hygrophytic tropical forest on northern slopes of the Siwaliks	350-900 m
7106	Siwalik tropical deciduous forest	

#### **Upper tropical East Nepalese biogeographic region**

7120	Tropical hill Sal forest	350-900 m
7122	Dense forest with <i>Shorea robusta</i> , <i>Lagerstroemia parviflora</i> ...	
7123	Dense forest with <i>Terminalia tomentosa</i> , <i>T. belerica</i> ...	

#### **Lower tropical level West Nepalese biogeographical region**

7204 Dun valleys Sal forest

### OTHER

9001 Dun cultivated areas

**Number of Siwaliks ecosystems**      13 (+ cultivated areas - code 9001)

## Terai Physiographic zone ecosystems

### TROPICAL LEVEL

#### Upper tropical Eastern Nepalese Biogeographic Region

- |      |                                      |
|------|--------------------------------------|
| 7121 | Tropical riverain forest             |
| 7124 | Sal forest ( <i>Shorea robusta</i> ) |

#### Lower tropical Western Nepalese biogeographical region

- |      |  |           |
|------|--|-----------|
| 7201 | Terai tropical Sal forest ( <i>Shorea robusta</i> , <i>Terminalia tomentosa</i> ...) |           |
| 7202 | Khair-Sissoo riverain forest   | 150-350 m |
| 7203 | <i>Samalia malabarica</i> , <i>Trewia nudiflora</i> riverain forest                  |           |
| 7205 | Bhabaar light Sal forest   |           |
| 7206 | Pseudo steppe with <i>Graminae</i> , Tropical elephant grasses                       | 75-300 m  |

#### Lower tropical Eastern Nepalese biogeographical region

- |      |  |           |
|------|--|-----------|
| 7220 | Terai tropical Sal forest                        | 150-350 m |
| 7221 | Tropical mixed wet forest                        | 300-450 m |
| 7222 | Tropical dense forest with <i>Terminalia</i> sp. |           |

### OTHER

- |      |                        |
|------|------------------------|
| 9000 | Cultivated areas ....  |
| 9002 | Terai cultivated areas |
| 9900 | Water bodies           |

**Number of Terai ecosystems** 10 (+ water bodies & cultivated areas - codes 9000, 9002, 9900)

## **Appendix 4-2**

---

### **Vascular plants recorded in the Highlands**





APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL

Flowering Plants Report (Qualitative)

Taxonomy: All species  
Area: Nivale

Number of Species : 216

Family	Scientific Name
AMARYLLIDACEAE	Allium carolinianum
AMARYLLIDACEAE	Allium hypsistum
BIGNONIACEAE	Incarvillea younghusbandii
BORAGINACEAE	Chionocharis hookeri
BORAGINACEAE	Eritrichium minimum
BORAGINACEAE	Lasiocaryum munroi
BORAGINACEAE	Microula tibetica
BORAGINACEAE	Trigonotis rotundifolia
CAMPANULACEAE	Campanula modesta
CAMPANULACEAE	Codonopsis bhutanica
CAMPANULACEAE	Cyananthus spathulifolius
CARYOPHYLLACEAE	Arenaria bryophylla
CARYOPHYLLACEAE	Arenaria edgeworthiana
CARYOPHYLLACEAE	Arenaria glanduligera
CARYOPHYLLACEAE	Arenaria paramelanandra
CARYOPHYLLACEAE	Arenaria polytrichoides
CARYOPHYLLACEAE	Minuartia kashmirica
CARYOPHYLLACEAE	Silene gonosperma
CARYOPHYLLACEAE	Silene helleboriflora
CARYOPHYLLACEAE	Thylacospermum caespitosum
COMPOSITAE	Anaphalis triplinervis
COMPOSITAE	Artemisia roxburghiana
COMPOSITAE	Aster himalaicus
COMPOSITAE	Cremanthodium ellisii
COMPOSITAE	Cremanthodium nanum
COMPOSITAE	Leontopodium himalayanum
COMPOSITAE	Leontopodium monocephalum
COMPOSITAE	Saussurea gnaphalodes
COMPOSITAE	Saussurea gossypiphora
COMPOSITAE	Saussurea graminifolia
COMPOSITAE	Saussurea leontodontoides
COMPOSITAE	Saussurea namikawae
COMPOSITAE	Saussurea simpsoniana
COMPOSITAE	Saussurea spicata
COMPOSITAE	Saussurea taraxacifolia
COMPOSITAE	Saussurea tridactyla
COMPOSITAE	Saussurea werneroides
COMPOSITAE	Soroseris gillii
COMPOSITAE	Soroseris hookeriana
COMPOSITAE	Tanacetum gossypinum
COMPOSITAE	Waldheimia glabra
COMPOSITAE	Waldheimia nivea
CRASSULACEAE	Rhodiola bupleuroides
CRASSULACEAE	Rhodiola crenulata
CRASSULACEAE	Rhodiola fastigiata
CRASSULACEAE	Rhodiola imbricata
CRASSULACEAE	Sedum oreades
CRUCIFERAE	Braya oxycarpa

CRUCIFERAE	Cardamine loxostemonoides
CRUCIFERAE	Desideria nepalensis
CRUCIFERAE	Dilophia salsa
CRUCIFERAE	Draba affghanica
CRUCIFERAE	Draba ellipsoidea
CRUCIFERAE	Draba glomerata
CRUCIFERAE	Draba oreades
CRUCIFERAE	Ermania himalayensis
CRUCIFERAE	Ermania linearis
CRUCIFERAE	Ermaniopsis pumila
CRUCIFERAE	Eutrema heterophyllum
CRUCIFERAE	Lepidium capitatum
CRUCIFERAE	Staintoniella nepalensis
CRUCIFERAE	Thlaspi cochlearioides
CYPERACEAE	Carex atrofusca
CYPERACEAE	Carex cruenta
CYPERACEAE	Carex melanantha
CYPERACEAE	Carex supina
CYPERACEAE	Kobresia caricina
CYPERACEAE	Kobresia deasyi
CYPERACEAE	Kobresia duthiei
CYPERACEAE	Kobresia nitens
CYPERACEAE	Kobresia pygmaea
CYPERACEAE	Kobresia seticulmis
EPHEDRACEAE	Ephedra gerardiana
ERICACEAE	Rhododendron nivale
ERICACEAE	Rhododendron setosum
GENTIANACEAE	Gentiana algida
GENTIANACEAE	Gentiana infelix
GENTIANACEAE	Gentiana ornata
GENTIANACEAE	Gentiana pentasticta
GENTIANACEAE	Gentiana phyllocalyx
GENTIANACEAE	Gentiana prolata
GENTIANACEAE	Gentiana tubiflora
GENTIANACEAE	Gentiana venusta
GENTIANACEAE	Gentianella falcata
GENTIANACEAE	Gentianella moorcroftiana
GENTIANACEAE	Swertia acaulis
GENTIANACEAE	Swertia petiolata
GRAMINEAE	Deyeuxia nivicola
GRAMINEAE	Festuca ovina
GRAMINEAE	Poa arnoldii
GRAMINEAE	Poa calliopsis
GRAMINEAE	Poa kanaii
GRAMINEAE	Poa pagophila
GRAMINEAE	Poa polycolea
GRAMINEAE	Poa poophagorum
GRAMINEAE	Trisetum spicatum
JUNCACEAE	Juncus concinnus
JUNCACEAE	Juncus grisebachii
JUNCACEAE	Juncus himalensis
JUNCACEAE	Juncus leucomelas
JUNCACEAE	Juncus sphacelatus
JUNCACEAE	Juncus thomsonii
LABIATAE	Ajuga bracteosa
LABIATAE	Dracocephalum heterophyllum
LABIATAE	Eriophyton wallichii
LABIATAE	Glechoma nivalis
LABIATAE	Nepeta coerulescens
LABIATAE	Nepeta lamiopsis
LEGUMINOSAE	Astragalus melanostachys
LEGUMINOSAE	Astragalus yunnanensis
LEGUMINOSAE	Chesneya nubigena
LEGUMINOSAE	Oxytropis fasciculiflorum

LEGUMINOSAE	Stracheya tibetica
LILIACEAE	Lilium oxypetalum
PAPAVERACEAE	Corydalis cashmeriana
PAPAVERACEAE	Corydalis flaccida
PAPAVERACEAE	Corydalis gerdae
PAPAVERACEAE	Corydalis hendersonii
PAPAVERACEAE	Corydalis latiflora
PAPAVERACEAE	Corydalis meifolia
PAPAVERACEAE	Corydalis nana
PAPAVERACEAE	Corydalis stricta
PAPAVERACEAE	Meconopsis bella
PAPAVERACEAE	Meconopsis dhwojii
PAPAVERACEAE	Meconopsis grandis
PAPAVERACEAE	Meconopsis horridula
PAPAVERACEAE	Meconopsis napaulensis
PAPAVERACEAE	Meconopsis simplicifolia
POLYGONACEAE	Aconogonum tortuosum
PRIMULACEAE	Androsace delavayi
PRIMULACEAE	Androsace lehmannii
PRIMULACEAE	Androsace muscoidea
PRIMULACEAE	Androsace tapete
PRIMULACEAE	Androsace zambalensis
PRIMULACEAE	Primula buryana
PRIMULACEAE	Primula caveana
PRIMULACEAE	Primula concinna
PRIMULACEAE	Primula gambeliana
PRIMULACEAE	Primula glandulifera
PRIMULACEAE	Primula glomerata
PRIMULACEAE	Primula macrophylla
PRIMULACEAE	Primula minutissima
PRIMULACEAE	Primula poluninii
PRIMULACEAE	Primula ramzanae
PRIMULACEAE	Primula reptans
PRIMULACEAE	Primula tenuiloba
PRIMULACEAE	Primula wigramiana
RANUNCULACEAE	Aconitum nepalense
RANUNCULACEAE	Anemone demissa
RANUNCULACEAE	Anemone geum
RANUNCULACEAE	Caltha scaposa
RANUNCULACEAE	Delphinium brunonianum
RANUNCULACEAE	Delphinium caeruleum
RANUNCULACEAE	Delphinium densiflorum
RANUNCULACEAE	Delphinium drepanocentrum
RANUNCULACEAE	Delphinium nepalense
RANUNCULACEAE	Delphinium viscosum
RANUNCULACEAE	Ranunculus hirtellus
RANUNCULACEAE	Ranunculus oreionannos
RANUNCULACEAE	Ranunculus pulchellus
RANUNCULACEAE	Thalictrum glareosum
RANUNCULACEAE	Trollius pumilus
ROSACEAE	Cotoneaster microphyllus
ROSACEAE	Potentilla biflora
ROSACEAE	Potentilla bifurca
ROSACEAE	Potentilla coriandrifolia
ROSACEAE	Potentilla eriocarpa
ROSACEAE	Potentilla fructicosa
ROSACEAE	Potentilla microphylla
ROSACEAE	Sibbaldia purpurea
ROSACEAE	Sibbaldia tetrandra
SALICACEAE	Salix sclerophylla
SALICACEAE	Salix sericocarpa
SAXIFRAGACEAE	Chrysosplenium carnosum
SAXIFRAGACEAE	Saxifraga andersonii
SAXIFRAGACEAE	Saxifraga aristulata

SAXIFRAGACEAE	Saxifraga brunonis
SAXIFRAGACEAE	Saxifraga consanguinea
SAXIFRAGACEAE	Saxifraga cordigera
SAXIFRAGACEAE	Saxifraga gageana
SAXIFRAGACEAE	Saxifraga georgei
SAXIFRAGACEAE	Saxifraga glabricaulis
SAXIFRAGACEAE	Saxifraga hemisphaerica
SAXIFRAGACEAE	Saxifraga hypostoma
SAXIFRAGACEAE	Saxifraga jacquemontiana
SAXIFRAGACEAE	Saxifraga llonakhensis
SAXIFRAGACEAE	Saxifraga lychnitis
SAXIFRAGACEAE	Saxifraga microphylla
SAXIFRAGACEAE	Saxifraga neopropagulifera
SAXIFRAGACEAE	Saxifraga perpusilla
SAXIFRAGACEAE	Saxifraga pseudo-pallida
SAXIFRAGACEAE	Saxifraga pulvinaria
SAXIFRAGACEAE	Saxifraga punctulata
SAXIFRAGACEAE	Saxifraga saginoides
SAXIFRAGACEAE	Saxifraga sikkimensis
SAXIFRAGACEAE	Saxifraga stella-aurea
SAXIFRAGACEAE	Saxifraga stenophylla
SAXIFRAGACEAE	Saxifraga tangutica
SCROPHULARIACEAE	Lagotis kunawurensis
SCROPHULARIACEAE	Lagotis nepalensis
SCROPHULARIACEAE	Oreosolen wattii
SCROPHULARIACEAE	Oreosolen williamsii
SCROPHULARIACEAE	Pedicularis globifera
SCROPHULARIACEAE	Pedicularis muscoides
SCROPHULARIACEAE	Pedicularis nana
SCROPHULARIACEAE	Pedicularis oederi
SCROPHULARIACEAE	Pedicularis roylei
SCROPHULARIACEAE	Pedicularis sectifolia
SCROPHULARIACEAE	Pedicularis trichoglossa
SCROPHULARIACEAE	Pedicularis yalungensis
SCROPHULARIACEAE	Veronica emodi
SCROPHULARIACEAE	Veronica lanuginosa
UMBELLIFERAE	Carum carvi
UMBELLIFERAE	Cortiella hookeri
UMBELLIFERAE	Pleurospermum hookeri
URTICACEAE	Urtica hyperborea

APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL

Flowering Plants Report (Qualitative)

Taxonomy: All species  
Area: Sub-Alpine

Number of Species : 1367

Family	Scientific Name
ACANTHACEAE	Aechmanthera claudiae
ACANTHACEAE	Pteracanthus alatus
ACANTHACEAE	Pteracanthus lachenensis
ACANTHACEAE	Strobilanthes atropurpureus
ACANTHACEAE	Strobilanthes thomsonii
ACERACEAE	Acer acuminatum
ACERACEAE	Acer campbellii
ACERACEAE	Acer caudatum
ACERACEAE	Acer pectinatum
ACERACEAE	Acer sterculiaceum
AMARYLLIDACEAE	Allium przewalskianum
AQUIFOLIACEAE	Ilex intricata
AQUIFOLIACEAE	Ilex sikkimensis
ARACEAE	Arisaema flavum
ARACEAE	Arisaema griffithii
ARACEAE	Arisaema intermedium
ARACEAE	Arisaema jacquemontii
ARACEAE	Arisaema ostiolatum
ARACEAE	Arisaema propinquum
ARACEAE	Arisaema speciosum
ARACEAE	Arisaema utile
ARACEAE	Arisaema vexillatum
ARALIACEAE	Acanthopanax cissifolius
ARALIACEAE	Brassaiopsis alpina
ARALIACEAE	Gamblea ciliata
ARALIACEAE	Hedera nepalensis
ARALIACEAE	Pentapanax leschenaultii
ARALIACEAE	Schefflera impressa
ARISTOLOCHIACEAE	Asarum himalaicum
ASCLEPIADACEAE	Ceropegia hookeri
ASCLEPIADACEAE	Cynanchum auriculatum
ASCLEPIADACEAE	Riocreuxia nepalensis
ASCLEPIADACEAE	Treutlera insignis
ASCLEPIADACEAE	Vincetoxicum hirundinaria
BALANOPHORACEAE	Balanophora involucrata
BALSAMINACEAE	Impatiens amplexicaulis
BALSAMINACEAE	Impatiens falcifer
BALSAMINACEAE	Impatiens glandulifera
BALSAMINACEAE	Impatiens hobsonii
BALSAMINACEAE	Impatiens kharensis
BALSAMINACEAE	Impatiens laxiflora
BALSAMINACEAE	Impatiens occultans
BALSAMINACEAE	Impatiens racemosa
BALSAMINACEAE	Impatiens radiata
BALSAMINACEAE	Impatiens scabrida
BALSAMINACEAE	Impatiens serrata
BALSAMINACEAE	Impatiens sunkoshiensis
BALSAMINACEAE	Impatiens urticifolia

BALSAMINACEAE	<i>Impatiens williamsii</i>
BERBERIDACEAE	<i>Berberis angulosa</i>
BERBERIDACEAE	<i>Berberis aristata</i>
BERBERIDACEAE	<i>Berberis ceratophylla</i>
BERBERIDACEAE	<i>Berberis chitria</i>
BERBERIDACEAE	<i>Berberis edgeworthiana</i>
BERBERIDACEAE	<i>Berberis erythroclada</i>
BERBERIDACEAE	<i>Berberis everestiana</i>
BERBERIDACEAE	<i>Berberis hookeri</i>
BERBERIDACEAE	<i>Berberis insignis</i>
BERBERIDACEAE	<i>Berberis jaeschkeana</i>
BERBERIDACEAE	<i>Berberis koehneana</i>
BERBERIDACEAE	<i>Berberis kumaonensis</i>
BERBERIDACEAE	<i>Berberis parisepala</i>
BERBERIDACEAE	<i>Berberis petiolaris</i>
BERBERIDACEAE	<i>Berberis tsarica</i>
BERBERIDACEAE	<i>Berberis wallichiana</i>
BIGNONIACEAE	<i>Incarvillea arguta</i>
BORAGINACEAE	<i>Anchusa ovata</i>
BORAGINACEAE	<i>Arnebia benthamii</i>
BORAGINACEAE	<i>Arnebia euchroma</i>
BORAGINACEAE	<i>Asperugo procumbens</i>
BORAGINACEAE	<i>Cynoglossum glochidiatum</i>
BORAGINACEAE	<i>Cynoglossum lanceolatum</i>
BORAGINACEAE	<i>Cynoglossum wallichii</i>
BORAGINACEAE	<i>Eritrichium canum</i>
BORAGINACEAE	<i>Eritrichium thomsonii</i>
BORAGINACEAE	<i>Lappula microcarpa</i>
BORAGINACEAE	<i>Lasiocaryum diffusum</i>
BORAGINACEAE	<i>Lasiocaryum munroi</i>
BORAGINACEAE	<i>Lindelofia longiflora</i>
BORAGINACEAE	<i>Maharanga egregia</i>
BORAGINACEAE	<i>Maharanga wallichiana</i>
BORAGINACEAE	<i>Microula pustulosa</i>
BORAGINACEAE	<i>Microula sikkimensis</i>
BORAGINACEAE	<i>Myosotis alpestris</i>
BORAGINACEAE	<i>Myosotis silvatica</i>
BORAGINACEAE	<i>Onosma bracteatum</i>
BORAGINACEAE	<i>Trigonotis multicaulis</i>
BORAGINACEAE	<i>Trigonotis ovalifolia</i>
BORAGINACEAE	<i>Trigonotis rotundifolia</i>
BORAGINACEAE	<i>Trigonotis tibetica</i>
BUXACEAE	<i>Sarcococca hookeriana</i>
CAMPANULACEAE	<i>Campanula aristata</i>
CAMPANULACEAE	<i>Campanula cana</i>
CAMPANULACEAE	<i>Campanula latifolia</i>
CAMPANULACEAE	<i>Campanula modesta</i>
CAMPANULACEAE	<i>Codonopsis benthamii</i>
CAMPANULACEAE	<i>Codonopsis dicentrifolia</i>
CAMPANULACEAE	<i>Codonopsis nepalensis</i>
CAMPANULACEAE	<i>Codonopsis rotundifolia</i>
CAMPANULACEAE	<i>Codonopsis subsimplex</i>
CAMPANULACEAE	<i>Codonopsis thalictrifolia</i>
CAMPANULACEAE	<i>Cyananthus cordifolius</i>
CAMPANULACEAE	<i>Cyananthus lobatus</i>
CAMPANULACEAE	<i>Cyananthus spathulifolius</i>
CAMPANULACEAE	<i>Lobelia seguinii</i>
CAPRIFOLIACEAE	<i>Leycesteria formosa</i>
CAPRIFOLIACEAE	<i>Lonicera acuminata</i>
CAPRIFOLIACEAE	<i>Lonicera angustifolia</i>
CAPRIFOLIACEAE	<i>Lonicera caucasica</i>
CAPRIFOLIACEAE	<i>Lonicera cyanocarpa</i>
CAPRIFOLIACEAE	<i>Lonicera lanceolata</i>
CAPRIFOLIACEAE	<i>Lonicera myrtilloides</i>

CAPRIFOLIACEAE	Lonicera obovata
CAPRIFOLIACEAE	Lonicera purpurascens
CAPRIFOLIACEAE	Lonicera rupicola
CAPRIFOLIACEAE	Lonicera spinosa
CAPRIFOLIACEAE	Lonicera tomentella
CAPRIFOLIACEAE	Triosteum himalayanum
CARYOPHYLLACEAE	Arenaria densissima
CARYOPHYLLACEAE	Arenaria depauperata
CARYOPHYLLACEAE	Arenaria globiflora
CARYOPHYLLACEAE	Arenaria kansuensis
CARYOPHYLLACEAE	Arenaria mukerjeeana
CARYOPHYLLACEAE	Arenaria roseiflora
CARYOPHYLLACEAE	Cerastium glomeratum
CARYOPHYLLACEAE	Lepyrodiclis holosteoides
CARYOPHYLLACEAE	Minuartia kashmirica
CARYOPHYLLACEAE	Pseudostellaria heterantha
CARYOPHYLLACEAE	Sagina japonica
CARYOPHYLLACEAE	Sagina saginoides
CARYOPHYLLACEAE	Silene caespitella
CARYOPHYLLACEAE	Silene holosteifolia
CARYOPHYLLACEAE	Silene jugorum
CARYOPHYLLACEAE	Silene khasiana
CARYOPHYLLACEAE	Silene laxantha
CARYOPHYLLACEAE	Silene nepalensis
CARYOPHYLLACEAE	Silene nigrescens
CARYOPHYLLACEAE	Silene setisperma
CARYOPHYLLACEAE	Silene stracheyi
CARYOPHYLLACEAE	Silene thomsonii
CARYOPHYLLACEAE	Silene vautierae
CARYOPHYLLACEAE	Stellaria decumbens
CARYOPHYLLACEAE	Stellaria graminea
CARYOPHYLLACEAE	Stellaria himalayensis
CARYOPHYLLACEAE	Stellaria lanata
CARYOPHYLLACEAE	Stellaria monosperma
CARYOPHYLLACEAE	Stellaria patens
CARYOPHYLLACEAE	Stellaria sikkimensis
CELASTRACEAE	Euonymus amygdalifolius
CELASTRACEAE	Euonymus fimbriatus
CELASTRACEAE	Euonymus tingens
CHENOPODIACEAE	Axyris hybrida
CHENOPODIACEAE	Axyris villosa
CHENOPODIACEAE	Chenopodium album
CHENOPODIACEAE	Chenopodium botrys
CHENOPODIACEAE	Chenopodium foliosum
CHENOPODIACEAE	Chenopodium murale
CHENOPODIACEAE	Chenopodium opulifolium
CHENOPODIACEAE	Krascheninnikovia ceratoides
COMMELINACEAE	Commelina paludosa
COMPOSITAE	Adenocaulon himalaicum
COMPOSITAE	Ainsliaea aptera
COMPOSITAE	Ainsliaea latifolia
COMPOSITAE	Anaphalis adnata
COMPOSITAE	Anaphalis alata
COMPOSITAE	Anaphalis corymbosa
COMPOSITAE	Anaphalis margaritacea
COMPOSITAE	Anaphalis tenella
COMPOSITAE	Anaphalis virgata
COMPOSITAE	Anaphalis xylorhiza
COMPOSITAE	Anaphalis yunnanensis
COMPOSITAE	Arctium lappa
COMPOSITAE	Artemisia biennis
COMPOSITAE	Artemisia caruifolia
COMPOSITAE	Artemisia dubia
COMPOSITAE	Artemisia incisa



COMPOSITAE	<i>Artemisia tukuchaensis</i>
COMPOSITAE	<i>Aster ageratoides</i>
COMPOSITAE	<i>Aster altaicus</i>
COMPOSITAE	<i>Aster asteroides</i>
COMPOSITAE	<i>Aster crenatifolius</i>
COMPOSITAE	<i>Aster diplostephioides</i>
COMPOSITAE	<i>Aster falconeri</i>
COMPOSITAE	<i>Aster heliopsis</i>
COMPOSITAE	<i>Aster himalaicus</i>
COMPOSITAE	<i>Aster peduncularis</i>
COMPOSITAE	<i>Aster sikkimensis</i>
COMPOSITAE	<i>Bidens tripartita</i>
COMPOSITAE	<i>Brachyactis pubescens</i>
COMPOSITAE	<i>Brachyactis roylei</i>
COMPOSITAE	<i>Cacalia chenopodiifolia</i>
COMPOSITAE	<i>Cacalia mortonii</i>
COMPOSITAE	<i>Cacalia pentaloba</i>
COMPOSITAE	<i>Carduus edelbergii</i>
COMPOSITAE	<i>Carpesium ? lipskyi</i>
COMPOSITAE	<i>Carpesium nepalense</i>
COMPOSITAE	<i>Centaurea cyanus</i>
COMPOSITAE	<i>Cicerbita macrantha</i>
COMPOSITAE	<i>Cirsium flavisquamatum</i>
COMPOSITAE	<i>Cirsium nishiokae</i>
COMPOSITAE	<i>Cirsium wallichii</i>
COMPOSITAE	<i>Cousinia thomsonii</i>
COMPOSITAE	<i>Cremanthodium arnicoides</i>
COMPOSITAE	<i>Cremanthodium decaisnei</i>
COMPOSITAE	<i>Cremanthodium ellisii</i>
COMPOSITAE	<i>Cremanthodium hookeri</i>
COMPOSITAE	<i>Cremanthodium purpureifolium</i>
COMPOSITAE	<i>Cremanthodium thomsonii</i>
COMPOSITAE	<i>Crepis himalaica</i>
COMPOSITAE	<i>Crepis porrifolia</i>
COMPOSITAE	<i>Crepis sancta</i>
COMPOSITAE	<i>Dendranthema mutellina</i>
COMPOSITAE	<i>Dendranthema tenuiflorum</i>
COMPOSITAE	<i>Echinops cornigerus</i>
COMPOSITAE	<i>Erigeron acer</i>
COMPOSITAE	<i>Erigeron kumaunensis</i>
COMPOSITAE	<i>Gnaphalium affine</i>
COMPOSITAE	<i>Inula barbata</i>
COMPOSITAE	<i>Inula hookeri</i>
COMPOSITAE	<i>Inula racemosa</i>
COMPOSITAE	<i>Jurinea dolomiaea</i>
COMPOSITAE	<i>Lactuca bracteata</i>
COMPOSITAE	<i>Lactuca dissecta</i>
COMPOSITAE	<i>Lactuca graciliflora</i>
COMPOSITAE	<i>Lactuca lessertiana</i>
COMPOSITAE	<i>Launaea secunda</i>
COMPOSITAE	<i>Leibnitzia pusilla</i>
COMPOSITAE	<i>Leibnitzia ruficoma</i>
COMPOSITAE	<i>Leontopodium brachyactis</i>
COMPOSITAE	<i>Leontopodium makianum</i>
COMPOSITAE	<i>Ligularia amplexicaulis</i>
COMPOSITAE	<i>Myriactis nepalensis</i>
COMPOSITAE	<i>Nannoglottis hookeri</i>
COMPOSITAE	<i>Nannoglottis souliei</i>
COMPOSITAE	<i>Petasites tricholobus</i>
COMPOSITAE	<i>Picris hieracioides</i>
COMPOSITAE	<i>Prenanthes brunoniana</i>
COMPOSITAE	<i>Saussurea abnormis</i>
COMPOSITAE	<i>Saussurea auriculata</i>
COMPOSITAE	<i>Saussurea crispa</i>

COMPOSITAE	Saussurea deltoidea
COMPOSITAE	Saussurea fastuosa
COMPOSITAE	Saussurea gossypiphora
COMPOSITAE	Saussurea graminifolia
COMPOSITAE	Saussurea heteromalla
COMPOSITAE	Saussurea hieracioides
COMPOSITAE	Saussurea laminamaensis
COMPOSITAE	Saussurea leontodontoides
COMPOSITAE	Saussurea linearifolia
COMPOSITAE	Saussurea nepalensis
COMPOSITAE	Saussurea obvallata
COMPOSITAE	Saussurea pachyneura
COMPOSITAE	Saussurea piptathera
COMPOSITAE	Saussurea simpsoniana
COMPOSITAE	Saussurea spicata
COMPOSITAE	Saussurea stracheyana
COMPOSITAE	Saussurea taraxacifolia
COMPOSITAE	Saussurea uniflora
COMPOSITAE	Saussurea werneroides
COMPOSITAE	Saussurea yakla
COMPOSITAE	Senecio acuminatus
COMPOSITAE	Senecio alatus
COMPOSITAE	Senecio biligulatus
COMPOSITAE	Senecio chola
COMPOSITAE	Senecio chrysanthemoides
COMPOSITAE	Senecio diversifolius
COMPOSITAE	Senecio kunthianus
COMPOSITAE	Senecio lancifera
COMPOSITAE	Senecio rufinervis
COMPOSITAE	Senecio tetranthus
COMPOSITAE	Senecio wallichii
COMPOSITAE	Serratula pallida
COMPOSITAE	Solidago virga-aurea
COMPOSITAE	Sonchus asper
COMPOSITAE	Sonchus oleraceus
COMPOSITAE	Soroseris deasyi
COMPOSITAE	Soroseris gillii
COMPOSITAE	Soroseris pumila
COMPOSITAE	Tanacetum atkinsonii
COMPOSITAE	Tanacetum gossypinum
COMPOSITAE	Taraxacum elegans
COMPOSITAE	Taraxacum eriopodum
COMPOSITAE	Taraxacum lanigerum
COMPOSITAE	Taraxacum monochlamydeum
COMPOSITAE	Taraxacum mucronulatum
COMPOSITAE	Taraxacum nepalense
COMPOSITAE	Taraxacum tibetanum
COMPOSITAE	Tragopogon gracilis
COMPOSITAE	Tussilago farfara
COMPOSITAE	Waldheimia nivea
COMPOSITAE	Youngia racemifera
COMPOSITAE	Youngia tenuifolia
CONVOLVULACEAE	Cuscuta europaea
CONVOLVULACEAE	Cuscuta reflexa
CORIARIACEAE	Coriaria terminalis
CORNACEAE	Benthamidia capitata
CORYLACEAE	Corylus ferox
CRASSULACEAE	Rhodiola amabilis
CRASSULACEAE	Rhodiola bouvieri
CRASSULACEAE	Rhodiola calliantha
CRASSULACEAE	Rhodiola cretinii
CRASSULACEAE	Rhodiola discolor
CRASSULACEAE	Rhodiola fastigiata
CRASSULACEAE	Rhodiola heterodonta

CRASSULACEAE	Rhodiola himalensis
CRASSULACEAE	Rhodiola humilis
CRASSULACEAE	Rhodiola nepalica
CRASSULACEAE	Rhodiola ovatisepala
CRASSULACEAE	Rhodiola prainii
CRASSULACEAE	Rhodiola quadrifida
CRASSULACEAE	Rhodiola sacra
CRASSULACEAE	Rhodiola sinuata
CRASSULACEAE	Rhodiola wallichiana
CRASSULACEAE	Rosularia marnieri
CRASSULACEAE	Sedum gagei
CRASSULACEAE	Sedum holei
CRASSULACEAE	Sedum magae
CRASSULACEAE	Sedum multicaule
CRASSULACEAE	Sedum obtusipetalum
CRASSULACEAE	Sedum odontophyllum
CRASSULACEAE	Sedum oreades
CRASSULACEAE	Sedum triactina
CRASSULACEAE	Sedum trullipetalum
CRUCIFERAE	Alliaria petiolata
CRUCIFERAE	Arabidopsis himalaica
CRUCIFERAE	Arabidopsis lasiocarpa
CRUCIFERAE	Barbarea intermedia
CRUCIFERAE	Brassica oleracea
CRUCIFERAE	Braya oxycarpa
CRUCIFERAE	Cardamine griffithii
CRUCIFERAE	Cardamine impatiens
CRUCIFERAE	Cardamine scutata
CRUCIFERAE	Cardamine violacea
CRUCIFERAE	Cardamine yunnanensis
CRUCIFERAE	Christolea crassifolia
CRUCIFERAE	Draba altaica
CRUCIFERAE	Draba amoena
CRUCIFERAE	Draba cholaensis
CRUCIFERAE	Draba ellipsoidea
CRUCIFERAE	Draba eriopoda
CRUCIFERAE	Draba gracillima
CRUCIFERAE	Draba radicans
CRUCIFERAE	Draba staintonii
CRUCIFERAE	Draba tibetica
CRUCIFERAE	Draba williamsii
CRUCIFERAE	Erysimum hieraciifolium
CRUCIFERAE	Erysimum pachycarpum
CRUCIFERAE	Eutrema heterophyllum
CRUCIFERAE	Hedinia tibetica
CRUCIFERAE	Lepidium capitatum
CRUCIFERAE	Lignariella hobsonii
CRUCIFERAE	Pegaeophyton minutum
CRUCIFERAE	Pycnoplithopsis bhutanica
CRUCIFERAE	Raphanus sativus
CRUCIFERAE	Sisymbrium heteromallum
CRUCIFERAE	Thlaspi andersonii
CUCURBITACEAE	Biswarea tonglensis
CUCURBITACEAE	Edgaria darjeelingensis
CUCURBITACEAE	Herpetospermum pedunculatum
CUCURBITACEAE	Solena heterophylla
CUPRESSACEAE	Cupressus torulosa
CUPRESSACEAE	Juniperus communis
CUPRESSACEAE	Juniperus indica
CUPRESSACEAE	Juniperus squamata
CYPERACEAE	Baeothryon pumilum
CYPERACEAE	Blysmus compressus
CYPERACEAE	Bulbostylis densa
CYPERACEAE	Carex atrata

CYPERACEAE	Carex atrofusca
CYPERACEAE	Carex bigelowii
CYPERACEAE	Carex breviculmis
CYPERACEAE	Carex cruciata
CYPERACEAE	Carex cruenta
CYPERACEAE	Carex decora
CYPERACEAE	Carex fastigiata
CYPERACEAE	Carex filicina
CYPERACEAE	Carex finitima
CYPERACEAE	Carex fucata
CYPERACEAE	Carex haematostoma
CYPERACEAE	Carex himalaica
CYPERACEAE	Carex inclinis
CYPERACEAE	Carex infuscata
CYPERACEAE	Carex japonica
CYPERACEAE	Carex kumaonensis
CYPERACEAE	Carex lehmannii
CYPERACEAE	Carex munda
CYPERACEAE	Carex nivalis
CYPERACEAE	Carex nubigena
CYPERACEAE	Carex polycephala
CYPERACEAE	Carex psychrophila
CYPERACEAE	Carex pulchra
CYPERACEAE	Carex rara
CYPERACEAE	Carex rochebrunii
CYPERACEAE	Carex rufulistolon
CYPERACEAE	Carex setosa
CYPERACEAE	Carex stracheyi
CYPERACEAE	Carex winterbottomii
CYPERACEAE	Eleocharis palustris
CYPERACEAE	Eleocharis quinqueflora
CYPERACEAE	Eleocharis tetraquetra
CYPERACEAE	Fimbristylis complanata
CYPERACEAE	Isolepis setacea
CYPERACEAE	Kobresia caricina
CYPERACEAE	Kobresia curticeps
CYPERACEAE	Kobresia curvata
CYPERACEAE	Kobresia duthiei
CYPERACEAE	Kobresia esbirajbhandarii
CYPERACEAE	Kobresia fissiglumis
CYPERACEAE	Kobresia fragilis
CYPERACEAE	Kobresia harae
CYPERACEAE	Kobresia laxa
CYPERACEAE	Kobresia macrantha
CYPERACEAE	Kobresia mallae
CYPERACEAE	Kobresia royleana
CYPERACEAE	Kobresia schoenoides
CYPERACEAE	Kobresia seticulmis
CYPERACEAE	Kobresia uncinoides
CYPERACEAE	Kobresia williamsii
CYPERACEAE	Pycnus flavidus
CYPERACEAE	Schoenoplectus fuscrobens
CYPERACEAE	Schoenoplectus tabernaemontani
DIAPENSIACEAE	Diapensia himalaica
DIOSCOREACEAE	Dioscorea deltoidea
DIPSACACEAE	Dipsacus atratus
DIPSACACEAE	Triplostegia glandulifera
DROSERACEAE	Drosera peltata
ELAEAGNACEAE	Elaeagnus caudata
ELAEAGNACEAE	Hippophae salicifolia
ELAEAGNACEAE	Hippophae tibetana
ERICACEAE	Cassiope selaginoides
ERICACEAE	Diplarche multiflora
ERICACEAE	Enkianthus deflexus

ERICACEAE	Gaultheria hookeri
ERICACEAE	Gaultheria pyroloides
ERICACEAE	Gaultheria semi-infera
ERICACEAE	Lyonia ovalifolia
ERICACEAE	Lyonia villosa
ERICACEAE	Pieris formosa
ERICACEAE	Rhododendron anthopogon
ERICACEAE	Rhododendron arboreum
ERICACEAE	Rhododendron barbatum
ERICACEAE	Rhododendron camelliiflorum
ERICACEAE	Rhododendron campylocarpum
ERICACEAE	Rhododendron ciliatum
ERICACEAE	Rhododendron cinnabarinum
ERICACEAE	Rhododendron cowanianum
ERICACEAE	Rhododendron epapillatum
ERICACEAE	Rhododendron fulgens
ERICACEAE	Rhododendron glaucophyllum
ERICACEAE	Rhododendron hodgsonii
ERICACEAE	Rhododendron lindleyi
ERICACEAE	Rhododendron lowndesii
ERICACEAE	Rhododendron pendulum
ERICACEAE	Rhododendron pumilum
ERICACEAE	Rhododendron setosum
ERICACEAE	Rhododendron thomsonii
ERICACEAE	Rhododendron trichocladum
ERICACEAE	Rhododendron triflorum
ERICACEAE	Rhododendron wightii
ERICACEAE	Vaccinium glauco-album
ERICACEAE	Vaccinium nummularia
ERICACEAE	Vaccinium retusum
ERICACEAE	Vaccinium sikkimense
ERIOCAULACEAE	Eriocaulon alpestre
EUPHORBIACEAE	Euphorbia griffithii
EUPHORBIACEAE	Euphorbia himalayensis
EUPHORBIACEAE	Euphorbia pseudosikkimensis
EUPHORBIACEAE	Euphorbia wallichii
FAGACEAE	Quercus glauca
FAGACEAE	Quercus semecarpifolia
GENTIANACEAE	Gentiana albicalyx
GENTIANACEAE	Gentiana amplicrater
GENTIANACEAE	Gentiana burkillii
GENTIANACEAE	Gentiana carinata
GENTIANACEAE	Gentiana crassuloides
GENTIANACEAE	Gentiana decemfida
GENTIANACEAE	Gentiana elwesii
GENTIANACEAE	Gentiana huxleyi
GENTIANACEAE	Gentiana karelini
GENTIANACEAE	Gentiana kumaonensis
GENTIANACEAE	Gentiana lacerulata
GENTIANACEAE	Gentiana leucomalaena
GENTIANACEAE	Gentiana ludlowii
GENTIANACEAE	Gentiana marginata
GENTIANACEAE	Gentiana meiantha
GENTIANACEAE	Gentiana ornata
GENTIANACEAE	Gentiana pedicellata
GENTIANACEAE	Gentiana phyllocalyx
GENTIANACEAE	Gentiana pluviarum
GENTIANACEAE	Gentiana prolata
GENTIANACEAE	Gentiana recurvata
GENTIANACEAE	Gentiana robusta
GENTIANACEAE	Gentiana sikkimensis
GENTIANACEAE	Gentiana stipitata
GENTIANACEAE	Gentiana straminea
GENTIANACEAE	Gentiana tibetica

GENTIANACEAE	<i>Gentiana tubiflora</i>
GENTIANACEAE	<i>Gentianella angustiflora</i>
GENTIANACEAE	<i>Gentianella falcata</i>
GENTIANACEAE	<i>Gentianella lowndesii</i>
GENTIANACEAE	<i>Gentianella maddenii</i>
GENTIANACEAE	<i>Lomatogonium brachyantherum</i>
GENTIANACEAE	<i>Lomatogonium carinthiacum</i>
GENTIANACEAE	<i>Lomatogonium chumbicum</i>
GENTIANACEAE	<i>Lomatogonium gamosepalum</i>
GENTIANACEAE	<i>Lomatogonium hoydioides</i>
GENTIANACEAE	<i>Megacodon stylophorus</i>
GENTIANACEAE	<i>Swertia acaulis</i>
GENTIANACEAE	<i>Swertia alata</i>
GENTIANACEAE	<i>Swertia alternifolia</i>
GENTIANACEAE	<i>Swertia ciliata</i>
GENTIANACEAE	<i>Swertia cuneata</i>
GENTIANACEAE	<i>Swertia dilatata</i>
GENTIANACEAE	<i>Swertia gracilescens</i>
GENTIANACEAE	<i>Swertia hispidicalyx</i>
GENTIANACEAE	<i>Swertia hookeri</i>
GENTIANACEAE	<i>Swertia kingii</i>
GENTIANACEAE	<i>Swertia macrosperma</i>
GENTIANACEAE	<i>Swertia multicaulis</i>
GENTIANACEAE	<i>Swertia ramosa</i>
GENTIANACEAE	<i>Swertia staintonii</i>
GENTIANACEAE	<i>Swertia tetragona</i>
GENTIANACEAE	<i>Tripterospermum volubile</i>
GERANIACEAE	<i>Erodium stephanianum</i>
GERANIACEAE	<i>Geranium donianum</i>
GERANIACEAE	<i>Geranium lambertii</i>
GERANIACEAE	<i>Geranium nakaoanum</i>
GERANIACEAE	<i>Geranium nepalense</i>
GERANIACEAE	<i>Geranium pratense</i>
GERANIACEAE	<i>Geranium procurrens</i>
GERANIACEAE	<i>Geranium refractum</i>
GESNERIACEAE	<i>Corallodiscus lanuginosus</i>
GESNERIACEAE	<i>Didymocarpus primulifolius</i>
GESNERIACEAE	<i>Platystemma violoides</i>
GRAMINEAE	<i>Agrostis gigantea</i>
GRAMINEAE	<i>Agrostis hookeriana</i>
GRAMINEAE	<i>Agrostis micrantha</i>
GRAMINEAE	<i>Agrostis stolonifera</i>
GRAMINEAE	<i>Agrostis triaristata</i>
GRAMINEAE	<i>Andropogon munroi</i>
GRAMINEAE	<i>Anthoxanthum hookeri</i>
GRAMINEAE	<i>Anthoxanthum sikkimense</i>
GRAMINEAE	<i>Arundinella hookeri</i>
GRAMINEAE	<i>Avena barbata</i>
GRAMINEAE	<i>Avena fatua</i>
GRAMINEAE	<i>Bothriochola ischaemum</i>
GRAMINEAE	<i>Bothriochola pertusa</i>
GRAMINEAE	<i>Brachypodium pinnatum</i>
GRAMINEAE	<i>Brachypodium sylvaticum</i>
GRAMINEAE	<i>Briza media</i>
GRAMINEAE	<i>Bromus grandis</i>
GRAMINEAE	<i>Bromus himalaicus</i>
GRAMINEAE	<i>Bromus japonicus</i>
GRAMINEAE	<i>Bromus staintonii</i>
GRAMINEAE	<i>Calamagrostis emodensis</i>
GRAMINEAE	<i>Calamagrostis epigejos</i>
GRAMINEAE	<i>Calamagrostis garhwalensis</i>
GRAMINEAE	<i>Cymbopogon stracheyi</i>
GRAMINEAE	<i>Dactylis glomerata</i>
GRAMINEAE	<i>Danthonia cachemyriana</i>

GRAMINEAE	<i>Deyeuxia holciformis</i>
GRAMINEAE	<i>Deyeuxia nepalensis</i>
GRAMINEAE	<i>Digitaria cruciata</i>
GRAMINEAE	<i>Elymus canaliculatus</i>
GRAMINEAE	<i>Elymus microlepis</i>
GRAMINEAE	<i>Elymus nepalensis</i>
GRAMINEAE	<i>Elymus nutans</i>
GRAMINEAE	<i>Elymus semicostatus</i>
GRAMINEAE	<i>Elymus sibiricus</i>
GRAMINEAE	<i>Elymus sikkimensis</i>
GRAMINEAE	<i>Elymus thomsonii</i>
GRAMINEAE	<i>Eragrostis ferruginea</i>
GRAMINEAE	<i>Eragrostis minor</i>
GRAMINEAE	<i>Erianthus rufipilus</i>
GRAMINEAE	<i>Eulalia mollis</i>
GRAMINEAE	<i>Festuca leptopogon</i>
GRAMINEAE	<i>Festuca nitidula</i>
GRAMINEAE	<i>Festuca ovina</i>
GRAMINEAE	<i>Festuca parvigluma</i>
GRAMINEAE	<i>Festuca polycolea</i>
GRAMINEAE	<i>Festuca undata</i>
GRAMINEAE	<i>Glyceria tonglensis</i>
GRAMINEAE	<i>Helictotrichon parviflorum</i>
GRAMINEAE	<i>Hierochloe laxa</i>
GRAMINEAE	<i>Hordeum turkestanicum</i>
GRAMINEAE	<i>Hordeum vulgare</i>
GRAMINEAE	<i>Melica jacquemontii</i>
GRAMINEAE	<i>Melica scaberrima</i>
GRAMINEAE	<i>Microstegium nudum</i>
GRAMINEAE	<i>Miscanthus nudipes</i>
GRAMINEAE	<i>Oryzopsis gracilis</i>
GRAMINEAE	<i>Oryzopsis lateralis</i>
GRAMINEAE	<i>Oryzopsis munroi</i>
GRAMINEAE	<i>Phragmites australis</i>
GRAMINEAE	<i>Poa alpigena</i>
GRAMINEAE	<i>Poa alpina</i>
GRAMINEAE	<i>Poa angustifolia</i>
GRAMINEAE	<i>Poa annua</i>
GRAMINEAE	<i>Poa digena</i>
GRAMINEAE	<i>Poa eleanorae</i>
GRAMINEAE	<i>Poa falconeri</i>
GRAMINEAE	<i>Poa himalayana</i>
GRAMINEAE	<i>Poa jaunsarensis</i>
GRAMINEAE	<i>Poa langtangensis</i>
GRAMINEAE	<i>Poa ludens</i>
GRAMINEAE	<i>Poa nitide-spiculata</i>
GRAMINEAE	<i>Poa pagophila</i>
GRAMINEAE	<i>Poa polycolea</i>
GRAMINEAE	<i>Poa poophagorum</i>
GRAMINEAE	<i>Poa sikkimensis</i>
GRAMINEAE	<i>Poa stapfiana</i>
GRAMINEAE	<i>Poa supina</i>
GRAMINEAE	<i>Poa tibetica</i>
GRAMINEAE	<i>Poa tibeticola</i>
GRAMINEAE	<i>Pogonatherum paniceum</i>
GRAMINEAE	<i>Polypogon fugax</i>
GRAMINEAE	<i>Setaria viridis</i>
GRAMINEAE	<i>Stipa breviflora</i>
GRAMINEAE	<i>Stipa capillata</i>
GRAMINEAE	<i>Stipa consanguinea</i>
GRAMINEAE	<i>Stipa roylei</i>
GRAMINEAE	<i>Stipa sibirica</i>
GRAMINEAE	<i>Stipa staintonii</i>
GRAMINEAE	<i>Thamnocalamus aristatus</i>

GRAMINEAE	Thamnocalamus spathiflora
GRAMINEAE	Tripogon filiformis
GRAMINEAE	Trisetum aeneum
GRAMINEAE	Trisetum clarkei
GRAMINEAE	Trisetum spicatum
GRAMINEAE	Triticum aestivum
GROSSULARIACEAE	Ribes alpestre
GROSSULARIACEAE	Ribes griffithii
GROSSULARIACEAE	Ribes himalense
GROSSULARIACEAE	Ribes laciniatum
GROSSULARIACEAE	Ribes luridum
GROSSULARIACEAE	Ribes takare
GROSSULARIACEAE	Ribes vilmorinii
HYDRANGEACEAE	Deutzia compacta
HYDRANGEACEAE	Deutzia staminea
HYDRANGEACEAE	Hydrangea heteromalla
HYDRANGEACEAE	Philadelphus tomentosus
HYPERICACEAE	Hypericum choisianum
HYPERICACEAE	Hypericum elodeoides
HYPERICACEAE	Hypericum himalaicum
HYPERICACEAE	Hypericum monanthemum
HYPERICACEAE	Hypericum petiolulatum
HYPERICACEAE	Hypericum reptans
HYPERICACEAE	Hypericum tenuicaule
HYPERICACEAE	Hypericum uralum
IRIDACEAE	Iris clarkei
IRIDACEAE	Iris decora
IRIDACEAE	Iris goniocarpa
IRIDACEAE	Iris staintonii
JUNCACEAE	Juncus allioides
JUNCACEAE	Juncus ariculatus
JUNCACEAE	Juncus benghalensis
JUNCACEAE	Juncus biglumoides
JUNCACEAE	Juncus brachystigma
JUNCACEAE	Juncus cephalostigma
JUNCACEAE	Juncus chrysocarpus
JUNCACEAE	Juncus himalensis
JUNCACEAE	Juncus inflexus
JUNCACEAE	Juncus kingii
JUNCACEAE	Juncus luteocarpus
JUNCACEAE	Juncus membranaceus
JUNCACEAE	Juncus ochraceus
JUNCACEAE	Juncus sikkimensis
JUNCACEAE	Juncus uniflorus
JUNCACEAE	Luzula effusa
JUNCACEAE	Luzula multiflora
JUNCACEAE	Luzula oligantha
JUNCACEAE	Luzula plumosa
LABIATAE	Ajuga forrestii
LABIATAE	Ajuga lobata
LABIATAE	Ajuga macrosperma
LABIATAE	Clinopodium umbrosum
LABIATAE	Clinopodium vulgare
LABIATAE	Dracocephalum heterophyllum
LABIATAE	Elsholtzia ciliata
LABIATAE	Elsholtzia concinna
LABIATAE	Eriophyton wallichii
LABIATAE	Galeopsis bifida
LABIATAE	Galeopsis tetrahit
LABIATAE	Lamium album
LABIATAE	Lamium amplexicaule
LABIATAE	Lamium staintonii
LABIATAE	Lamium tuberosum
LABIATAE	Leonurus cardiaca



LABIATAE	Melissa axillaris
LABIATAE	Micromeria biflora
LABIATAE	Micromeria nepalensis
LABIATAE	Nepeta cataria
LABIATAE	Nepeta ciliaris
LABIATAE	Nepeta coerulescens
LABIATAE	Nepeta discolor
LABIATAE	Nepeta lamiopsis
LABIATAE	Nepeta leucophylla
LABIATAE	Origanum vulgare
LABIATAE	Phlomis breviflora
LABIATAE	Phlomis macrophylla
LABIATAE	Phlomis rotata
LABIATAE	Phlomis spectabilis
LABIATAE	Pogostemon tuberculosus
LABIATAE	Prunella vulgaris
LABIATAE	Rabdosia coetsa
LABIATAE	Rabdosia maddenii
LABIATAE	Rabdosia namikawana
LABIATAE	Rabdosia repens
LABIATAE	Rabdosia rugosa
LABIATAE	Rabdosia scrophularioides
LABIATAE	Roylea cinerea
LABIATAE	Salvia campanulata
LABIATAE	Salvia nubicola
LABIATAE	Salvia sikkimensis
LABIATAE	Scutellaria grossa
LABIATAE	Stachys melissaefolia
LABIATAE	Stachys sericea
LARDIZABALACEAE	Holboellia latifolia
LEGUMINOSAE	Agyrolobium roseum
LEGUMINOSAE	Astragalus amherstianus
LEGUMINOSAE	Astragalus bicuspidis
LEGUMINOSAE	Astragalus candolleanus
LEGUMINOSAE	Astragalus chlorostachys
LEGUMINOSAE	Astragalus concretus
LEGUMINOSAE	Astragalus emodi
LEGUMINOSAE	Astragalus himalayanus
LEGUMINOSAE	Astragalus leucocephalus
LEGUMINOSAE	Astragalus melanostachys
LEGUMINOSAE	Astragalus multiceps
LEGUMINOSAE	Astragalus nakaoi
LEGUMINOSAE	Astragalus oplites
LEGUMINOSAE	Astragalus rigidulus
LEGUMINOSAE	Astragalus sikkimensis
LEGUMINOSAE	Astragalus stipulatus
LEGUMINOSAE	Astragalus yunnanensis
LEGUMINOSAE	Campylotropis speciosa
LEGUMINOSAE	Caragana brevispina
LEGUMINOSAE	Caragana campanulata
LEGUMINOSAE	Caragana chumbica
LEGUMINOSAE	Caragana gerardiana
LEGUMINOSAE	Caragana jubata
LEGUMINOSAE	Caragana limprichtii
LEGUMINOSAE	Caragana polyacantha
LEGUMINOSAE	Caragana sukiensis
LEGUMINOSAE	Caragana versicolor
LEGUMINOSAE	Chesneya nubigena
LEGUMINOSAE	Chesneya polystichoides
LEGUMINOSAE	Colutea nepalensis
LEGUMINOSAE	Gueldenstaedtia himalaica
LEGUMINOSAE	Hedysarum sikkimense
LEGUMINOSAE	Indigofera atropurpurea
LEGUMINOSAE	Indigofera bracteata

LEGUMINOSAE	Indigofera cylindracea
LEGUMINOSAE	Indigofera hebeptala
LEGUMINOSAE	Indigofera heterantha
LEGUMINOSAE	Lathyrus laevigatus
LEGUMINOSAE	Lotus corniculatus
LEGUMINOSAE	Medicago falcata
LEGUMINOSAE	Medicago lupulina
LEGUMINOSAE	Medicago varia
LEGUMINOSAE	Melilotus indica
LEGUMINOSAE	Oxytropis duthieana
LEGUMINOSAE	Oxytropis graminetorum
LEGUMINOSAE	Oxytropis humifusa
LEGUMINOSAE	Oxytropis lapponica
LEGUMINOSAE	Oxytropis morenarum
LEGUMINOSAE	Oxytropis nepalensis
LEGUMINOSAE	Parochetus communis
LEGUMINOSAE	Piptanthus nepalensis
LEGUMINOSAE	Pisum sativum
LEGUMINOSAE	Sophora moorcroftiana
LEGUMINOSAE	Thermopsis lanceolata
LEGUMINOSAE	Trigonella corniculata
LEGUMINOSAE	Trigonella gracilis
LEGUMINOSAE	Trigonella pubescens
LEGUMINOSAE	Vicia angustifolia
LEGUMINOSAE	Vicia bakeri
LENTIBULARIACEAE	Utricularia australis
LENTIBULARIACEAE	Utricularia brachiata
LENTIBULARIACEAE	Utricularia multicaulis
LENTIBULARIACEAE	Utricularia scandens
LENTIBULARIACEAE	Utricularia stellaris
LENTIBULARIACEAE	Utricularia striatula
LILIACEAE	Aletris alpestris
LILIACEAE	Aletris gracilis
LILIACEAE	Aletris sikkimensis
LILIACEAE	Chlorophytum khasianum
LILIACEAE	Clintonia udensis
LILIACEAE	Hemerocallis fulva
LILIACEAE	Lilium bakerianum
LILIACEAE	Lilium nanum
LILIACEAE	Lilium nepalense
LILIACEAE	Lilium oxypetalum
LILIACEAE	Lilium sherriffiae
LILIACEAE	Lloydia flavonutans
LILIACEAE	Lloydia longiscapa
LILIACEAE	Lloydia serotina
LILIACEAE	Notholirion bulbuliferum
LILIACEAE	Notholirion thomsonianum
LILIACEAE	Paris polyphylla
LILIACEAE	Polygonatum cathcartii
LILIACEAE	Polygonatum singalilense
LILIACEAE	Smilacina oleracea
LILIACEAE	Smilax glaucophylla
LILIACEAE	Smilax menispermoides
LILIACEAE	Smilax minutiflora
LILIACEAE	Streptopus parasimplex
LILIACEAE	Streptopus simplex
LILIACEAE	Tofieldia himalaica
LILIACEAE	Trillidium govanianum
LILIACEAE	Ypsilandra yunnanensis
LINACEAE	Linum usitatissimum
LOGANIACEAE	Buddleja colvillei
LORANTHACEAE	Arceuthobium minutissimum
MAGNOLIACEAE	Magnolia globosa
MALVACEAE	Hibiscus vitifolius

MALVACEAE	Lavatera kashmiriana
MONOTROPACEAE	Monotropa humile
MONOTROPACEAE	Monotropa hypopithys
NYCTAGINACEAE	Mirabilis himalaica
OLEACEAE	Osmanthus fragrans
OLEACEAE	Osmanthus suavis
OLEACEAE	Syringa emodi
ONAGRACEAE	Epilobium amurense
ONAGRACEAE	Epilobium angustifolium
ONAGRACEAE	Epilobium brevifolium
ONAGRACEAE	Epilobium brevisquamatum
ONAGRACEAE	Epilobium latifolium
ONAGRACEAE	Epilobium leiospermum
ONAGRACEAE	Epilobium parviflorum
ONAGRACEAE	Epilobium staintonii
ONAGRACEAE	Epilobium williamsii
ORCHIDACEAE	Aphyllorchis parviflora
ORCHIDACEAE	Bulbophyllum leopardinum
ORCHIDACEAE	Calanthe alpina
ORCHIDACEAE	Calanthe tricarinata
ORCHIDACEAE	Cephalanthera longifolia
ORCHIDACEAE	Coeloglossum viride
ORCHIDACEAE	Corallorhiza trifida
ORCHIDACEAE	Cypripedium cordigerum
ORCHIDACEAE	Cypripedium elegans
ORCHIDACEAE	Dactylorhiza hatagirea
ORCHIDACEAE	Diphylax urceolata
ORCHIDACEAE	Epipactis helleborine
ORCHIDACEAE	Epipactis royleana
ORCHIDACEAE	Epipogium aphyllum
ORCHIDACEAE	Galearis spathulata
ORCHIDACEAE	Galearis stracheyi
ORCHIDACEAE	Goodyera fusca
ORCHIDACEAE	Goodyera hemsleyana
ORCHIDACEAE	Habenaria aitchisonii
ORCHIDACEAE	Habenaria albomarginata
ORCHIDACEAE	Habenaria diceras
ORCHIDACEAE	Habenaria pectinata
ORCHIDACEAE	Herminium lanceum
ORCHIDACEAE	Herminium macrophyllum
ORCHIDACEAE	Herminium monorchis
ORCHIDACEAE	Herminium pugioniforme
ORCHIDACEAE	Liparis pygmaea
ORCHIDACEAE	Listera nepalensis
ORCHIDACEAE	Listera pinetorum
ORCHIDACEAE	Malaxis cylindrostachya
ORCHIDACEAE	Myrmechis pumila
ORCHIDACEAE	Neottia listeroides
ORCHIDACEAE	Neottianthe calcicola
ORCHIDACEAE	Neottianthe secundiflora
ORCHIDACEAE	Oreorchis foliosa
ORCHIDACEAE	Oreorchis porphyranthes
ORCHIDACEAE	Peristylus elisabethae
ORCHIDACEAE	Peristylus fallax
ORCHIDACEAE	Platanthera arcuata
ORCHIDACEAE	Platanthera biermanniana
ORCHIDACEAE	Platanthera juncea
ORCHIDACEAE	Platanthera latilabris
ORCHIDACEAE	Platanthera stenantha
ORCHIDACEAE	Pleione hookeriana
ORCHIDACEAE	Satyrium ciliatum
OROBANCHACEAE	Orobanche aegyptiaca
OROBANCHACEAE	Orobanche alba
OROBANCHACEAE	Orobanche solmsii

PAPAVERACEAE	Corydalis brevicarata
PAPAVERACEAE	Corydalis chasmophila
PAPAVERACEAE	Corydalis clavibracteata
PAPAVERACEAE	Corydalis elegans
PAPAVERACEAE	Corydalis flabellata
PAPAVERACEAE	Corydalis flaccida
PAPAVERACEAE	Corydalis hendersonii
PAPAVERACEAE	Corydalis juncea
PAPAVERACEAE	Corydalis lathyroides
PAPAVERACEAE	Corydalis megacalyx
PAPAVERACEAE	Corydalis meifolia
PAPAVERACEAE	Corydalis pachypoda
PAPAVERACEAE	Corydalis polygalina
PAPAVERACEAE	Corydalis pseudojuncea
PAPAVERACEAE	Corydalis ramosa
PAPAVERACEAE	Corydalis staintonii
PAPAVERACEAE	Corydalis trifoliata
PAPAVERACEAE	Dicranostigma lactuoides
PAPAVERACEAE	Meconopsis bella
PAPAVERACEAE	Meconopsis dhwojii
PAPAVERACEAE	Meconopsis discigera
PAPAVERACEAE	Meconopsis gracilipes
PAPAVERACEAE	Meconopsis regia
PAPAVERACEAE	Meconopsis simplicifolia
PAPAVERACEAE	Meconopsis sinuata
PAPAVERACEAE	Meconopsis taylorii
PAPAVERACEAE	Meconopsis villosa
PARNASSIACEAE	Parnassia chinensis
PARNASSIACEAE	Parnassia kumaonica
PARNASSIACEAE	Parnassia tenella
PARNASSIACEAE	Parnassia wightiana
PHYTOLACCACEAE	Phytolacca acinosa
PINACEAE	Abies densa
PINACEAE	Abies spectabilis
PINACEAE	Cedrus deodara
PINACEAE	Larix griffithiana
PINACEAE	Larix himalaica
PINACEAE	Larix potaninii
PINACEAE	Picea smithiana
PINACEAE	Pinus wallichiana
PINACEAE	Tsuga dumosa
PLANTAGINACEAE	Plantago major
PLUMBAGINACEAE	Ceratostigma ulcinum
POLEMONIACEAE	Polemonium caeruleum
POLYGALACEAE	Polygala sibirica
POLYGONACEAE	Aconogonum campanulatum
POLYGONACEAE	Aconogonum molle
POLYGONACEAE	Aconogonum rumicifolium
POLYGONACEAE	Aconogonum sibiricum
POLYGONACEAE	Aconogonum tortuosum
POLYGONACEAE	Bistorta affinis
POLYGONACEAE	Bistorta emodi
POLYGONACEAE	Bistorta milletii
POLYGONACEAE	Bistorta vivipara
POLYGONACEAE	Fagopyrum dibotrys
POLYGONACEAE	Fagopyrum tataricum
POLYGONACEAE	Fallopia convolvulus
POLYGONACEAE	Koenigia islandica
POLYGONACEAE	Koenigia nummularifolia
POLYGONACEAE	Persicaria amphibia
POLYGONACEAE	Persicaria capathifolia
POLYGONACEAE	Persicaria glacialis
POLYGONACEAE	Persicaria humilis
POLYGONACEAE	Persicaria lapathifolia

POLYGONACEAE	Persicaria muricata
POLYGONACEAE	Persicaria runcinata
POLYGONACEAE	Persicaria sagittata
POLYGONACEAE	Polygonum aviculare
POLYGONACEAE	Polygonum tubulosum
POLYGONACEAE	Rheum acuminatum
POLYGONACEAE	Rheum australe
POLYGONACEAE	Rheum moorcroftianum
POLYGONACEAE	Rheum nobile
POLYGONACEAE	Rheum spiciforme
POLYGONACEAE	Rumex patientia
POTAMOGETONACEAE	Potamogeton natans
PRIMULACEAE	Androsace geraniifolia
PRIMULACEAE	Androsace globifera
PRIMULACEAE	Androsace hookeriana
PRIMULACEAE	Androsace lehmannii
PRIMULACEAE	Androsace muscoidea
PRIMULACEAE	Androsace nortonii
PRIMULACEAE	Androsace sarmentosa
PRIMULACEAE	Androsace tapete
PRIMULACEAE	Androsaceae rotundifolia
PRIMULACEAE	Bryocarpum himalaicum
PRIMULACEAE	Lysimachia chenopodioides
PRIMULACEAE	Lysimachia prolifera
PRIMULACEAE	Omphalogramma elwesiana
PRIMULACEAE	Primula atrodentata
PRIMULACEAE	Primula aureata
PRIMULACEAE	Primula boothii
PRIMULACEAE	Primula calderiana
PRIMULACEAE	Primula concinna
PRIMULACEAE	Primula deuteranana
PRIMULACEAE	Primula dickieana
PRIMULACEAE	Primula didyma
PRIMULACEAE	Primula drummondiana
PRIMULACEAE	Primula gambeliana
PRIMULACEAE	Primula glabra
PRIMULACEAE	Primula glandulifera
PRIMULACEAE	Primula glomerata
PRIMULACEAE	Primula gracilipes
PRIMULACEAE	Primula hookeri
PRIMULACEAE	Primula irregularis
PRIMULACEAE	Primula listeri
PRIMULACEAE	Primula macrophylla
PRIMULACEAE	Primula megalocarpa
PRIMULACEAE	Primula minutissima
PRIMULACEAE	Primula muscoides
PRIMULACEAE	Primula obliqua
PRIMULACEAE	Primula petiolaris
PRIMULACEAE	Primula prenantha
PRIMULACEAE	Primula primulina
PRIMULACEAE	Primula pulchra
PRIMULACEAE	Primula reidii
PRIMULACEAE	Primula reticulata
PRIMULACEAE	Primula rotundifolia
PRIMULACEAE	Primula scapigera
PRIMULACEAE	Primula sessilis
PRIMULACEAE	Primula soldanelloides
PRIMULACEAE	Primula stuartii
PRIMULACEAE	Primula tanneri
PRIMULACEAE	Primula tenuiloba
PRIMULACEAE	Primula tibetica
PRIMULACEAE	Primula uniflora
PRIMULACEAE	Primula wollastonii
RANUNCULACEAE	Aconitum amplexicaule

RANUNCULACEAE	Trollius acaulis
RANUNCULACEAE	Trollius pumilus
RHAMNACEAE	Berchemia flavescens
ROSACEAE	Aruncus dioicus
ROSACEAE	Cotoneaster acuminatus
ROSACEAE	Cotoneaster bisramianus
ROSACEAE	Cotoneaster cavei
ROSACEAE	Cotoneaster congestus
ROSACEAE	Cotoneaster duthieanus
ROSACEAE	Cotoneaster frigidus
ROSACEAE	Cotoneaster integrifolius
ROSACEAE	Cotoneaster ludlowii
ROSACEAE	Cotoneaster meuselii
ROSACEAE	Cotoneaster paradoxus
ROSACEAE	Cotoneaster racemiflorus
ROSACEAE	Cotoneaster rotundifolius
ROSACEAE	Cotoneaster sandakphuensis
ROSACEAE	Cotoneaster sanguineus
ROSACEAE	Cotoneaster schlechtendalii
ROSACEAE	Cotoneaster sherriffii
ROSACEAE	Cotoneaster staintonii
ROSACEAE	Cotoneaster tibeticus
ROSACEAE	Cotoneaster verruculosus
ROSACEAE	Cotoneaster virgatus
ROSACEAE	Cotoneaster zayulensis
ROSACEAE	Filipendula vestita
ROSACEAE	Fragaria daltoniana
ROSACEAE	Fragaria nubicola
ROSACEAE	Fragaria rubiginosa
ROSACEAE	Geum elatum
ROSACEAE	Geum roylei
ROSACEAE	Malus baccata
ROSACEAE	Neillia rubiflora
ROSACEAE	Potentilla anserina
ROSACEAE	Potentilla argyrophylla
ROSACEAE	Potentilla bifurca
ROSACEAE	Potentilla coriandrifolia
ROSACEAE	Potentilla eriocarpa
ROSACEAE	Potentilla exigua
ROSACEAE	Potentilla forrestii
ROSACEAE	Potentilla griffithii
ROSACEAE	Potentilla leuconota
ROSACEAE	Potentilla microphylla
ROSACEAE	Potentilla multifida
ROSACEAE	Potentilla saundersiana
ROSACEAE	Potentilla spodioclora
ROSACEAE	Potentilla supina
ROSACEAE	Prunus armeniaca
ROSACEAE	Prunus cornuta
ROSACEAE	Prunus himalaica
ROSACEAE	Prunus mira
ROSACEAE	Prunus rufa
ROSACEAE	Prunus venosa
ROSACEAE	Rosa macrophylla
ROSACEAE	Rubus amabilis
ROSACEAE	Rubus biflorus
ROSACEAE	Rubus fragarioides
ROSACEAE	Rubus hypargyrus
ROSACEAE	Rubus nepalensis
ROSACEAE	Rubus pungens
ROSACEAE	Sibbaldia cuneata
ROSACEAE	Sibbaldia micropetala
ROSACEAE	Sibbaldia perpusilloides
ROSACEAE	Sibbaldia purpurea

RANUNCULACEAE	Aconitum angulatum
RANUNCULACEAE	Aconitum balangrense
RANUNCULACEAE	Aconitum balfourii
RANUNCULACEAE	Aconitum bhedingense
RANUNCULACEAE	Aconitum deinorrhizum
RANUNCULACEAE	Aconitum ferox
RANUNCULACEAE	Aconitum gammiei
RANUNCULACEAE	Aconitum heterophylloides
RANUNCULACEAE	Aconitum heterophyllum
RANUNCULACEAE	Aconitum jucundum
RANUNCULACEAE	Aconitum nepalense
RANUNCULACEAE	Aconitum orochryseum
RANUNCULACEAE	Aconitum poluninii
RANUNCULACEAE	Aconitum spicatum
RANUNCULACEAE	Aconitum staintonii
RANUNCULACEAE	Aconitum tamuranum
RANUNCULACEAE	Aconitum williamsii
RANUNCULACEAE	Actaea spicata
RANUNCULACEAE	Adonis chrysocyathus
RANUNCULACEAE	Adonis nepalensis
RANUNCULACEAE	Anemone elongata
RANUNCULACEAE	Anemone fuscopurpurea
RANUNCULACEAE	Anemone geum
RANUNCULACEAE	Anemone rivularis
RANUNCULACEAE	Anemone rupestris
RANUNCULACEAE	Anemone vitifolia
RANUNCULACEAE	Aquilegia moorcroftiana
RANUNCULACEAE	Aquilegia pubiflora
RANUNCULACEAE	Calathodes palmata
RANUNCULACEAE	Callianthemum pimpinelloides
RANUNCULACEAE	Cimicifuga foetida
RANUNCULACEAE	Clematis barbellata
RANUNCULACEAE	Clematis bracteolata
RANUNCULACEAE	Clematis buchananiana
RANUNCULACEAE	Clematis connata
RANUNCULACEAE	Clematis montana
RANUNCULACEAE	Clematis phlebantha
RANUNCULACEAE	Clematis tibetana
RANUNCULACEAE	Clematis tortuosa
RANUNCULACEAE	Delphinium brunonianum
RANUNCULACEAE	Delphinium densiflorum
RANUNCULACEAE	Delphinium drepanocentrum
RANUNCULACEAE	Delphinium grandiflorum
RANUNCULACEAE	Delphinium ludlowii
RANUNCULACEAE	Delphinium nepalense
RANUNCULACEAE	Delphinium pyramidale
RANUNCULACEAE	Paraquilegia microphylla
RANUNCULACEAE	Paroxygraphis sikkimensis
RANUNCULACEAE	Ranunculus adoxifolius
RANUNCULACEAE	Ranunculus diffusus
RANUNCULACEAE	Ranunculus ficariifolius
RANUNCULACEAE	Ranunculus munroanus
RANUNCULACEAE	Ranunculus natans
RANUNCULACEAE	Ranunculus pegaeus
RANUNCULACEAE	Ranunculus pseudopygmaeus
RANUNCULACEAE	Thalictrum chelidonii
RANUNCULACEAE	Thalictrum elegans
RANUNCULACEAE	Thalictrum foliolosum
RANUNCULACEAE	Thalictrum glareosum
RANUNCULACEAE	Thalictrum leuconotum
RANUNCULACEAE	Thalictrum pauciflorum
RANUNCULACEAE	Thalictrum reniforme
RANUNCULACEAE	Thalictrum rostellatum
RANUNCULACEAE	Thalictrum setulosinerve

ROSACEAE	Sorbus cuspidata
ROSACEAE	Sorbus foliolosa
ROSACEAE	Sorbus hedlundii
ROSACEAE	Sorbus kurzii
ROSACEAE	Sorbus lanata
ROSACEAE	Sorbus rhamnoides
ROSACEAE	Sorbus wallichii
ROSACEAE	Spiraea arcuata
ROSACEAE	Spiraea canescens
ROSACEAE	Spiraea hypericifolia
ROSACEAE	Spiraea hypoleuca
RUBIACEAE	Galium aparine
RUBIACEAE	Galium asperuloides
RUBIACEAE	Galium exile
RUBIACEAE	Galium paradoxum
RUBIACEAE	Galium pusillosetosum
RUBIACEAE	Galium serpylloides
RUBIACEAE	Leptodermis kumaonensis
RUBIACEAE	Leptodermis lanceolata
RUBIACEAE	Leptodermis stapfiana
RUBIACEAE	Neanotis calycina
RUBIACEAE	Rubia wallichiana
RUTACEAE	Boenninghausenia albiflora
RUTACEAE	Skimmia melanocarpa
RUTACEAE	Zanthoxylum nepalense
SABIACEAE	Sabia campanulata
SALICACEAE	Populus ciliata
SALICACEAE	Salix anticecrenata
SALICACEAE	Salix babylonica
SALICACEAE	Salix bistyla
SALICACEAE	Salix calyculata
SALICACEAE	Salix daltoniana
SALICACEAE	Salix disperma
SALICACEAE	Salix eriostachya
SALICACEAE	Salix lindleyana
SALICACEAE	Salix longiflora
SALICACEAE	Salix luctuosa
SALICACEAE	Salix myrtilleacea
SALICACEAE	Salix obscura
SALICACEAE	Salix oreophila
SALICACEAE	Salix ovaticmicrophylla
SALICACEAE	Salix psilostigma
SALICACEAE	Salix pycnostachya
SALICACEAE	Salix salwinensis
SALICACEAE	Salix sclerophylla
SALICACEAE	Salix sikkimensis
SALICACEAE	Salix staintonianiana
SALICACEAE	Salix thomsoniana
SAMBUCACEAE	Sambucus adnata
SAMBUCACEAE	Viburnum cotinifolium
SAMBUCACEAE	Viburnum grandiflorum
SAMBUCACEAE	Viburnum mullaha
SAMBUCACEAE	Viburnum nervosum
SANTALACEAE	Thesium himalense
SAXIFRAGACEAE	Astilbe rivularis
SAXIFRAGACEAE	Bergenia ciliata
SAXIFRAGACEAE	Bergenia purpurascens
SAXIFRAGACEAE	Chrysosplenium carnosum
SAXIFRAGACEAE	Chrysosplenium forrestii
SAXIFRAGACEAE	Chrysosplenium griffithii
SAXIFRAGACEAE	Chrysosplenium lanuginosum
SAXIFRAGACEAE	Chrysosplenium nepalense
SAXIFRAGACEAE	Chrysosplenium nudicaule
SAXIFRAGACEAE	Chrysosplenium uniflorum



SAXIFRAGACEAE	Rodgersia nepalensis
SAXIFRAGACEAE	Saxifraga alpigena
SAXIFRAGACEAE	Saxifraga andersonii
SAXIFRAGACEAE	Saxifraga asarifolia
SAXIFRAGACEAE	Saxifraga brachypoda
SAXIFRAGACEAE	Saxifraga excellens
SAXIFRAGACEAE	Saxifraga filicaulis
SAXIFRAGACEAE	Saxifraga gageana
SAXIFRAGACEAE	Saxifraga georgei
SAXIFRAGACEAE	Saxifraga granulifera
SAXIFRAGACEAE	Saxifraga hispidula
SAXIFRAGACEAE	Saxifraga kingiana
SAXIFRAGACEAE	Saxifraga kumaunensis
SAXIFRAGACEAE	Saxifraga lepida
SAXIFRAGACEAE	Saxifraga lowndesii
SAXIFRAGACEAE	Saxifraga matta-viridis
SAXIFRAGACEAE	Saxifraga micans
SAXIFRAGACEAE	Saxifraga microphylla
SAXIFRAGACEAE	Saxifraga mucronulata
SAXIFRAGACEAE	Saxifraga nakaoi
SAXIFRAGACEAE	Saxifraga pallida
SAXIFRAGACEAE	Saxifraga poluninana
SAXIFRAGACEAE	Saxifraga pseudo-pallida
SAXIFRAGACEAE	Saxifraga pulvinaria
SAXIFRAGACEAE	Saxifraga rhodopetala
SAXIFRAGACEAE	Saxifraga rolwalingensis
SAXIFRAGACEAE	Saxifraga roylei
SAXIFRAGACEAE	Saxifraga saginoides
SAXIFRAGACEAE	Saxifraga serrula
SAXIFRAGACEAE	Saxifraga sikkimensis
SAXIFRAGACEAE	Saxifraga stella-aurea
SAXIFRAGACEAE	Saxifraga umbellulata
SAXIFRAGACEAE	Saxifraga williamsii
SAXIFRAGACEAE	Tiarella polyphylla
SCHISANDRACEAE	Schisandra grandiflora
SCROPHULARIACEAE	Euphrasia himalayica
SCROPHULARIACEAE	Euphrasia multiflora
SCROPHULARIACEAE	Euphrasia platyphylla
SCROPHULARIACEAE	Euphrasia schlagintweitii
SCROPHULARIACEAE	Hemiphragma heterophyllum
SCROPHULARIACEAE	Lagotis clarkei
SCROPHULARIACEAE	Lagotis kunawurensis
SCROPHULARIACEAE	Lancea tibetica
SCROPHULARIACEAE	Leptorhabdos parviflora
SCROPHULARIACEAE	Oreosolen unguiculatus
SCROPHULARIACEAE	Pedicularis albiflora
SCROPHULARIACEAE	Pedicularis anserantha
SCROPHULARIACEAE	Pedicularis breviscaposa
SCROPHULARIACEAE	Pedicularis chamissonoides
SCROPHULARIACEAE	Pedicularis clarkei
SCROPHULARIACEAE	Pedicularis cornigera
SCROPHULARIACEAE	Pedicularis denudata
SCROPHULARIACEAE	Pedicularis diffusa
SCROPHULARIACEAE	Pedicularis elevatogaleata
SCROPHULARIACEAE	Pedicularis elwesii
SCROPHULARIACEAE	Pedicularis excelsa
SCROPHULARIACEAE	Pedicularis flexuosa
SCROPHULARIACEAE	Pedicularis gibbera
SCROPHULARIACEAE	Pedicularis globifera
SCROPHULARIACEAE	Pedicularis gracilis
SCROPHULARIACEAE	Pedicularis hookeriana
SCROPHULARIACEAE	Pedicularis instar
SCROPHULARIACEAE	Pedicularis kansuensis
SCROPHULARIACEAE	Pedicularis lamjungensis

SCROPHULARIACEAE	Pedicularis megalantha
SCROPHULARIACEAE	Pedicularis megalochila
SCROPHULARIACEAE	Pedicularis microcalyx
SCROPHULARIACEAE	Pedicularis muguensis
SCROPHULARIACEAE	Pedicularis nepalensis
SCROPHULARIACEAE	Pedicularis nodosa
SCROPHULARIACEAE	Pedicularis oederi
SCROPHULARIACEAE	Pedicularis ophiocephala
SCROPHULARIACEAE	Pedicularis oxyrhyncha
SCROPHULARIACEAE	Pedicularis pantlingii
SCROPHULARIACEAE	Pedicularis pectinata
SCROPHULARIACEAE	Pedicularis pennelliana
SCROPHULARIACEAE	Pedicularis porrecta
SCROPHULARIACEAE	Pedicularis pseudoregeliana
SCROPHULARIACEAE	Pedicularis regeliana
SCROPHULARIACEAE	Pedicularis rhinanthoides
SCROPHULARIACEAE	Pedicularis roylei
SCROPHULARIACEAE	Pedicularis scullyana
SCROPHULARIACEAE	Pedicularis tamurensis
SCROPHULARIACEAE	Pedicularis trichodonta
SCROPHULARIACEAE	Pedicularis tsoongii
SCROPHULARIACEAE	Pedicularis wallichii
SCROPHULARIACEAE	Pedicularis yalungensis
SCROPHULARIACEAE	Picrorhiza scrophulariiflora
SCROPHULARIACEAE	Scrophularia calycina
SCROPHULARIACEAE	Scrophularia decomposita
SCROPHULARIACEAE	Scrophularia elatior
SCROPHULARIACEAE	Verbascum thapsus
SCROPHULARIACEAE	Veronica beccabunga
SCROPHULARIACEAE	Veronica cephaloides
SCROPHULARIACEAE	Veronica emodi
SCROPHULARIACEAE	Veronica umbelliformis
SOLANACEAE	Hyoscyamus niger
SOLANACEAE	Physochlaina praealta
SOLANACEAE	Scopolia stramonifolia
TAMARICACEAE	Myricaria davurica
TAMARICACEAE	Myricaria rosea
TAMARICACEAE	Myricaria squamosa
TAXACEAE	Taxus baccata
TETRACENTRACEAE	Tetracentron sinense
THYMELAEACEAE	Daphne bholua
THYMELAEACEAE	Daphne retusa
THYMELAEACEAE	Edgeworthia gardneri
THYMELAEACEAE	Wikstroemia canescens
UMBELLIFERAE	Acronema acronemifolium
UMBELLIFERAE	Acronema handelii
UMBELLIFERAE	Acronema paniculatum
UMBELLIFERAE	Acronema tenerum
UMBELLIFERAE	Angelica archangelica
UMBELLIFERAE	Angelica cyclocarpa
UMBELLIFERAE	Anthriscus nemorosa
UMBELLIFERAE	Bupleurum candollii
UMBELLIFERAE	Bupleurum hamiltonii
UMBELLIFERAE	Bupleurum lanceolatum
UMBELLIFERAE	Bupleurum longicaule
UMBELLIFERAE	Carum diversifolium
UMBELLIFERAE	Chaerophyllum reflexum
UMBELLIFERAE	Chaerophyllum villosum
UMBELLIFERAE	Cortia depressa
UMBELLIFERAE	Heracleum brunonis
UMBELLIFERAE	Heracleum candicans
UMBELLIFERAE	Heracleum nepalense
UMBELLIFERAE	Heracleum wallichii
UMBELLIFERAE	Osmorhiza aristata

UMBELLIFERAE	Pimpinella achilleifolia
UMBELLIFERAE	Pimpinella acuminata
UMBELLIFERAE	Pimpinella diversifolia
UMBELLIFERAE	Pimpinella sikkimensis
UMBELLIFERAE	Pimpinella tibetanica
UMBELLIFERAE	Pimpinella wallichii
UMBELLIFERAE	Pleurospermopsis sikkimensis
UMBELLIFERAE	Pleurospermum angelicoides
UMBELLIFERAE	Pleurospermum apiolens
UMBELLIFERAE	Pleurospermum benthamii
UMBELLIFERAE	Pleurospermum dentatum
UMBELLIFERAE	Pleurospermum hookeri
UMBELLIFERAE	Pleurospermum rotundatum
UMBELLIFERAE	Pleurospermum stellatum
UMBELLIFERAE	Sanicula elata
UMBELLIFERAE	Selinum candollii
UMBELLIFERAE	Seseli trilobum
UMBELLIFERAE	Vicatia coniifolia
URTICACEAE	Elatostema monandrum
URTICACEAE	Elatostema obtusum
URTICACEAE	Laportea terminalis
URTICACEAE	Lecanthus peduncularis
URTICACEAE	Parietaria micrantha
URTICACEAE	Pilea martinii
URTICACEAE	Pilea racemosa
URTICACEAE	Pilea symmeria
URTICACEAE	Urtica mairei
VALERIANACEAE	Nardostachys grandiflora
VALERIANACEAE	Valeriana hardwickii
VALERIANACEAE	Valeriana jatamansii
VERBENACEAE	Callicarpa lobata
VIOLACEAE	Viola betonicifolia
VIOLACEAE	Viola hookeri
VIOLACEAE	Viola kunawarensis
VIOLACEAE	Viola paravaginata
VITACEAE	Parthenocissus himalayana
ZINGIBERACEAE	Cautleya gracilis
ZINGIBERACEAE	Hedychium ellipticum
ZINGIBERACEAE	Roscoea alpina

APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL

Flowering Plants Report (Qualitative)

Taxonomy: All species  
Area: Alpine

Number of Species : 932

Family	Scientific Name
ACANTHACEAE	Dossifluga cuneata
AMARYLLIDACEAE	Allium carolinianum
AMARYLLIDACEAE	Allium fasciculatum
AMARYLLIDACEAE	Allium prattii
AMARYLLIDACEAE	Allium przewalskianum
AMARYLLIDACEAE	Allium sikkimense
AMARYLLIDACEAE	Allium wallichii
AMARYLLIDACEAE	Milula spicata
ARACEAE	Typhonium diversifolium
ARALIACEAE	Aralia cachemirica
ARALIACEAE	Panax pseudo-ginseng
BALSAMINACEAE	Impatiens kharensis
BALSAMINACEAE	Impatiens sulcata
BALSAMINACEAE	Impatiens wallichii
BERBERIDACEAE	Berberis angulosa
BERBERIDACEAE	Berberis concinna
BERBERIDACEAE	Berberis everestiana
BERBERIDACEAE	Berberis hamiltoniana
BERBERIDACEAE	Berberis hobsoni
BERBERIDACEAE	Berberis mucrifolia
BERBERIDACEAE	Berberis parisekala
BERBERIDACEAE	Berberis poluninii
BERBERIDACEAE	Berberis tsarica
BERBERIDACEAE	Berberis umbellata
BERBERIDACEAE	Podophyllum hexandrum
BETULACEAE	Betula utilis
BIGNONIACEAE	Incarvillea mairei
BIGNONIACEAE	Incarvillea younghusbandii
BORAGINACEAE	Arnebia nepalensis
BORAGINACEAE	Chionocharis hookeri
BORAGINACEAE	Cynoglossum zeylanicum
BORAGINACEAE	Eritrichium canum
BORAGINACEAE	Hackelia concinna
BORAGINACEAE	Hackelia uncinata
BORAGINACEAE	Lasiocaryum densiflorum
BORAGINACEAE	Lasiocaryum diffusum
BORAGINACEAE	Lindelofia longiflora
BORAGINACEAE	Maharanga emodi
BORAGINACEAE	Microcaryum pygmaeum
BORAGINACEAE	Microula pustulosa
BORAGINACEAE	Microula sikkimensis
BORAGINACEAE	Myosotis caespitosa
BORAGINACEAE	Onosma bracteatum
BORAGINACEAE	Onosma hookeri
BORAGINACEAE	Trigonotis multicaulis
BORAGINACEAE	Trigonotis tibetica
CALLITRICHACEAE	Callitriche palustris
CAMPANULACEAE	Campanula argyrotricha

CAMPANULACEAE	Campanula aristata
CAMPANULACEAE	Campanula nakaoi
CAMPANULACEAE	Campanula pallida
CAMPANULACEAE	Codonopsis convolvulacea
CAMPANULACEAE	Codonopsis thalictrifolia
CAMPANULACEAE	Cyananthus hayanus
CAMPANULACEAE	Cyananthus hookeri
CAMPANULACEAE	Cyananthus incanus
CAMPANULACEAE	Cyananthus inflatus
CAMPANULACEAE	Cyananthus lobatus
CAMPANULACEAE	Cyananthus microphyllus
CAMPANULACEAE	Cyananthus pedunculatus
CAMPANULACEAE	Lobelia erectiuscula
CAPRIFOLIACEAE	Abelia triflora
CAPRIFOLIACEAE	Lonicera cyanocarpa
CAPRIFOLIACEAE	Lonicera hispida
CAPRIFOLIACEAE	Lonicera hypoleuca
CAPRIFOLIACEAE	Lonicera litangensis
CAPRIFOLIACEAE	Lonicera minutifolia
CAPRIFOLIACEAE	Lonicera myrtillus
CAPRIFOLIACEAE	Lonicera obovata
CAPRIFOLIACEAE	Lonicera rupicola
CAPRIFOLIACEAE	Lonicera spinosa
CAPRIFOLIACEAE	Lonicera webbiana
CARYOPHYLLACEAE	Arenaria bryophylla
CARYOPHYLLACEAE	Arenaria ciliolata
CARYOPHYLLACEAE	Arenaria debilis
CARYOPHYLLACEAE	Arenaria densissima
CARYOPHYLLACEAE	Arenaria depauperata
CARYOPHYLLACEAE	Arenaria edgeworthiana
CARYOPHYLLACEAE	Arenaria glanduligera
CARYOPHYLLACEAE	Arenaria globiflora
CARYOPHYLLACEAE	Arenaria kansuensis
CARYOPHYLLACEAE	Arenaria melandryiformis
CARYOPHYLLACEAE	Arenaria melandryoides
CARYOPHYLLACEAE	Arenaria mukerjeeana
CARYOPHYLLACEAE	Arenaria orbiculata
CARYOPHYLLACEAE	Arenaria paramelanandra
CARYOPHYLLACEAE	Arenaria polytrichoides
CARYOPHYLLACEAE	Arenaria pulvinata
CARYOPHYLLACEAE	Arenaria roseiflora
CARYOPHYLLACEAE	Cerastium fontanum
CARYOPHYLLACEAE	Drymaria cordata
CARYOPHYLLACEAE	Gypsophila cerastioides
CARYOPHYLLACEAE	Lepyrodiclis holosteoides
CARYOPHYLLACEAE	Silene caespitella
CARYOPHYLLACEAE	Silene fissicalyx
CARYOPHYLLACEAE	Silene indica
CARYOPHYLLACEAE	Silene kumaonensis
CARYOPHYLLACEAE	Silene madens
CARYOPHYLLACEAE	Silene moorcroftiana
CARYOPHYLLACEAE	Silene nepalensis
CARYOPHYLLACEAE	Silene nigrescens
CARYOPHYLLACEAE	Silene vautierae
CARYOPHYLLACEAE	Silene waltonii
CARYOPHYLLACEAE	Stellaria congestiflora
CARYOPHYLLACEAE	Stellaria decumbens
CARYOPHYLLACEAE	Stellaria subumbellata
CARYOPHYLLACEAE	Stellaria uliginosa
CARYOPHYLLACEAE	Thylacospermum caespitosum
CHENOPODIACEAE	Axyris prostrata
CHENOPODIACEAE	Krascheninnikovia ceratoides
CHENOPODIACEAE	Microgynoecium tibeticum
CHENOPODIACEAE	Salsola nepalensis

## CIRCAEASTERACEAE

COMPOSITAE	<i>Circaeaster agrestis</i>
COMPOSITAE	<i>Anaphalis cavei</i>
COMPOSITAE	<i>Anaphalis contorta</i>
COMPOSITAE	<i>Anaphalis royleana</i>
COMPOSITAE	<i>Anaphalis subumbellata</i>
COMPOSITAE	<i>Anaphalis tenella</i>
COMPOSITAE	<i>Anaphalis viridis</i>
COMPOSITAE	<i>Anaphalis xylorhiza</i>
COMPOSITAE	<i>Anaphalis yunnanensis</i>
COMPOSITAE	<i>Artemisia biennis</i>
COMPOSITAE	<i>Artemisia capillaris</i>
COMPOSITAE	<i>Artemisia caruifolia</i>
COMPOSITAE	<i>Artemisia gmelinii</i>
COMPOSITAE	<i>Artemisia sieversiana</i>
COMPOSITAE	<i>Artemisia stricta</i>
COMPOSITAE	<i>Artemisia wallichiana</i>
COMPOSITAE	<i>Aster albescens</i>
COMPOSITAE	<i>Aster altaicus</i>
COMPOSITAE	<i>Aster asteroides</i>
COMPOSITAE	<i>Aster barbellatus</i>
COMPOSITAE	<i>Aster diplostephioides</i>
COMPOSITAE	<i>Aster falconeri</i>
COMPOSITAE	<i>Aster flaccidus</i>
COMPOSITAE	<i>Aster heliopsis</i>
COMPOSITAE	<i>Aster indamellus</i>
COMPOSITAE	<i>Aster stracheyi</i>
COMPOSITAE	<i>Aster tricephalus</i>
COMPOSITAE	<i>Brachyactis anomala</i>
COMPOSITAE	<i>Brachyactis roylei</i>
COMPOSITAE	<i>Cacalia penninervis</i>
COMPOSITAE	<i>Cacalia pentaloba</i>
COMPOSITAE	<i>Calendula officinalis</i>
COMPOSITAE	<i>Cicerbita cyanea</i>
COMPOSITAE	<i>Cicerbita macrorrhiza</i>
COMPOSITAE	<i>Cirsium falconeri</i>
COMPOSITAE	<i>Cremanthodium arnicoides</i>
COMPOSITAE	<i>Cremanthodium cuculliferum</i>
COMPOSITAE	<i>Cremanthodium decaisnei</i>
COMPOSITAE	<i>Cremanthodium hookeri</i>
COMPOSITAE	<i>Cremanthodium nanum</i>
COMPOSITAE	<i>Cremanthodium nepalense</i>
COMPOSITAE	<i>Cremanthodium oblongatum</i>
COMPOSITAE	<i>Cremanthodium pinnatifidum</i>
COMPOSITAE	<i>Cremanthodium purpureifolium</i>
COMPOSITAE	<i>Cremanthodium reniforme</i>
COMPOSITAE	<i>Cremanthodium retusum</i>
COMPOSITAE	<i>Crepis porrifolia</i>
COMPOSITAE	<i>Crepis tibetica</i>
COMPOSITAE	<i>Dendranthema mutellina</i>
COMPOSITAE	<i>Dendranthema nubigenum</i>
COMPOSITAE	<i>Dendranthema tenuiflorum</i>
COMPOSITAE	<i>Doronicum roylei</i>
COMPOSITAE	<i>Dubyaea hispida</i>
COMPOSITAE	<i>Erigeron bellidioides</i>
COMPOSITAE	<i>Erigeron multiradiatus</i>
COMPOSITAE	<i>Erigeron uniflorus</i>
COMPOSITAE	<i>Gerbera nivea</i>
COMPOSITAE	<i>Jurinea dolomiaea</i>
COMPOSITAE	<i>Lactuca lessertiana</i>
COMPOSITAE	<i>Leibnitzia nepalensis</i>
COMPOSITAE	<i>Leontopodium brachyactis</i>
COMPOSITAE	<i>Leontopodium haastioides</i>
COMPOSITAE	<i>Leontopodium jacotianum</i>
COMPOSITAE	<i>Leontopodium monocephalum</i>

COMPOSITAE	Leontopodium nanum
COMPOSITAE	Leontopodium stracheyi
COMPOSITAE	Ligularia fischeri
COMPOSITAE	Nannoglottis hookeri
COMPOSITAE	Prenanthes violaeifolia
COMPOSITAE	Saussurea abnormis
COMPOSITAE	Saussurea candolleana
COMPOSITAE	Saussurea chrysotricha
COMPOSITAE	Saussurea crispa
COMPOSITAE	Saussurea dhwojii
COMPOSITAE	Saussurea gnaphalodes
COMPOSITAE	Saussurea hieracioides
COMPOSITAE	Saussurea hookeri
COMPOSITAE	Saussurea laminamaensis
COMPOSITAE	Saussurea linearifolia
COMPOSITAE	Saussurea namikawae
COMPOSITAE	Saussurea nepalensis
COMPOSITAE	Saussurea nishiokae
COMPOSITAE	Saussurea obvallata
COMPOSITAE	Saussurea pachyneura
COMPOSITAE	Saussurea platyphyllaria
COMPOSITAE	Saussurea polystichoides
COMPOSITAE	Saussurea roylei
COMPOSITAE	Saussurea sughoo
COMPOSITAE	Saussurea tridactyla
COMPOSITAE	Saussurea uniflora
COMPOSITAE	Saussurea yakla
COMPOSITAE	Senecio albopurpureus
COMPOSITAE	Senecio biligulatus
COMPOSITAE	Senecio candolleanus
COMPOSITAE	Senecio graciliflorus
COMPOSITAE	Senecio kunthianus
COMPOSITAE	Senecio ramosus
COMPOSITAE	Senecio topkegolensis
COMPOSITAE	Soroseris deasyi
COMPOSITAE	Soroseris glomerata
COMPOSITAE	Soroseris hookeriana
COMPOSITAE	Soroseris pumila
COMPOSITAE	Tanacetum atkinsonii
COMPOSITAE	Tanacetum dolichophyllum
COMPOSITAE	Taraxacum eriopodum
COMPOSITAE	Taraxacum mitalii
COMPOSITAE	Taraxacum pseudostenoceras
COMPOSITAE	Taraxacum sikkimense
COMPOSITAE	Taraxacum tibetanum
COMPOSITAE	Waldheimia glabra
COMPOSITAE	Waldheimia tomentosa
COMPOSITAE	Youngia depressa
COMPOSITAE	Youngia gracilipes
COMPOSITAE	Youngia simulatrix
CONVOLVULACEAE	Convolvulus arvensis
CRASSULACEAE	Rhodiola calliantha
CRASSULACEAE	Rhodiola crenulata
CRASSULACEAE	Rhodiola cretinii
CRASSULACEAE	Rhodiola discolor
CRASSULACEAE	Rhodiola heterodonta
CRASSULACEAE	Rhodiola himalensis
CRASSULACEAE	Rhodiola humilis
CRASSULACEAE	Rhodiola imbricata
CRASSULACEAE	Rhodiola nepalica
CRASSULACEAE	Rhodiola prainii
CRASSULACEAE	Rhodiola quadrifida
CRASSULACEAE	Rhodiola smithii
CRASSULACEAE	Rhodiola wallichiana

CRASSULACEAE	Rosularia marnieri
CRASSULACEAE	Sedum gagei
CRASSULACEAE	Sedum henrici-roberti
CRASSULACEAE	Sedum magae
CRASSULACEAE	Sedum perpusillum
CRASSULACEAE	Sedum przewalskii
CRASSULACEAE	Sedum roborowskii
CRASSULACEAE	Sedum trullipetalum
CRUCIFERAE	Arabis pterosperma
CRUCIFERAE	Arcyosperma primulifolium
CRUCIFERAE	Capsella bursa-pastoris
CRUCIFERAE	Cardamine macrophylla
CRUCIFERAE	Cardamine trifoliolata
CRUCIFERAE	Christolea crassifolia
CRUCIFERAE	Chrysobraya glaricola
CRUCIFERAE	Descurainia sophia
CRUCIFERAE	Dilophia salsa
CRUCIFERAE	Dontostemon pectinatus
CRUCIFERAE	Draba altaica
CRUCIFERAE	Draba amoena
CRUCIFERAE	Draba elata
CRUCIFERAE	Draba gracillima
CRUCIFERAE	Draba lasiophylla
CRUCIFERAE	Draba oreades
CRUCIFERAE	Draba staintonii
CRUCIFERAE	Draba williamsii
CRUCIFERAE	Ermania linearis
CRUCIFERAE	Ermaniopsis pumila
CRUCIFERAE	Erysimum dolpoense
CRUCIFERAE	Glaribraya lowndesii
CRUCIFERAE	Lepidium apetalum
CRUCIFERAE	Lignariella hobsonii
CRUCIFERAE	Loxostemon pulchellus
CRUCIFERAE	Megacarpaea polyandra
CRUCIFERAE	Pegaeophyton minutum
CRUCIFERAE	Phaeonychium parryoides
CRUCIFERAE	Staintoniella nepalensis
CRUCIFERAE	Staintoniella verticillata
CRUCIFERAE	Thlaspi andersonii
CRUCIFERAE	Thlaspi arvense
CRUCIFERAE	Torularia humilis
CUPRESSACEAE	Juniperus indica
CUPRESSACEAE	Juniperus recurva
CUPRESSACEAE	Juniperus squamata
CYPERACEAE	Carex atrata
CYPERACEAE	Carex haematostoma
CYPERACEAE	Carex himalaica
CYPERACEAE	Carex hirtella
CYPERACEAE	Carex inanis
CYPERACEAE	Carex infusata
CYPERACEAE	Carex laeta
CYPERACEAE	Carex lehmannii
CYPERACEAE	Carex maritima
CYPERACEAE	Carex microglochin
CYPERACEAE	Carex munda
CYPERACEAE	Carex nakaoana
CYPERACEAE	Carex nivalis
CYPERACEAE	Carex obscura
CYPERACEAE	Carex orbicularis
CYPERACEAE	Carex parva
CYPERACEAE	Carex pseudofloetida
CYPERACEAE	Carex supina
CYPERACEAE	Kobresia curvata
CYPERACEAE	Kobresia deasyi



CYPERACEAE	Kobresia esbirajbhandarii
CYPERACEAE	Kobresia kanaii
CYPERACEAE	Kobresia mallae
CYPERACEAE	Kobresia nepalensis
CYPERACEAE	Kobresia royleana
CYPERACEAE	Kobresia schoenoides
CYPERACEAE	Kobresia sikkimensis
CYPERACEAE	Kobresia trinervis
CYPERACEAE	Kobresia uncinoides
CYPERACEAE	Kobresia vidua
DIPSACACEAE	Dipsacus inermis
DIPSACACEAE	Morina longifolia
DIPSACACEAE	Morina nepalensis
DIPSACACEAE	Morina polyphylla
DIPSACACEAE	Pterocephalus hookeri
ELAEAGNACEAE	Hippophae tibetana
EPHEDRACEAE	Ephedra pachyclada
ERICACEAE	Cassiope fastigiata
ERICACEAE	Cassiope selaginoides
ERICACEAE	Gaultheria nummularioides
ERICACEAE	Gaultheria trichophylla
ERICACEAE	Rhododendron anthopogon
ERICACEAE	Rhododendron campanulatum
ERICACEAE	Rhododendron fulgens
ERICACEAE	Rhododendron lepidotum
ERICACEAE	Rhododendron lowndesii
ERICACEAE	Rhododendron nivale
ERICACEAE	Rhododendron pumilum
ERICACEAE	Rhododendron wightii
EUPHORBIACEAE	Euphorbia stracheyi
GENTIANACEAE	Gentiana albicalyx
GENTIANACEAE	Gentiana algida
GENTIANACEAE	Gentiana amplicrater
GENTIANACEAE	Gentiana argentea
GENTIANACEAE	Gentiana bryoides
GENTIANACEAE	Gentiana capitata
GENTIANACEAE	Gentiana crassuloides
GENTIANACEAE	Gentiana decemfida
GENTIANACEAE	Gentiana depressa
GENTIANACEAE	Gentiana elwesii
GENTIANACEAE	Gentiana infelix
GENTIANACEAE	Gentiana karelini
GENTIANACEAE	Gentiana lacerulata
GENTIANACEAE	Gentiana ludlowii
GENTIANACEAE	Gentiana marginata
GENTIANACEAE	Gentiana micans
GENTIANACEAE	Gentiana pentasticta
GENTIANACEAE	Gentiana pluviarum
GENTIANACEAE	Gentiana radicans
GENTIANACEAE	Gentiana stipitata
GENTIANACEAE	Gentiana straminea
GENTIANACEAE	Gentiana stylosa
GENTIANACEAE	Gentiana tibetica
GENTIANACEAE	Gentiana urnula
GENTIANACEAE	Gentiana vernayi
GENTIANACEAE	Gentianella angustiflora
GENTIANACEAE	Gentianella glanduligera
GENTIANACEAE	Gentianella lowndesii
GENTIANACEAE	Gentianella paludosa
GENTIANACEAE	Gentianella pedunculata
GENTIANACEAE	Gentianella stellariifolia
GENTIANACEAE	Gentianella vvedenskyi
GENTIANACEAE	Halenia elliptica
GENTIANACEAE	Lomatogonium brachyantherum

GENTIANACEAE	Lomatogonium caeruleum
GENTIANACEAE	Lomatogonium carinthiacum
GENTIANACEAE	Lomatogonium graciliflorum
GENTIANACEAE	Lomatogonium hoydioides
GENTIANACEAE	Lomatogonium sikkimense
GENTIANACEAE	Swertia candelabrum
GENTIANACEAE	Swertia cuneata
GENTIANACEAE	Swertia hispidicalyx
GENTIANACEAE	Swertia hookeri
GENTIANACEAE	Swertia kingii
GENTIANACEAE	Swertia multicaulis
GENTIANACEAE	Swertia racemosa
GENTIANACEAE	Swertia ramosa
GENTIANACEAE	Swertia speciosa
GENTIANACEAE	Swertia staintonii
GERANIACEAE	Geranium donianum
GERANIACEAE	Geranium himalayensis
GERANIACEAE	Geranium lambertii
GERANIACEAE	Geranium nakaoanum
GERANIACEAE	Geranium polyanthes
GERANIACEAE	Geranium refractum
GERANIACEAE	Geranium wallichianum
GRAMINEAE	Agrostis hookeriana
GRAMINEAE	Agrostis inaequiglumis
GRAMINEAE	Agrostis munroana
GRAMINEAE	Agrostis nervosa
GRAMINEAE	Agrostis pilosula
GRAMINEAE	Bromus grandis
GRAMINEAE	Bromus tectorum
GRAMINEAE	Calamagrostis pseudophragmites
GRAMINEAE	Colpodium wallichii
GRAMINEAE	Danthonia cachemyriana
GRAMINEAE	Danthonia cumminsii
GRAMINEAE	Deschampsia caespitosa
GRAMINEAE	Deyeuxia holciformis
GRAMINEAE	Deyeuxia nepalensis
GRAMINEAE	Deyeuxia nivicola
GRAMINEAE	Deyeuxia pulchella
GRAMINEAE	Deyeuxia scabrescens
GRAMINEAE	Duthiea nepalensis
GRAMINEAE	Elymus nutans
GRAMINEAE	Elymus schrenkianus
GRAMINEAE	Elymus sibiricus
GRAMINEAE	Festuca polycolea
GRAMINEAE	Festuca rubra
GRAMINEAE	Festuca undata
GRAMINEAE	Helictotrichon asperum
GRAMINEAE	Helictotrichon virescens
GRAMINEAE	Hierochloe laxa
GRAMINEAE	Koeleria cristata
GRAMINEAE	Leucopoa albida
GRAMINEAE	Littledalea tibetica
GRAMINEAE	Oryzopsis munroi
GRAMINEAE	Pennisetum flaccidum
GRAMINEAE	Phleum alpinum
GRAMINEAE	Poa alpigena
GRAMINEAE	Poa bulbosa
GRAMINEAE	Poa calliopsis
GRAMINEAE	Poa falconeri
GRAMINEAE	Poa harae
GRAMINEAE	Poa hirtiglumis
GRAMINEAE	Poa imperialis
GRAMINEAE	Poa kanaii
GRAMINEAE	Poa ludens

GRAMINEAE	Poa mustangensis
GRAMINEAE	Poa nemoralis
GRAMINEAE	Poa pratensis
GRAMINEAE	Poa sikkimensis
GRAMINEAE	Poa stapfiana
GRAMINEAE	Poa tibetica
GRAMINEAE	Stipa mongholica
GRAMINEAE	Themeda triandra
GRAMINEAE	Trisetum aeneum
GRAMINEAE	Trisetum scitulum
GROSSULARIACEAE	Ribes glaciale
GROSSULARIACEAE	Ribes luridum
GROSSULARIACEAE	Ribes orientale
HIPPURIDACEAE	Hippuris vulgaris
HYPERICACEAE	Hypericum monanthemum
HYPERICACEAE	Hypericum reptans
IRIDACEAE	Iris goniocarpa
IRIDACEAE	Iris kemaonensis
JUNCACEAE	Juncus allioides
JUNCACEAE	Juncus bhutanensis
JUNCACEAE	Juncus brachystigma
JUNCACEAE	Juncus cephalostigma
JUNCACEAE	Juncus kingii
JUNCACEAE	Juncus leucanthus
JUNCACEAE	Juncus minimus
JUNCACEAE	Juncus pseudocastaneus
JUNCACEAE	Juncus sikkimensis
JUNCACEAE	Juncus sphacelatus
JUNCACEAE	Juncus triglumis
JUNCACEAE	Juncus uniflorus
JUNCAGINACEAE	Triglochin maritima
JUNCAGINACEAE	Triglochin palustris
LABIATAE	Ajuga lupulina
LABIATAE	Colquhounia coccinea
LABIATAE	Dracocephalum tanguticum
LABIATAE	Dracocephalum wallichii
LABIATAE	Elsholtzia densa
LABIATAE	Elsholtzia eriostachya
LABIATAE	Elsholtzia fruticosa
LABIATAE	Elsholtzia strobilifera
LABIATAE	Galeopsis bifida
LABIATAE	Glechoma decolorans
LABIATAE	Glechoma nivalis
LABIATAE	Glechoma pharica
LABIATAE	Lamium nepalense
LABIATAE	Lamium tuberosum
LABIATAE	Nepeta discolor
LABIATAE	Nepeta laevigata
LABIATAE	Nepeta staintonii
LABIATAE	Phlomis bracteosa
LABIATAE	Phlomis macrophylla
LABIATAE	Phlomis setigera
LABIATAE	Phlomis tibetica
LABIATAE	Rabdosia pharica
LABIATAE	Salvia castanea
LABIATAE	Salvia hians
LABIATAE	Salvia roborowskii
LABIATAE	Scutellaria prostrata
LABIATAE	Thymus linearis
LEGUMINOSAE	Astragalus candolleanus
LEGUMINOSAE	Astragalus confertus
LEGUMINOSAE	Astragalus donianus
LEGUMINOSAE	Astragalus floridus
LEGUMINOSAE	Astragalus frigidus

LEGUMINOSAE	Astragalus himalayanus
LEGUMINOSAE	Astragalus lessertioides
LEGUMINOSAE	Astragalus oplites
LEGUMINOSAE	Astragalus rigidulus
LEGUMINOSAE	Astragalus strictus
LEGUMINOSAE	Caragana gerardiana
LEGUMINOSAE	Caragana tragacanthoides
LEGUMINOSAE	Caragana versicolor
LEGUMINOSAE	Cicer microphyllum
LEGUMINOSAE	Gueldenstaedtia himalaica
LEGUMINOSAE	Hedysarum campylocarpon
LEGUMINOSAE	Hedysarum kumaonense
LEGUMINOSAE	Hedysarum manaslense
LEGUMINOSAE	Hedysarum sikkimense
LEGUMINOSAE	Oxytropis arenae-ripariae
LEGUMINOSAE	Oxytropis duthieana
LEGUMINOSAE	Oxytropis graminetorum
LEGUMINOSAE	Oxytropis humifusa
LEGUMINOSAE	Oxytropis kansuensis
LEGUMINOSAE	Oxytropis lapponica
LEGUMINOSAE	Oxytropis microphylla
LEGUMINOSAE	Oxytropis morenarum
LEGUMINOSAE	Oxytropis nepalensis
LEGUMINOSAE	Oxytropis torrentium
LEGUMINOSAE	Oxytropis williamsii
LEGUMINOSAE	Stracheya tibetica
LEGUMINOSAE	Thermopsis barbata
LEGUMINOSAE	Thermopsis lanceolata
LEGUMINOSAE	Trigonella emodi
LENTIBULARIACEAE	Pinguicula alpina
LENTIBULARIACEAE	Utricularia minor
LILIACEAE	Alettris pauciflora
LILIACEAE	Fritillaria cirrhosa
LILIACEAE	Gagea elegans
LILIACEAE	Lilium nanum
LILIACEAE	Lloydia flavonutans
LILIACEAE	Lloydia longiscapa
LILIACEAE	Lloydia serotina
LILIACEAE	Notholirion bulbuliferum
LILIACEAE	Notholirion macrophyllum
LILIACEAE	Polygonatum cirrhifolium
LILIACEAE	Polygonatum hookeri
LILIACEAE	Polygonatum singalilense
LILIACEAE	Polygonatum verticillatum
LILIACEAE	Smilacina purpurea
LILIACEAE	Ypsilandra yunnanensis
LOGANIACEAE	Buddleja crispa
ONAGRACEAE	Circaea alpina
ONAGRACEAE	Epilobium conspersum
ONAGRACEAE	Epilobium cylindricum
ONAGRACEAE	Epilobium latifolium
ONAGRACEAE	Epilobium palustre
ONAGRACEAE	Epilobium royleanum
ONAGRACEAE	Epilobium sikkimense
ONAGRACEAE	Epilobium wallichianum
ONAGRACEAE	Epilobium williamsii
ORCHIDACEAE	Cypripedium elegans
ORCHIDACEAE	Cypripedium himalaicum
ORCHIDACEAE	Diphylax urceolata
ORCHIDACEAE	Galearis spathulata
ORCHIDACEAE	Galearis stracheyi
ORCHIDACEAE	Goodyera fusca
ORCHIDACEAE	Goodyera repens
ORCHIDACEAE	Gymnadenia orchidis

ORCHIDACEAE	Herminium duthiei
ORCHIDACEAE	Herminium josephii
ORCHIDACEAE	Herminium macrophyllum
ORCHIDACEAE	Herminium monorchis
ORCHIDACEAE	Herminium pugioniforme
ORCHIDACEAE	Liparis glossula
ORCHIDACEAE	Malaxis muscifera
ORCHIDACEAE	Neottianthe calcicola
ORCHIDACEAE	Platanthera clavigera
ORCHIDACEAE	Platanthera exelliana
ORCHIDACEAE	Platanthera leptocaulon
ORCHIDACEAE	Ponerorchis chusua
ORCHIDACEAE	Satyrium nepalense
ORCHIDACEAE	Spathoglottis ixiioides
ORCHIDACEAE	Spiranthes sinensis
OROBANCHACEAE	Boschniakia himalaica
PAPAVERACEAE	Corydalis alburyi
PAPAVERACEAE	Corydalis casimiriana
PAPAVERACEAE	Corydalis chaerophylla
PAPAVERACEAE	Corydalis chasmophila
PAPAVERACEAE	Corydalis clavibracteata
PAPAVERACEAE	Corydalis elegans
PAPAVERACEAE	Corydalis gerdae
PAPAVERACEAE	Corydalis govaniana
PAPAVERACEAE	Corydalis hamata
PAPAVERACEAE	Corydalis hookeri
PAPAVERACEAE	Corydalis latiflora
PAPAVERACEAE	Corydalis longipes
PAPAVERACEAE	Corydalis megacalyx
PAPAVERACEAE	Corydalis nana
PAPAVERACEAE	Corydalis pachypoda
PAPAVERACEAE	Corydalis polygalina
PAPAVERACEAE	Corydalis pseudojuncea
PAPAVERACEAE	Corydalis staintonii
PAPAVERACEAE	Corydalis stricta
PAPAVERACEAE	Corydalis sykesii
PAPAVERACEAE	Corydalis trifoliata
PAPAVERACEAE	Hypecoum leptocarpum
PAPAVERACEAE	Meconopsis discigera
PAPAVERACEAE	Meconopsis gracilipes
PAPAVERACEAE	Meconopsis lyrata
PAPAVERACEAE	Meconopsis paniculata
PAPAVERACEAE	Meconopsis regia
PAPAVERACEAE	Meconopsis taylorii
PARNASSIACEAE	Parnassia chinensis
PARNASSIACEAE	Parnassia kumaonica
PARNASSIACEAE	Parnassia nubicola
PARNASSIACEAE	Parnassia pusilla
PLANTAGINACEAE	Plantago erosa
POLYGONACEAE	Aconogonum rumicifolium
POLYGONACEAE	Aconogonum sibiricum
POLYGONACEAE	Bistorta affinis
POLYGONACEAE	Bistorta amplexicaulis
POLYGONACEAE	Bistorta macrophylla
POLYGONACEAE	Bistorta perpusilla
POLYGONACEAE	Bistorta vacciniifolia
POLYGONACEAE	Bistorta vivipara
POLYGONACEAE	Fagopyrum esculentum
POLYGONACEAE	Koenigia delicatula
POLYGONACEAE	Koenigia forrestii
POLYGONACEAE	Koenigia islandica
POLYGONACEAE	Koenigia nepalensis
POLYGONACEAE	Koenigia nummularifolia
POLYGONACEAE	Oxyria digyna

POLYGONACEAE	Persicaria glacialis
POLYGONACEAE	Persicaria nepalensis
POLYGONACEAE	Persicaria polystachya
POLYGONACEAE	Rheum acuminatum
POLYGONACEAE	Rheum australe
POLYGONACEAE	Rheum delavayi
POLYGONACEAE	Rheum moorcroftianum
POLYGONACEAE	Rheum nobile
POLYGONACEAE	Rheum spiciforme
POLYGONACEAE	Rheum webbianum
POLYGONACEAE	Rumex acetosa
POLYGONACEAE	Rumex nepalensis
POTAMOGETONACEAE	Potamogeton filiformis
POTAMOGETONACEAE	Potamogeton natans
PRIMULACEAE	Androsace delavayi
PRIMULACEAE	Androsace globifera
PRIMULACEAE	Androsace hookeriana
PRIMULACEAE	Androsace nortonii
PRIMULACEAE	Androsace strigillosa
PRIMULACEAE	Androsace zambalensis
PRIMULACEAE	Primula atrodentata
PRIMULACEAE	Primula aureata
PRIMULACEAE	Primula bellidifolia
PRIMULACEAE	Primula calderiana
PRIMULACEAE	Primula capitata
PRIMULACEAE	Primula caveana
PRIMULACEAE	Primula denticulata
PRIMULACEAE	Primula deuteronana
PRIMULACEAE	Primula dickieana
PRIMULACEAE	Primula didyma
PRIMULACEAE	Primula edgeworthii
PRIMULACEAE	Primula geraniifolia
PRIMULACEAE	Primula glabra
PRIMULACEAE	Primula gracilipes
PRIMULACEAE	Primula hookeri
PRIMULACEAE	Primula involucreta
PRIMULACEAE	Primula megalocarpa
PRIMULACEAE	Primula muscoides
PRIMULACEAE	Primula obliqua
PRIMULACEAE	Primula poluninii
PRIMULACEAE	Primula primulina
PRIMULACEAE	Primula pulchra
PRIMULACEAE	Primula ramzananae
PRIMULACEAE	Primula reidii
PRIMULACEAE	Primula reticulata
PRIMULACEAE	Primula rotundifolia
PRIMULACEAE	Primula sapphirina
PRIMULACEAE	Primula sharmae
PRIMULACEAE	Primula sikkimensis
PRIMULACEAE	Primula soldanelloides
PRIMULACEAE	Primula spathulifolia
PRIMULACEAE	Primula stirtoniana
PRIMULACEAE	Primula stuartii
PRIMULACEAE	Primula tanneri
PRIMULACEAE	Primula tibetica
PRIMULACEAE	Primula uniflora
PRIMULACEAE	Primula walshii
PRIMULACEAE	Primula wigramiana
PRIMULACEAE	Primula wollastonii
RANUNCULACEAE	Aconitum alpino-nepalense
RANUNCULACEAE	Aconitum amplexicaule
RANUNCULACEAE	Aconitum angulatum
RANUNCULACEAE	Aconitum deinorrhizum
RANUNCULACEAE	Aconitum dhwojii

RANUNCULACEAE	Aconitum gammiei
RANUNCULACEAE	Aconitum heterophylloides
RANUNCULACEAE	Aconitum hookeri
RANUNCULACEAE	Aconitum laciniatum
RANUNCULACEAE	Aconitum naviculare
RANUNCULACEAE	Aconitum novoluridum
RANUNCULACEAE	Aconitum orochryseum
RANUNCULACEAE	Aconitum pulchellum
RANUNCULACEAE	Aconitum rotundifolium
RANUNCULACEAE	Aconitum spicatum
RANUNCULACEAE	Aconitum staintonii
RANUNCULACEAE	Aconitum tamuranum
RANUNCULACEAE	Aconitum violaceum
RANUNCULACEAE	Adonis nepalensis
RANUNCULACEAE	Anemone fuscopurpurea
RANUNCULACEAE	Anemone obtusiloba
RANUNCULACEAE	Anemone polyanthes
RANUNCULACEAE	Anemone polycarpa
RANUNCULACEAE	Anemone rupestris
RANUNCULACEAE	Anemone rupicola
RANUNCULACEAE	Anemone smithiana
RANUNCULACEAE	Anemone trullifolia
RANUNCULACEAE	Aquilegia moorcroftiana
RANUNCULACEAE	Caltha govaniana
RANUNCULACEAE	Caltha palustris
RANUNCULACEAE	Delphinium cooperi
RANUNCULACEAE	Delphinium glaciale
RANUNCULACEAE	Delphinium himalayai
RANUNCULACEAE	Delphinium incisum
RANUNCULACEAE	Delphinium kamaonense
RANUNCULACEAE	Delphinium nortonii
RANUNCULACEAE	Delphinium vestitum
RANUNCULACEAE	Oxygraphis polypetala
RANUNCULACEAE	Paraquilegia microphylla
RANUNCULACEAE	Paroxygraphis sikkimensis
RANUNCULACEAE	Ranunculus adoxifolius
RANUNCULACEAE	Ranunculus brotherusii
RANUNCULACEAE	Ranunculus munroanus
RANUNCULACEAE	Ranunculus oreionannos
RANUNCULACEAE	Ranunculus pegaeus
RANUNCULACEAE	Ranunculus pseudopygmaeus
RANUNCULACEAE	Ranunculus trichophyllus
RANUNCULACEAE	Ranunculus tricuspis
RANUNCULACEAE	Thalictrum alpinum
RANUNCULACEAE	Thalictrum cultratum
RANUNCULACEAE	Thalictrum elegans
RANUNCULACEAE	Thalictrum foetidum
RANUNCULACEAE	Thalictrum platycarpum
RANUNCULACEAE	Thalictrum rutifolium
RANUNCULACEAE	Thalictrum setulosinerve
RANUNCULACEAE	Thalictrum virgatum
RHAMNACEAE	Berchemia edgeworthii
ROSACEAE	Cotoneaster adpressus
ROSACEAE	Cotoneaster duthieanus
ROSACEAE	Fragaria nilgerrensis
ROSACEAE	Geum elatum
ROSACEAE	Geum sikkimense
ROSACEAE	Potentilla anserina
ROSACEAE	Potentilla argyrophylla
ROSACEAE	Potentilla biflora
ROSACEAE	Potentilla cuneata
ROSACEAE	Potentilla exigua
ROSACEAE	Potentilla forrestii
ROSACEAE	Potentilla fulgens

ROSACEAE	Potentilla monanthes
ROSACEAE	Potentilla peduncularis
ROSACEAE	Potentilla polyphylla
ROSACEAE	Potentilla saundersiana
ROSACEAE	Rosa sericea
ROSACEAE	Rubus fragarioides
ROSACEAE	Sanguisorba diandra
ROSACEAE	Sibbaldia cuneata
ROSACEAE	Sibbaldia perpusilloides
ROSACEAE	Sibbaldia sikkimensis
ROSACEAE	Sibbaldia tetrandra
ROSACEAE	Sorbus microphylla
ROSACEAE	Sorbus ursina
ROSACEAE	Spiraea arcuata
ROSACEAE	Spiraea bella
ROSACEAE	Spiraea diversifolia
RUBIACEAE	Galium acutum
RUBIACEAE	Galium exile
RUBIACEAE	Galium pusillosetosum
SALICACEAE	Salix anticecrenata
SALICACEAE	Salix bhutanensis
SALICACEAE	Salix calyculata
SALICACEAE	Salix daltoniana
SALICACEAE	Salix eriostachya
SALICACEAE	Salix hylematica
SALICACEAE	Salix karelinii
SALICACEAE	Salix lindleyana
SALICACEAE	Salix ovatomicrophylla
SALICACEAE	Salix serpyllum
SALICACEAE	Salix sikkimensis
SANTALACEAE	Thesium emodi
SAXIFRAGACEAE	Bergenia purpurascens
SAXIFRAGACEAE	Chrysosplenium forrestii
SAXIFRAGACEAE	Chrysosplenium nudicaule
SAXIFRAGACEAE	Chrysosplenium tenellum
SAXIFRAGACEAE	Saxifraga afghanica
SAXIFRAGACEAE	Saxifraga alpigena
SAXIFRAGACEAE	Saxifraga aristulata
SAXIFRAGACEAE	Saxifraga asarifolia
SAXIFRAGACEAE	Saxifraga brachypoda
SAXIFRAGACEAE	Saxifraga caveana
SAXIFRAGACEAE	Saxifraga consanguinea
SAXIFRAGACEAE	Saxifraga contraria
SAXIFRAGACEAE	Saxifraga cordigera
SAXIFRAGACEAE	Saxifraga diversifolia
SAXIFRAGACEAE	Saxifraga elliptica
SAXIFRAGACEAE	Saxifraga engleriana
SAXIFRAGACEAE	Saxifraga excellens
SAXIFRAGACEAE	Saxifraga glabricaulis
SAXIFRAGACEAE	Saxifraga granulifera
SAXIFRAGACEAE	Saxifraga hemisphaerica
SAXIFRAGACEAE	Saxifraga hirculoides
SAXIFRAGACEAE	Saxifraga hispidula
SAXIFRAGACEAE	Saxifraga hookeri
SAXIFRAGACEAE	Saxifraga humilis
SAXIFRAGACEAE	Saxifraga hypostoma
SAXIFRAGACEAE	Saxifraga jacquemontiana
SAXIFRAGACEAE	Saxifraga kingiana
SAXIFRAGACEAE	Saxifraga kumaunensis
SAXIFRAGACEAE	Saxifraga llonakhensis
SAXIFRAGACEAE	Saxifraga lowndesii
SAXIFRAGACEAE	Saxifraga lychnitis
SAXIFRAGACEAE	Saxifraga melanocentra
SAXIFRAGACEAE	Saxifraga mira



SAXIFRAGACEAE	Saxifraga montana
SAXIFRAGACEAE	Saxifraga montanella
SAXIFRAGACEAE	Saxifraga moorcroftiana
SAXIFRAGACEAE	Saxifraga mucronulata
SAXIFRAGACEAE	Saxifraga nakaoi
SAXIFRAGACEAE	Saxifraga namdoensis
SAXIFRAGACEAE	Saxifraga nanella
SAXIFRAGACEAE	Saxifraga neopropagulifera
SAXIFRAGACEAE	Saxifraga nutans
SAXIFRAGACEAE	Saxifraga pallida
SAXIFRAGACEAE	Saxifraga palpebrata
SAXIFRAGACEAE	Saxifraga parnassifolia
SAXIFRAGACEAE	Saxifraga parva
SAXIFRAGACEAE	Saxifraga perpusilla
SAXIFRAGACEAE	Saxifraga pilifera
SAXIFRAGACEAE	Saxifraga punctulata
SAXIFRAGACEAE	Saxifraga rhodopetala
SAXIFRAGACEAE	Saxifraga rolwalingensis
SAXIFRAGACEAE	Saxifraga sibirica
SAXIFRAGACEAE	Saxifraga sphaeradena
SAXIFRAGACEAE	Saxifraga staintonii
SAXIFRAGACEAE	Saxifraga stenophylla
SAXIFRAGACEAE	Saxifraga stolitzkae
SAXIFRAGACEAE	Saxifraga strigosa
SAXIFRAGACEAE	Saxifraga tentaculata
SAXIFRAGACEAE	Saxifraga williamsii
SAXIFRAGACEAE	Saxifraga zimmermannii
SCROPHULARIACEAE	Euphrasia himalayica
SCROPHULARIACEAE	Euphrasia nepalensis
SCROPHULARIACEAE	Lagotis clarkei
SCROPHULARIACEAE	Lancea tibetica
SCROPHULARIACEAE	Oreosolen unguiculatus
SCROPHULARIACEAE	Oreosolen wattii
SCROPHULARIACEAE	Oreosolen williamsii
SCROPHULARIACEAE	Pedicularis alashanica
SCROPHULARIACEAE	Pedicularis albiflora
SCROPHULARIACEAE	Pedicularis annapurnensis
SCROPHULARIACEAE	Pedicularis brevifolia
SCROPHULARIACEAE	Pedicularis cheilanthifolia
SCROPHULARIACEAE	Pedicularis collata
SCROPHULARIACEAE	Pedicularis confertiflora
SCROPHULARIACEAE	Pedicularis cornigera
SCROPHULARIACEAE	Pedicularis denudata
SCROPHULARIACEAE	Pedicularis diffusa
SCROPHULARIACEAE	Pedicularis elevatogaleata
SCROPHULARIACEAE	Pedicularis elwesii
SCROPHULARIACEAE	Pedicularis furfuracea
SCROPHULARIACEAE	Pedicularis heydei
SCROPHULARIACEAE	Pedicularis hoffmeisteri
SCROPHULARIACEAE	Pedicularis hookeriana
SCROPHULARIACEAE	Pedicularis integrifolia
SCROPHULARIACEAE	Pedicularis kansuensis
SCROPHULARIACEAE	Pedicularis klotzschii
SCROPHULARIACEAE	Pedicularis lachnoglossa
SCROPHULARIACEAE	Pedicularis lamjungensis
SCROPHULARIACEAE	Pedicularis longiflora
SCROPHULARIACEAE	Pedicularis megalantha
SCROPHULARIACEAE	Pedicularis microcalyx
SCROPHULARIACEAE	Pedicularis mollis
SCROPHULARIACEAE	Pedicularis muquensis
SCROPHULARIACEAE	Pedicularis muscoides
SCROPHULARIACEAE	Pedicularis nana
SCROPHULARIACEAE	Pedicularis nepalensis
SCROPHULARIACEAE	Pedicularis nodosa

SCROPHULARIACEAE	Pedicularis odontoloma
SCROPHULARIACEAE	Pedicularis ophiocephala
SCROPHULARIACEAE	Pedicularis oxyrhyncha
SCROPHULARIACEAE	Pedicularis poluninii
SCROPHULARIACEAE	Pedicularis porrecta
SCROPHULARIACEAE	Pedicularis pseudoregeliana
SCROPHULARIACEAE	Pedicularis regeliana
SCROPHULARIACEAE	Pedicularis rhinanthoides
SCROPHULARIACEAE	Pedicularis schizorrhyncha
SCROPHULARIACEAE	Pedicularis scullyana
SCROPHULARIACEAE	Pedicularis siphonantha
SCROPHULARIACEAE	Pedicularis trichodonta
SCROPHULARIACEAE	Pedicularis wallichii
SCROPHULARIACEAE	Picrorhiza scrophulariiflora
SCROPHULARIACEAE	Scrophularia pauciflora
SCROPHULARIACEAE	Veronica anagallis-aquatica
SCROPHULARIACEAE	Veronica biloba
SCROPHULARIACEAE	Veronica cephaloides
SCROPHULARIACEAE	Veronica deltigera
SCROPHULARIACEAE	Veronica himalensis
SCROPHULARIACEAE	Veronica lanuginosa
SCROPHULARIACEAE	Veronica robusta
SCROPHULARIACEAE	Veronica umbelliformis
SOLANACEAE	Mandragora caulescens
SOLANACEAE	Physochlaina praealta
SOLANACEAE	Scopolia tangutica
TAMARICACEAE	Myricaria rosea
TAMARICACEAE	Myricaria wardii
THYMELAEACEAE	Stellera chamaejasme
UMBELLIFERAE	Acronema acronemifolium
UMBELLIFERAE	Acronema handelii
UMBELLIFERAE	Bupleurum falcatum
UMBELLIFERAE	Bupleurum longicaule
UMBELLIFERAE	Chamaesium novemjugum
UMBELLIFERAE	Cortia depressa
UMBELLIFERAE	Cortiella hookeri
UMBELLIFERAE	Heracleum brunonis
UMBELLIFERAE	Heracleum lallii
UMBELLIFERAE	Heracleum wallichii
UMBELLIFERAE	Physospermopsis obtusiuscula
UMBELLIFERAE	Pimpinella tibetanica
UMBELLIFERAE	Pleurospermum apiolens
UMBELLIFERAE	Pleurospermum brunonis
UMBELLIFERAE	Pleurospermum dentatum
UMBELLIFERAE	Pleurospermum rotundatum
UMBELLIFERAE	Pleurospermum stellatum
UMBELLIFERAE	Selinum cortioides
UMBELLIFERAE	Selinum tenuifolium
URTICACEAE	Urtica hyperborea
VALERIANACEAE	Nardostachys grandiflora
VALERIANACEAE	Valeriana barbulata
VIOLACEAE	Viola biflora



## **Appendix 4-3**

---

### **Gymnosperms recorded in the PAS of the Highlands**



APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL

Gymnosperms Report (Qualitative)

Taxonomy: All species

Area: All protected Areas

Number of Species : 16

Family	Genus	Species	Protected Areas													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
CUPRESSACEAE	CUPRESSUS	torulosa	-	-	-	+	-	-	-	-	+	-	-	-	-	+
CUPRESSACEAE	JUNIPERUS	communis	-	-	-	+	-	+	-	-	-	-	-	-	-	-
CUPRESSACEAE	JUNIPERUS	indica	-	+	-	+	-	+	-	+	+	+	-	-	-	+
CUPRESSACEAE	JUNIPERUS	recurva	-	+	-	+	+	+	-	-	+	+	-	-	-	+
CUPRESSACEAE	JUNIPERUS	squamata	-	-	-	+	+	+	-	-	-	+	-	-	-	+
EPHEDRACEAE	EPHEDRA	gerardiana	-	+	-	+	-	+	-	-	+	+	-	-	-	-
GNETACEAE	GNETUM	montanum	-	+	+	-	-	-	-	-	-	-	-	-	-	-
PINACEAE	ABIES	spectabilis	-	+	-	+	+	+	+	-	+	+	-	-	-	+
PINACEAE	CEDRUS	deodara	-	-	-	-	+	-	+	-	-	+	-	-	-	+
PINACEAE	LARIX	griffithiana	-	-	-	-	-	+	-	-	+	-	-	-	-	-
PINACEAE	LARIX	potaninii	-	-	-	-	-	+	-	-	-	-	-	-	-	-
PINACEAE	PICEA	smithiana	-	-	-	+	-	-	+	-	-	+	-	-	-	+
PINACEAE	PINUS	roxburghii	-	+	+	-	-	+	-	+	-	-	-	-	+	-
PINACEAE	PINUS	wallichiana	-	-	-	+	+	+	+	-	+	+	-	-	+	+
PINACEAE	TSUGA	dumosa	-	+	-	-	-	+	-	-	+	+	-	-	-	-
TAXACEAE	TAXUS	baccata	-	+	-	+	+	+	-	-	+	-	-	-	-	+

Legend:

1 = KOSHI TAPPU  
5 = KHAPTAD  
9 = SAGARMATHA  
13 = SHIVAPURI

2 = MAKALU BARUN  
6 = LANGTANG  
10 = SHEY-PHOKSUNDO  
14 = DHORPATAN

3 = ROYAL CHITWAN  
7 = RARA  
11 = PARSA

4 = ANNAPURNA  
8 = ROYAL BARDIA  
12 = ROYAL SUKLAPHANTA



## **Appendix 4-4**

---

### **Pteridophytes recorded in the Highlands**





# Appendix 4-4

## APPLIED DATABASE for INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL

### Pteridophytes Report (Qualitative)

Taxonomy: All species

Physiographic zone: High Mountain

Bioclimatic zone : Alpine + Sub-Alpine

Number of Species : 78

Family	Scientific Name
ASPIDIACEAE	Ctenitis clarkei
ASPIDIACEAE	Ctenitis nidus
ASPLENIACEAE	Asplenium septentrionale
ASPLENIACEAE	Asplenium trichomanes
ASPLENIACEAE	Asplenium varians
ASPLENIACEAE	Asplenium viride
ATHYRIACEAE	Athyrium atkinsonii
ATHYRIACEAE	Athyrium dentigerum
ATHYRIACEAE	Athyrium duthiei
ATHYRIACEAE	Athyrium falcatum
ATHYRIACEAE	Athyrium filix-femina
ATHYRIACEAE	Athyrium fimbriatum
ATHYRIACEAE	Athyrium rupicola
ATHYRIACEAE	Athyrium schimperi
ATHYRIACEAE	Athyrium schizochlamys
ATHYRIACEAE	Athyrium strigillosum
ATHYRIACEAE	Athyrium subtriangulare
ATHYRIACEAE	Athyrium wallichianum
ATHYRIACEAE	Cystopteris fragilis
ATHYRIACEAE	Cystopteris sudetica
ATHYRIACEAE	Deparia allantodioides
ATHYRIACEAE	Woodsia andersonii
ATHYRIACEAE	Woodsia cycloloba
ATHYRIACEAE	Woodsia elongata
DAVALLIACEAE	Araiostegia hookeri
DRYOPTERIDACEAE	Acrophorus stipellatus
DRYOPTERIDACEAE	Arachniodes spectabilis
DRYOPTERIDACEAE	Cyrtomium macrophyllum
DRYOPTERIDACEAE	Dryopteris barbigera
DRYOPTERIDACEAE	Dryopteris chrysocoma
DRYOPTERIDACEAE	Dryopteris serrato-dentata
DRYOPTERIDACEAE	Dryopteris sino-fibrillosa
DRYOPTERIDACEAE	Dryopteris subbarbigera
DRYOPTERIDACEAE	Polystichum atkinsonii
DRYOPTERIDACEAE	Polystichum bakerianum
DRYOPTERIDACEAE	Polystichum lachenense
DRYOPTERIDACEAE	Polystichum neolobatum
DRYOPTERIDACEAE	Polystichum nigropaleaceum

DRYOPTERIDACEAE	Polystichum obliquum
DRYOPTERIDACEAE	Polystichum prescottianum
DRYOPTERIDACEAE	Polystichum squarrosus
DRYOPTERIDACEAE	Polystichum stenophyllum
DRYOPTERIDACEAE	Polystichum stimulans
DRYOPTERIDACEAE	Polystichum thomsonii
EQUISETACEAE	Equisetum arvense
GRAMMITIDACEAE	Xiphopteris sikkimensis
HYMENOPHYLLACEAE	Crepidomanes schmidtianum
HYMENOPHYLLACEAE	Hymenophyllum polyanthos
LYCOPODIACEAE	Lycopodium clavatum
LYCOPODIACEAE	Lycopodium herterianum
LYCOPODIACEAE	Lycopodium selago
LYCOPODIACEAE	Lycopodium veitchii
OPHIOGLOSSACEAE	Botrychium lunaria
OPHIOGLOSSACEAE	Botrychium multifidum
OSMUNDACEAE	Osmunda claytoniana
PARKERIACEAE	Adiantum pedatum
PARKERIACEAE	Adiantum venustum
PARKERIACEAE	Cheilanthes duthiei
PARKERIACEAE	Cheilanthes subvillosa
PARKERIACEAE	Cryptogramma brunoniana
PARKERIACEAE	Cryptogramma stelleri
PARKERIACEAE	Notholaena marantae
PARKERIACEAE	Onychium contiguum
POLYPODIACEAE	Crypsinus ebenipes
POLYPODIACEAE	Crypsinus malacodon
POLYPODIACEAE	Crypsinus nigrovenius
POLYPODIACEAE	Crypsinus quasidivaricatus
POLYPODIACEAE	Crypsinus stewardtii
POLYPODIACEAE	Lepisorus bicolor
POLYPODIACEAE	Lepisorus clathratus
POLYPODIACEAE	Polypodium atkinsonii
POLYPODIACEAE	Polypodium subamoenum
PTERIDACEAE	Pteris dactylina
PTERIDACEAE	Pteris puberula
SELAGINELLACEAE	Selaginella pallidissima
SELAGINELLACEAE	Selaginella sanguinolenta
THELYPTERIDACEAE	Thelypteris phegopteris
VITTARIACEAE	Vittaria taeniophylla

## **Appendix 4-5**

---

### **Bryophytes recorded in the Highlands**



# Appendix 4-5

## APPLIED DATABASE for INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL

### Bryophytes Report (Qualitative)

Taxonomy: All species

Physiographic zone: High Mountain

Bioclimatic zone : Alpine + Sub-Alpine

Number of Species : 347

Family	Scientific Name
ACROBOLBACEAE	Acrobolbus ciliatus
AMBLYSTEGIACEAE	Calliergon sarmentosum
AMBLYSTEGIACEAE	Cratoneuron commutatum
AMBLYSTEGIACEAE	Cratoneuron filicinum
AMBLYSTEGIACEAE	Drepanocladus uncinatus
ANDREAEACEAE	Andreaea densifolia
ANDREAEACEAE	Andreaea rupestris
ANTHELIACEAE	Anthelia juratzkana
ARNELLIACEAE	Southbya gollanii
AULACOMNIACEAE	Aulacomnium palustre
BARTRAMIACEAE	Anacolia menziesii
BARTRAMIACEAE	Anacolia sinensis
BARTRAMIACEAE	Bartramia halleriana
BARTRAMIACEAE	Bartramia ithyphylla
BARTRAMIACEAE	Breutelia dicranacea
BARTRAMIACEAE	Fleischerobryum longicolle
BARTRAMIACEAE	Philonotis fontana
BARTRAMIACEAE	Philonotis turneriana
BARTRAMIACEAE	Plagiopus oederi
BLEPHAROSTOMACEAE	Blepharostoma trichophyllum
BLEPHAROSTOMACEAE	Pseudolepicolea trollii
BRACHYTHECIACEAE	Brachythecium buchanani
BRACHYTHECIACEAE	Brachythecium formosanum
BRACHYTHECIACEAE	Brachythecium populeum
BRACHYTHECIACEAE	Brachythecium rutabulum
BRACHYTHECIACEAE	Cirriphyllum cirrhosus
BRACHYTHECIACEAE	Eurhynchium riparioides
BRYACEAE	Brachymenium longicolle
BRYACEAE	Bryum algovicum
BRYACEAE	Bryum argenteum
BRYACEAE	Bryum auratum
BRYACEAE	Bryum blandum
BRYACEAE	Bryum caespiticium
BRYACEAE	Bryum pallens
BRYACEAE	Bryum paradoxum
BRYACEAE	Bryum pellucidum
BRYACEAE	Bryum pseudotriquetrum
BRYACEAE	Bryum recurvulum

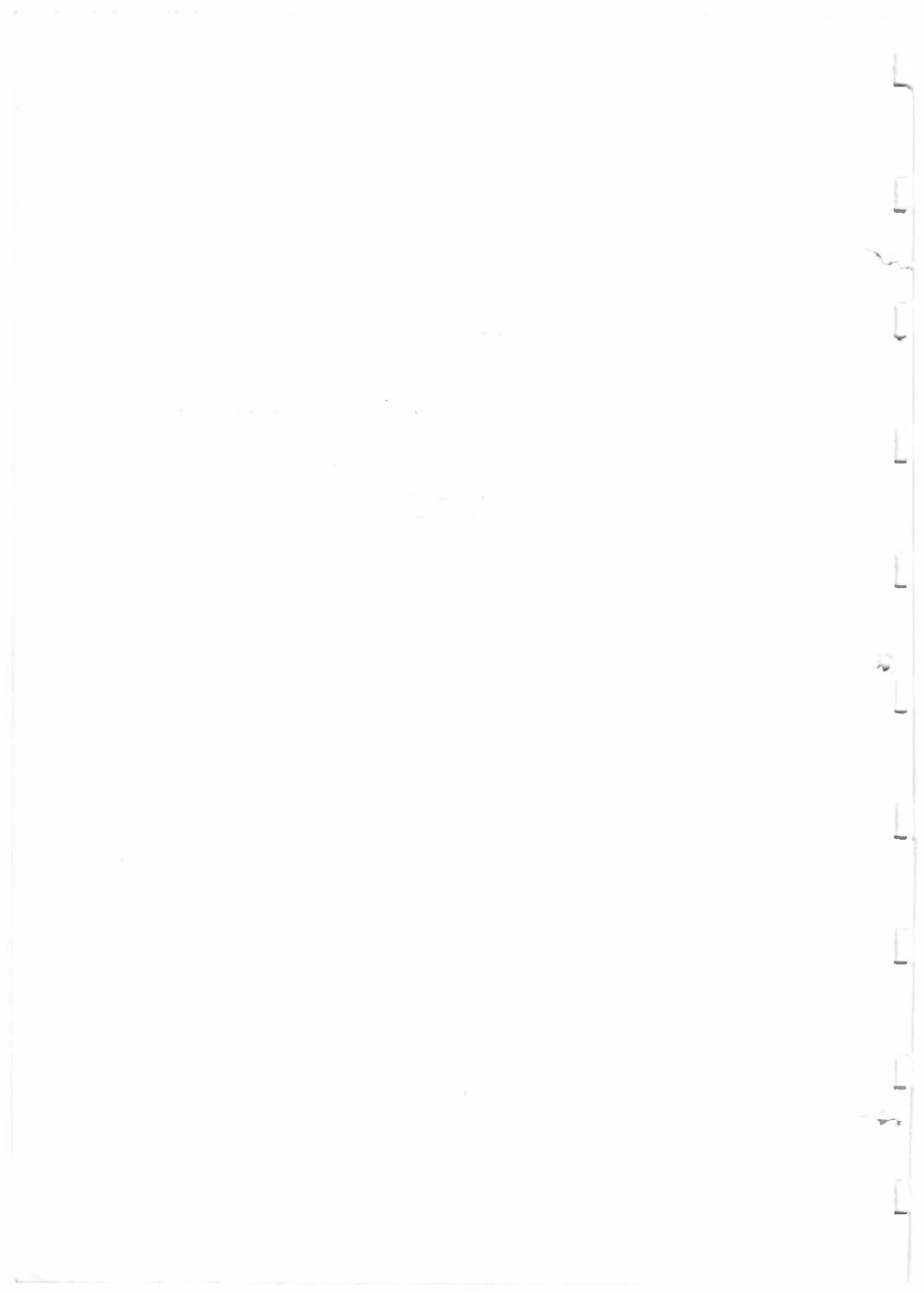
BRYACEAE	Bryum reflexifolium
BRYACEAE	Bryum salakense
BRYACEAE	Bryum subrotundum
BRYACEAE	Bryum teretiusculum
BRYACEAE	Bryum thomsonii
BRYACEAE	Bryum ventricosum
BRYACEAE	Bryum wightii
BRYACEAE	Plagiobryum demissum
BRYACEAE	Pohlia acuminata
BRYACEAE	Pohlia cruda
BRYACEAE	Pohlia crudoides
BRYACEAE	Pohlia elongata
BRYACEAE	Pohlia longicollis
BRYACEAE	Pohlia nutans
BRYACEAE	Pohlia prolifera
BRYACEAE	Rhodobryum roseum
CALYPOGEIACEAE	Calypogeia lunata
CALYPOGEIACEAE	Matacylopogeia alternifolia
CEPHALOZIACEAE	Cephalozia terminalis
CEPHALOZIELLACEAE	Cephaloziella massalongoi
CLEVEACEAE	Sauteria spongiosa
CLIMACIACEAE	Climacium dendroides
CRYPHAEACEAE	Sphaerothereciella sphaerocarpa
DICRANACEAE	Aongstroemia julacea
DICRANACEAE	Aongstroemia orientalis
DICRANACEAE	Atractylocarpus erectifolius
DICRANACEAE	Brothera himalayana
DICRANACEAE	Brothera leana
DICRANACEAE	Campylopodiella tenella
DICRANACEAE	Campylopus albescens
DICRANACEAE	Campylopus alpigena
DICRANACEAE	Campylopus goughii
DICRANACEAE	Campylopus gracilis
DICRANACEAE	Campylopus introflexus
DICRANACEAE	Campylopus latinervis
DICRANACEAE	Campylopus nilghiriensis
DICRANACEAE	Campylopus schwarzii
DICRANACEAE	Dichodontium pellucidum
DICRANACEAE	Dicranella heteromalla
DICRANACEAE	Dicranodontium asperulum
DICRANACEAE	Dicranodontium caespitosum
DICRANACEAE	Dicranodontium denudatum
DICRANACEAE	Dicranodontium dimorphus
DICRANACEAE	Dicranodontium nepalense
DICRANACEAE	Dicranodontium uncinatum
DICRANACEAE	Dicranoweisia alpina
DICRANACEAE	Dicranoweisia indica
DICRANACEAE	Dicranum crispifolium
DICRANACEAE	Dicranum gymnostomum
DICRANACEAE	Dicranum himalayanum
DICRANACEAE	Dicranum setschwanicum
DICRANACEAE	Oncophorus wahlenbergii
DICRANACEAE	Oreas martiana
DICRANACEAE	Paraleucobryum enerve

DICRANACEAE	Rhabdoweisia crenulata
DICRANACEAE	Symblepharis helicophylla
DITRICHACEAE	Ceratodon purpureus
DITRICHACEAE	Ceratodon stenocarpus
DITRICHACEAE	Distichium capillaceum
ENCALYPTACEAE	Encalyptra alpina
ENCALYPTACEAE	Encalyptra ciliata
ENTODONTACEAE	Entodon concinnus
ENTODONTACEAE	Entodon laetus
ENTODONTACEAE	Entodon prorepens
ENTODONTACEAE	Orthothecium intricatum
ENTODONTACEAE	Rozea pterogonioides
EXORMOTHECACEAE	Exormotheca tuberifera
FABRONIACEAE	Schwetschkeopsis formosana
FISSIDENTACEAE	Fissidens cristatus
FISSIDENTACEAE	Fissidens grandifrons
FISSIDENTACEAE	Fissidens involutus
FRULLANIACEAE	Frullania delavayi
FRULLANIACEAE	Frullania duthiana
FRULLANIACEAE	Frullania nepalensis
FRULLANIACEAE	Frullania yunnanensis
FUNARIACEAE	Funaria hygrometrica
FUNARIACEAE	Physcomitrium eurystomum
GRIMMIACEAE	Grimmia affinis
GRIMMIACEAE	Racomitrium crispulum
GRIMMIACEAE	Racomitrium fasciculare
GRIMMIACEAE	Racomitrium heterostichum
GRIMMIACEAE	Racomitrium himalayanum
GRIMMIACEAE	Racomitrium subsecundum
GYMNOMITRIACEAE	Gymnomitrium laceratum
GYMNOMITRIACEAE	Gymnomitrium obtusilobum
GYMNOMITRIACEAE	Gymnomitrium papillosum
GYMNOMITRIACEAE	Gymnomitrium sinense
GYMNOMITRIACEAE	Marsupella alpina
GYMNOMITRIACEAE	Marsupella emarginata
GYMNOMITRIACEAE	Marsupella integra
GYMNOMITRIACEAE	Marsupella revoluta
GYMNOMITRIACEAE	Marsupella rubida
HERBERTACEAE	Herberta dicrana
HERBERTACEAE	Herberta fragilis
HERBERTACEAE	Herberta giraldiana
HERBERTACEAE	Herberta himalayana
HERBERTACEAE	Herberta kurzii
HERBERTACEAE	Herberta pseudoceylanica
HERBERTACEAE	Herberta sendtneri
HYLOCOMIACEAE	Hylocomium himalayanum
HYPNACEAE	Hypnum humulosum
HYPNACEAE	Hypnum macrogynum
HYPNACEAE	Hypnum pallescens
HYPNACEAE	Hypnum plumaeforme
HYPNACEAE	Hypnum setschwanicum
HYPNACEAE	Hypnum sikkimense
HYPNACEAE	Isopteripgium albescens
HYPNACEAE	Isopteripgium distichaceum



HYPNACEAE	Leiodontium gracile
HYPNACEAE	Leptocladiella psilura
HYPNACEAE	Leptohymenium tenue
HYPNACEAE	Macrothamnium psilurum
HYPNACEAE	Macrothamnium submacrocarpum
HYPNACEAE	Orontobryum hookeri
HYPNACEAE	Platygyrium russulum
HYPNACEAE	Ptilium crista-castrensis
HYPNACEAE	Pylaisia aurea
HYPNACEAE	Stenotheciopstis serrula
JUNGERMANNIACEAE	Horikawaella grosse-verrucosa
JUNGERMANNIACEAE	Horikawaella subacuta
JUNGERMANNIACEAE	Jungermannia appressifolia
JUNGERMANNIACEAE	Jungermannia atrobrunnea
JUNGERMANNIACEAE	Jungermannia bengalensis
JUNGERMANNIACEAE	Jungermannia flavorevoluta
JUNGERMANNIACEAE	Jungermannia lanigera
JUNGERMANNIACEAE	Jungermannia ohbae
JUNGERMANNIACEAE	Jungermannia parvitexta
JUNGERMANNIACEAE	Jungermannia pseudodecolyana
JUNGERMANNIACEAE	Jungermannia saccaticoncava
JUNGERMANNIACEAE	Jungermannia sanguinolentha
JUNGERMANNIACEAE	Jungermannia subrubra
JUNGERMANNIACEAE	Mylia taylori
JUNGERMANNIACEAE	Nardia nepalensis
JUNGERMANNIACEAE	Nardia poeltii
LEJEUNEACEAE	Leucolejeunea turgida
LEPIDOZIACEAE	Bazannia tricrenata
LEPIDOZIACEAE	Bazzania angustistipula
LEPIDOZIACEAE	Bazzania imbricata
LEPIDOZIACEAE	Bazzania praerupta
LEPIDOZIACEAE	Kurzia makinoana
LEPIDOZIACEAE	Lepidozia reptans
LEPIDOZIACEAE	Lepidozia robusta
LESKEACEAE	Lescuraea incurvata
LEUCODONTACEAE	Leucodon secundus
LOPHOCOLEACEAE	Chiloscyphus inflatus
LOPHOCOLEACEAE	Chiloscyphus polyanthus
LOPHOCOLEACEAE	Lophocolea sikkimesis
LOPHOZIACEAE	Anastrepta orcadensis
LOPHOZIACEAE	Anastrophyllum assimile
LOPHOZIACEAE	Anastrophyllum bidens
LOPHOZIACEAE	Anastrophyllum donianum
LOPHOZIACEAE	Anastrophyllum joergensenii
LOPHOZIACEAE	Andrewsianthus ferrugineus
LOPHOZIACEAE	Chandonanthus filiformis
LOPHOZIACEAE	Chandonanthus hirtellus
LOPHOZIACEAE	Jamesoniella nipponica
LOPHOZIACEAE	Lophozia handelii
LOPHOZIACEAE	Lophozia incisa
LOPHOZIACEAE	Lophozia setosa
LOPHOZIACEAE	Sphenolobopsis himalayensis
LOPHOZIACEAE	Sphenolobus minutus
LOPHOZIACEAE	Tritomaria exsecta

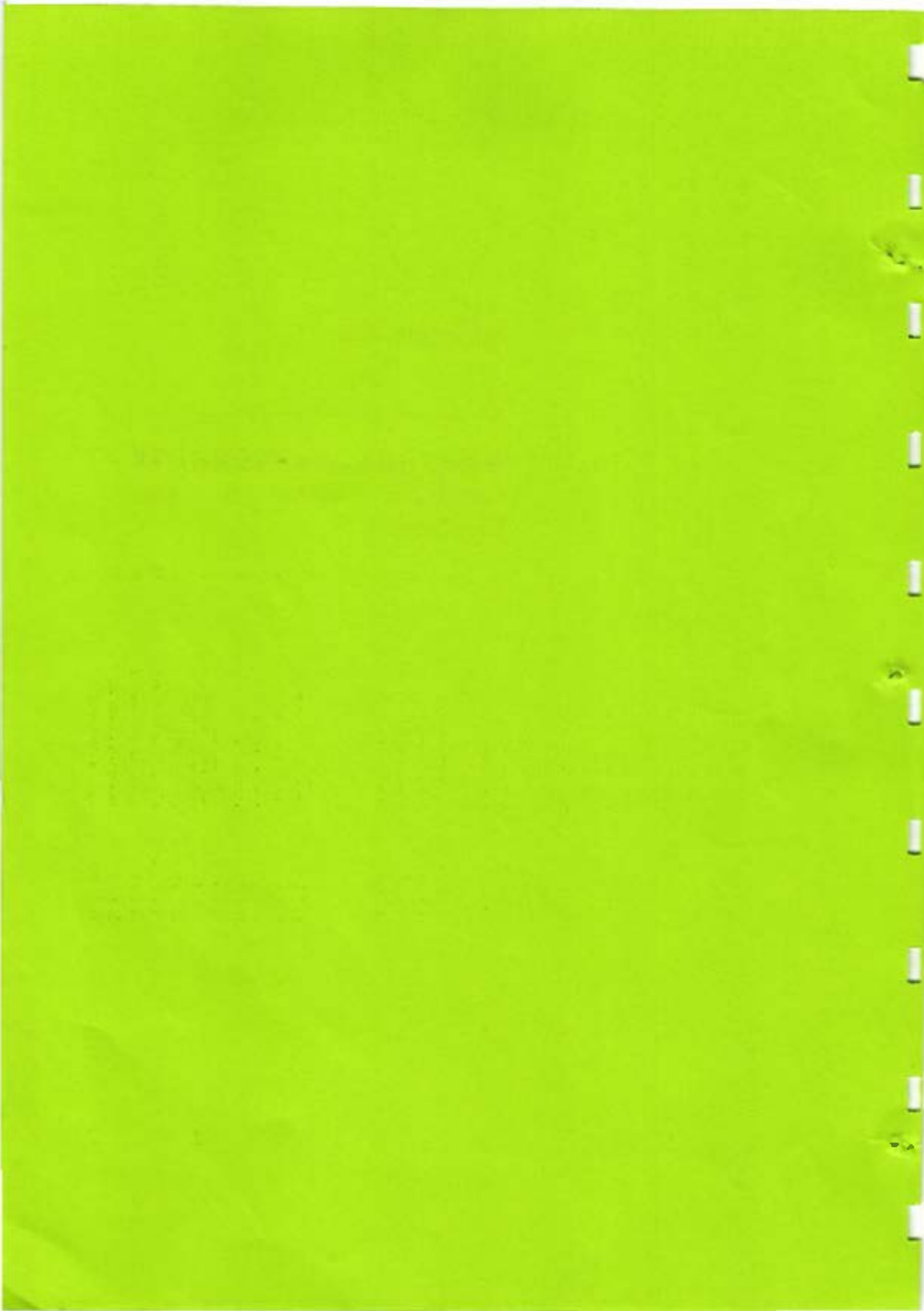
SEMATOPHYLLACEAE	Brotherella amblystegia
SEMATOPHYLLACEAE	Brotherella curvirostris
SEMATOPHYLLACEAE	Brotherella perpinnata
SEMATOPHYLLACEAE	Gammiella capillacea
SEMATOPHYLLACEAE	Pylaisiopsis speciosa
SEMATOPHYLLACEAE	Sematophyllum caespitosum
SEMATOPHYLLACEAE	Struckia argentata
SEMATOPHYLLACEAE	Wijkia penicillata
SPHAGNACEAE	Sphagnum cuspidatulum
SPHAGNACEAE	Sphagnum girgensohnii
SPHAGNACEAE	Sphagnum imbricatum
SPHAGNACEAE	Sphagnum khasianum
SPLACHNACEAE	Tayloria froelichiana
SPLACHNACEAE	Tayloria splachniodes
SPLACHNACEAE	Tetraplodon angustatus
SPLACHNACEAE	Tetraplodon mnioides
SPLACHNACEAE	Tetraplodon urceolatus
TAKAKIACEAE	Takakia ceratophylla
TAKAKIACEAE	Takakia lepidozoioides
TARGIONIACEAE	Targionia hypophylla
TETRAPHIDACEAE	Tetradontium brownianum
THELIACEAE	Myurella sibirica
THUIDIACEAE	Abietinella abietina
THUIDIACEAE	Actinothuidium hookeri
THUIDIACEAE	Anomodon apiculatus
THUIDIACEAE	Anomodon rugelii
THUIDIACEAE	Haplocladium parvulum
THUIDIACEAE	Herpetineuron toccoae
THUIDIACEAE	Thuidium brachymenium
THUIDIACEAE	Thuidium cymbifolium
THUIDIACEAE	Thuidium philibertii
THUIDIACEAE	Thuidium recognitum
TRACHYPODACEAE	Diaphanodon blandus
TRACHYPODACEAE	Duthiella formosana
TRACHYPODACEAE	Trachypodopsis crispatula
TRACHYPODACEAE	Trachypodopsis himanthophylla
TRACHYPODACEAE	Trachypodopsis serrulata
TRACHYPODACEAE	Trachypus bicolor
TRICHOCOLEACEAE	Trichocolea tomentella



## **Appendix 4-6**

---

**Status and distribution of  
butterflies found in the  
Highlands**



## APPENDIX 4-6 DISTRIBUTION OF BUTTERFLIES OF NEPAL HIGHLANDS

### *PAPILIONIDAE:*

<u>NRDB</u>	<u>ENDEMIC</u>	<u>CHECKLIST</u>	<u>World P/H/O</u>	<u>Butterflies of Nepal</u>	<u>Regions of Nepal</u>			<u>E</u>
					<u>W</u>	<u>C</u>		
1	1	A 1.03a	<i>P. epaphus chidii</i>	P	2c	A		
2	2	1.03b	<i>P. epaphus robertsi</i>	P	2d	A	A	
3	3	1.03c	<i>P. epaphus capdevillei</i>	P	2b		A	
4	4	1.03a	<i>P. epaphus boschmai</i>	P	2a			A
		A 1.04a	<i>P. hardwickei</i> (dsf.)	P	3	A	A	A
		1.04b	<i>P. hardwickei</i> (wsf.)	P		A	AM	A
5	5	A 1.09a	<i>P. acdestis laurentii</i>	P	1b		A	
6	6	1.09b	<i>P. acdestis marki</i>	P	1a		A	
7	-	1.09c	<i>P. acdestis whitei</i>	P	1c			A
8	7	A 1.10	<i>P. cephalus horii</i>	P	615		A	
9	-	A 1.11	<i>Parnassius simo</i>	P	616			A
	9	A 9.01a	<i>P. machaon rinpoche</i>	P	20a	AM	AM	AM
		A 11.6	<i>A. alcinous</i>	H	39	A	M K	M

### *PIERIDAE:*

-	10	B 2.1	<i>Mesapia peloria</i>	P	46		A	
18	11	B 3.1	<i>Baltia butleri</i>	P	47	A		
		B 4.1	<i>Pieris brassicae</i>	P	48	AMT	AMT K	AMT
		B 4.2	<i>P. canidia</i>	P	49	AMT	AMT K	AMT
		B 4.6	<i>P. montanus</i>	P	50	AM		
19	-	B 5.2	<i>Synchlœa sherpae</i>	P	52	A	A	
		B 9.10	<i>D. eucharis</i>	O	70	MT	MT K	AMT
		B 18.1(a-c)	<i>C. pomona pomona</i>	O	77	AMT	MT K	MT
		B 19.1	<i>Gonepteryx rhamni</i>	P	80	AM	AM K	AM
		B 19.2	<i>G. aspasia zaneke</i>	H	79	AM	AM K	M
22	12	B 23.02	<i>Colias tibetana</i>	P	87			A

23	-	B 23.03	<i>C. ladakensis</i>	P	90	A	A		
		B 23.06(a-c)	<i>C. erate</i>	H	88	AM	M	K	A
24		B 23.08a	<i>C. stolicckana miranda</i>	P	91				A
25	13	23.08b	<i>C.S. cathleenae</i>	P		A			
		B 23.10	<i>C. fieldii</i>	H	92	AMT	AMT	K	AM

#### LYCAENIDAE:

		C 11.2	<i>E. mandara</i>	H	102	AM	A		M
		C 12.12	<i>C. bhutanensis</i>	H	107	AM	M	K	M
		C 12.14	<i>C. syla</i>	H	108	AM			
		C 61.2	<i>L. phlaeas baralacha</i>	P	197	AM	AM		
		C 62.6	<i>H. oda</i>	H	202	AM	M		
		C 62.8	<i>H. androcles</i>	H	204	AM	M	K	M
		C 73.1	<i>Lampides boeticus</i>	P	225	MT	AMT	K	AMT
		C 81.2	<i>E. hugelii hugelii</i>	H	239	AM		K	
		C 88.1	<i>Acytolepis puspa</i>	O	254	AM	MT	K	MT
		C 90.1a	<i>C. argiolus kollari</i>	P	245	AM			
		90.1b	<i>C. argiolus jynteana</i>				M	K	M
		C 91.1	<i>Udara dilecta</i>	H	252	M	MT	K	AM
		C 96.2	<i>P. stoliczkana</i>	P	263		AM		
59	19	C 96.3	<i>Polyommatus nepalensis</i>	P	262	(AM)	AM		
		C 100.1	<i>Albulina asiatica</i>	P	265	A		A	
		C 100.2	<i>A. lehana</i>	P	266		A		
60	20	C 100.3	<i>A. orbitulus</i>	P	267		A		
		C 100.7	<i>A. galathea</i>	P	268	A			

#### NYMPHALIDAE:

		G 9.1a	<i>Chilrena c. childreni</i>	H	292		AM	K	AM
		9.1b	<i>C. childreni sakontala</i>	H		AM			
		G 10.1	<i>Fabriciana kamala</i>	H	293	AM	AM		
61		G 10.2	<i>F. adippe jaindeva</i>	P	294	A			
62		G 11.1a	<i>Mesoacidalia c. clara</i>	P	295	A			
63	21	11.1b	<i>M. clara shieldsi</i>	P		A			
		G 13.1	<i>Issoria issaea</i>	H	296	AM	AM	K	AM
		G 14.1	<i>K. annapurnae</i>	P	-		A		

65		G 14.2	<i>K. mackinnoni</i>	P	298	A	A		
		G 14.3	<i>Kuekenthaliella gemmata</i>	P	297		A		
		G 16.1	<i>Melitaea arcesia</i>	P	299	AM	A		
		G 18.1	<i>Vanessa cardui</i>	P	304	MT	AMT	K	AM
		G 18.2	<i>V. indica</i>	H	305	M	AMT	K	AM
		G 19.1	<i>Aglaia cashmirensis</i>	H	306	AM	AMT	K	AM
		G 19.2	<i>A. ladakensis</i>	P	307		A		A
		G 20.1	<i>Nymphalis xanthomelas</i>	H	309	AM		K	
		G 22.3	<i>Polygonia agnicula</i>	P	310	A	A		
		G 24.1	<i>Hypolimnias misippus</i>	O	317	M	AM	K	MT
		G 36.04	<i>N. hylas</i>	O	344	AMT	MT	K	MT

# **SATYRIDAE:**

104	27	I 5.03	<i>Z. sidonis</i>	H	419	AM	M	K	M
		I 5.08	<i>Z. maitrya</i>	H	421	A	AM		A
		I 5.11a	<i>Z. jalaurida jalaurida</i>	H	423	A			
		5.11b	<i>Z. jalaurida elwesi</i>	H		A	AM		
		I 5.14	<i>Z. goalpara</i>	H	425	A	M	K	
		I 9.1	<i>Lasiommata menava</i>	P	435	A			
		I 9.3	<i>L. schakra</i>	P	434	AM	AM		
		I 10.1	<i>Raphicera moorei</i>	H	436	AM	M	K	AM
		I 22.1	<i>Ypthima sakra</i>	H	454	AM	M	K	M
		I 22.02a	<i>Y. h. hanningtoni</i>	H	456a		M	K	AM
		22.02b	<i>Y. h. khumbuensis</i>	H	456b				M
		I 24.2	<i>C. hybrida</i>	H	470	AM	M	K	M
		I 24.5	<i>C. nirmala</i>	H	472	AM			
107	29	I 25.3	<i>Paralasa nepalica</i>	P	473	A			
108	30	I 26.1	<i>C. amaryllis forsteri</i>	P	474		AM		
		I 27.4	<i>H. lupinus cheena</i>	P	475	A			
		I 28.1a	<i>Aulocera b. brahminus</i>	H	476	A			
		28.1b	<i>A. brahminus dokwana</i>	H		A	A		
		I 28.2	<i>A. padma</i>	H	477	M	AM	K	A
		I 28.3	<i>A. loha</i>	H	478		M	K	A
		I 28.4a	<i>A. swaha gauena</i>	H	479	AM			
-	31	28.4b	<i>A. swaha lobbichleri</i>	H		AM			
-	32	28.4c	<i>A. swaha schaeferi</i>	H		AM	AM		



I 28.5	<i>A.saraswatti</i>	H	480	M	M	K	
I 31.2	<i>P.pumilus grandis</i>	P	482		A		
I 31.3	<i>Paroeneis sikkimensis</i>	P	483		A		A

**DANAIDAE:**

J 3.1	<i>Parantica aglea</i>	O	488	MT	MT	K	AMT
-------	------------------------	---	-----	----	----	---	-----

**HESPERIIDAE:**

130	, 33	K 2.2	<i>H.chromus</i>	O	506		M	K	AMT
		K 3.1	<i>Badamia exclamationis</i>	O	508	AMT	MT	K	MT
		K 26.2	<i>Pyrgus nepalensis</i>	P	540	A	A		A
		K 27.1	<i>Carterocephalus avanti</i>	P	541	AM	M		A
		K 69.1	<i>Taractrocera danna</i>	H	577	AM	M	K	M

**Notes:** World regions- P = Palaearctic, H = Himalayan, O = Oriental.

Nepal regions- A = Alpine (over 3,000m.)

M = Midland (less than 3,000m, and either above 1,000m, or N. of Mahabharat range)

T = Terai (below 1,000m. but S. of Mahabharat.)

K = Kathmandu Valley (which is M, but between C. & E.)

## **Appendix 4-7**

---

**Status and distribution of fishes  
found in the Highlands**



# APPENDIX 4-7 STATUS AND DISTRIBUTION OF FISHES FOUND IN THE HIGHLANDS

Scientific Name	Local Name	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cu	Es	We	Cu	Es	We	Cu	Es
ORDER	CYPRINIFORMES											
Family - Cyprinidae												
Schizothorax macrophthalmus	Asala	Endemic	# Western							*		
Schizothorax nepalensis	Asala	Endemic	# Western							*		
Schizothorax raraensis	Asala	Endemic	# Western							*		
Schizothorax plagiosomus	Bucche Asala	V					*	*	*		*	
Family - Cobitidae												
Noemacheilus rupeicola	Gadela			*	*	*	*	*	*		*	
Family - Sisoridae												
Euchiloglanis hodgartii	Tilkabri				*	*		*	*		*	
Legend:												
TS = Terai and Siwaliks	We = West											
MH = Midhills	Ce = Central											
HL = High Mountains and Himal	Es = East											
Endemic = Endemic species	# = recorded from Highlands only											
V = Vulnerable	* = species recorded											



## **Appendix 4-8**

---

**Status and distribution of  
herpetofauna found in the  
Highlands**



# APPENDIX 4-8 STATUS AND DISTRIBUTION OF HERPETOFAUNA FOUND IN THE HIGHLANDS

Scientific Name	Common Name	NRDB Status	Confined Region	We	TS Cn	Es	We	MH Cn	Es	We	HL Cn	Es
<b>ORDER ANURA</b>												
<b>Family - Ptilobatidae</b>												
<i>Scutiger alticola</i>			# Central								*	
<i>Scutiger sikkimensis</i>			#							*	*	*
<b>Family - Ranidae</b>												
<i>Amolops afghanus</i>								*	*		*	*
<i>Amolops formosus</i>								*			*	*
<i>Rana parkeri</i>			# Central								*	
<i>Rana leibigii</i>								*			*	*
<i>Rana polunini</i>								*		*	*	*
<i>Rana rara</i>		S (es)						*		*		
<i>Rana rostandui</i>		S (es)						*			*	*
<b>ORDER SAURIA</b>												
<b>Family - Agamidae</b>												
<i>Laudakia tuberculata</i>	Kashmir Agama							*		*	*	*
<i>Calotes versicolor</i>	Common Garden Lizard			*	*	*	*	*	*		*	
<i>Japalura major</i>			# Western							*		
<i>Phrynocephalus theobaldi</i>	Theobald's Toad Agama						*				*	
<b>Family - Gekkonidae</b>												
<i>Hemidactylus garnotti</i>			# Central								*	
<b>Family - Scincidae</b>												
<i>Scincella ludacensis</i>	Himalayana Ground Skink						*	*		*		
<i>Scincella sikkimensis</i>	Sikkim Skink			*		*		*	*		*	*
<b>ORDER SERPENTES</b>												
<b>Family - Colubridae</b>												
<i>Amphiesma platyceps</i>	Mountain Keelback				*	*		*		*	*	
<i>Elaphe hodgsoni</i>	Himalayan Trinket Snake				*	*		*		*	*	*
<i>Oligodon erythrogaster</i>	Red-bellied Kukri Snake						*				*	
<i>Rhabdophis parallela</i>	Boulenger's Keelback					*	*	*				*



## APPENDIX 4-8 STATUS AND DISTRIBUTION OF HERPETOFAUNA FOUND IN THE HIGHLANDS

Scientific Name	Common Name	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cn	Es	We	Cn	Es	We	Cn	Es
<b>Family - Viperidae</b>												
<i>Agkistrodon himalayanus</i>	Himalayan Pit Viper						*	*		*	*	
<i>Trimeresurus albolabris</i>	White-lipped Pit Viper				*			*			*	
<b>Legend:</b>												
S = Susceptible	TS = Terai and Siwalik											
E = Endangered	MH = Midhills											
V = Vulnerable	HL = High mountains and himal											
(es) = Endemic species	We = Western											
# = recorded from High Mountains only	Cn = Central											
* = species recorded	Es = Eastern											

## **Appendix 4-9**

---

### **Status and distribution of bird species found in the Highlands**



# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cu	Es	We	Cu	Es	We	Cu	Es
<b>ORDER</b>	<b>GAVIIFORMES</b>											
<b>Family - Podicipididae</b>												
PODICEPS	CRISTATUS	S			*	*	*	*		*	*	
PODICEPS	NIGRICOLLIS	VG				*	*	*		*		
TACHYBAPTUS	RUFICOLLIS			*	*	*	*	*		*	*	
<b>Family - Phalacrocoracidae</b>												
PHALACROCORAX	CARBO			*	*	*	*	*	*	*	*	*
<b>ORDER</b>	<b>CICONIFORMES</b>											
<b>Family - Ardeidae</b>												
ARDEOLA	GRAYII			*	*	*	*	*	*		*	
EGRETTA	ALBA			*	*	*	*	*		*		
ARDEA	CINEREA			*	*	*	*	*		*	*	
<b>Family - Ciconiidae</b>												
CICONIA	NIGRA	E (IIMG/P)		*	*	*	*	*	*	*	*	
<b>ORDER</b>	<b>ANSERIFORMES</b>											
<b>Family - Anatidae</b>												
ANSER	ANSER	S		*	*	*	*	*	*	*		
ANSER	INDICUS	S		*	*	*		*		*	*	*
TADORNA	FERRUGINEA			*	*	*	*	*	*	*	*	*
ANAS	PENELOPE	S		*	*	*		*		*	*	*
ANAS	STREPERA			*	*	*		*		*	*	*
ANAS	FORMOSA	VG				*		*	*		*	
ANAS	CRECCA			*	*	*	*	*	*	*	*	
ANAS	PLATYRHYNCHIOS			*	*	*	*	*	*	*	*	
ANAS	POECILORHYNCHIA			*	*	*		*			*	
ANAS	ACUTA			*	*	*	*	*	*	*	*	*
ANAS	QUERQUEDULA			*	*	*	*	*	*	*	*	*
ANAS	CLYPEATA			*	*	*		*		*	*	*
NETTA	RUFINA			*	*	*	*	*	*	*		
AYTHYA	FERINA			*	*	*		*		*	*	*
AYTHYA	NYROCA	S		*	*	*		*		*	*	*
AYTHYA	FULIGULA			*	*	*	*	*		*	*	*
BUCEPHALA	CLANGULA	VG			*	*		*		*	*	*
MERGUS	MERGANSE			*	*	*	*	*	*	*	*	
<b>ORDER</b>	<b>FALCONIFORMES</b>											
<b>Family - Accipitridae</b>												
PERNIS	PTILORHYNCHUS			*	*	*	*	*	*		*	*
MILVUS	MIGRANS			*	*	*	*	*	*	*	*	*

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cn	Es	We	Cu	Es	We	Cu	Es
MILVUS	MILVUS	VG	# Central								*	
HALIAEETUS	LEUCORYPHUS	E		*	*	*	*	*			*	
ICHTHYOPHAGA	HUMILIS	E		*	*	*		*				*
NEOPHRON	PERCNOPTERUS	S		*	*	*	*	*	*	*	*	
GYPAETUS	BARBATUS	S		*	*	*	*	*	*	*	*	*
GYPS	BENGHIALENSIS			*	*	*	*	*	*	*	*	*
GYPS	INDICUS	S		*	*	*	*	*	*		*	
GYPS	HIMALAYENSIS				*	*	*	*	*	*	*	*
GYPS	FULVUS			*	*	*	*	*	*		*	
SARCOGYPS	CALVUS	S		*	*	*	*	*	*	*	*	*
AEGYPIUS	MONACHUS	V			*	*	*	*	*	*	*	*
CIRCAETUS	GALLICUS				*	*		*			*	
SPILORNIS	CHEELA	S		*	*	*	*	*	*	*	*	*
CIRCUS	AERUGINOSUS			*	*	*	*	*	*		*	
CIRCUS	CYANEUS			*	*	*	*	*	*	*	*	*
CIRCUS	MACROURUS	S			*	*	*	*	*	*	*	
CIRCUS	PYGARGUS				*	*		*			*	
CIRCUS	MELANOLEUCUS	S		*	*	*	*	*	*		*	
ACCIPITER	GENTILIS			*	*	*	*	*	*	*	*	*
ACCIPITER	VIRGATUS	S			*	*	*	*	*	*	*	*
ACCIPITER	NISUS			*	*	*	*	*	*	*	*	*
ACCIPITER	TRIVIRGATUS	S		*	*	*		*	*		*	*
ACCIPITER	BADIUS	S		*	*	*	*	*	*		*	*
BUTASTUR	TEESA	S		*	*	*		*	*		*	
BUTEO	BUTEO	S		*	*	*	*	*	*	*	*	*
BUTEO	RUFINUS	S		*	*	*		*	*	*	*	*
BUTEO	HEMILASIUS	S		*	*	*	*	*	*	*	*	*
ICTINAETUS	MALAYENSIS			*	*	*	*	*	*	*	*	*
AQUILA	CLANGA	V			*	*		*	*		*	*
AQUILA	NIPALENSIS			*	*	*	*	*	*	*	*	*
AQUILA	RAPAX	E		*	*	*		*			*	
AQUILA	HEIJACA	V			*	*		*	*		*	*
AQUILA	CHRYSAETOS	S				*	*	*	*	*	*	*
HIERAAETUS	PENNATUS			*	*	*	*	*	*	*	*	*
HIERAAETUS	FASCIATUS				*		*	*	*	*	*	
SPIZAETUS	NIPALENSIS	S		*	*	*	*	*	*		*	*
PANDION	HALIAETUS	S		*	*	*	*	*	*	*	*	*



# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cn	Es	We	Cu	Es	We	Cn	Es
<b>Family - Falconidae</b>												
FALCO	NAUMANNI	V			*	*		*	*		*	*
FALCO	TINNUNCULUS			*	*	*	*	*	*	*	*	*
FALCO	CHICQUERA	E			*	*		*	*		*	*
FALCO	AMURENSIS	S			*			*	*	*	*	*
FALCO	COLUMBARIUS					*		*		*	*	*
FALCO	SUBBUTEO			*	*	*	*	*	*	*	*	*
FALCO	SEVERUS	E		*	*	*	*	*			*	
FALCO	CHERRUG	S						*			*	
FALCO	PEREGRINUS	E			*	*	*	*	*	*	*	*
FALCO	PELEGRINOIDES	E						*			*	
ORDER	GALLIFORMES											
<b>Family - Phasianidae</b>												
LERWA	LERWA		#							*	*	*
TETRAOGALLUS	TIBETANUS	S	#							*	*	*
TETRAOGALLUS	HIMALAYENSIS		#							*	*	
ALECTORIS	CHUKAR						*	*		*	*	
PERDIX	HODGSONIAE		#							*	*	
COTURNIX	COTURNIX			*	*	*		*			*	
ARBOROPHILA	TORQUEOLA						*	*	*	*	*	*
ITHAGINIS	CRUENTUS	S						*	*	*	*	*
TRAGOPAN	SATYRA	E (HMG/P)					*	*	*	*	*	*
PUCRASIA	MACROLOPHIA	S					*	*		*	*	
LOPHOPHORUS	IMPEJANUS	S (HMG/P)					*	*	*	*	*	*
LOPHURA	LEUCOMELANA	S		*	*	*	*	*	*	*	*	*
CATREUS	WALLICHII	E (HMG/P)					*	*		*	*	
ORDER	GRUIFORMES											
<b>Family - Rallidae</b>												
GALLINULA	CHLOROPUS			*	*	*		*		*	*	
FULICA	ATRA			*	*	*	*	*		*	*	*
<b>Family - Gruidae</b>												
GRUS	GRUS	E (HMG/P)		*	*	*		*			*	
GRUS	NIGRICOLLIS							*			?	
ANTHIPOIDES	VIRGO	S		*	*	*	*	*	*		*	*
ORDER	CHARADRIIFORMES											
<b>Family - Jacanidae</b>												
HYDROPHASIANUS	CHIRURGUS			*	*	*		*		*		

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB Status	Confined Region	We	TS Cn	Es	We	MH Cu	Es	We	HL Cn	Es
<b>Family - Recurvirostridae</b>												
IBIDORHYNCHA	STRUTHERSII	S			*	*	*	*	*	*	*	*
IIIMANTOPUS	IIIMANTOPUS	VG		*	*	*		*		*	*	
<b>Family - Charadriidae</b>												
CHARADRIUS	DUBIUS			*	*	*	*	*	*		*	
CHARADRIUS	MONGOLUS				*	*		*		*		
PLUVIALIS	FULVA				*	*		*	*		*	
VANELLUS	VANELLUS			*	*	*		*		*	*	
CALIDRIS	MINUTA			*	*	*		*		*		
CALIDRIS	TEMMINCKII			*	*	*	*	*		*	*	*
GALLINAGO	GALLINAGO			*	*	*	*	*	*	*	*	*
GALLINAGO	SOLITARIA						*	*	*	*	*	*
GALLINAGO	NEMORICOLA	V				*		*			*	*
SCOLOPAX	RUSTICOLA			*	*	*	*	*	*	*	*	*
NUMENIUS	ARQUATA			*	*	*	*	*		*	*	*
TRINGA	ERYTHROPUS			*	*	*		*			*	
TRINGA	TOTANUS			*	*	*		*		*	*	*
TRINGA	NEBULARIA			*	*	*		*	*	*	*	*
TRINGA	OCHROPUS			*	*	*	*	*	*	*	*	*
TRINGA	GLAREOLA			*	*	*		*	*	*	*	
XENUS	CINEREUS	VG				*						*
ACTITIS	HYPOLEUCOS			*	*	*	*	*	*	*	*	*
ARENARIA	INTERPRES	VG	# Central								*	
PHALAROPUS	LOBATUS	VG	# Western							*		
<b>Family - Laridae</b>												
LARUS	ICHTHYAETUS	VG		*	*	*		*	*	*		
LARUS	RIDIBUNDUS			*	*	*		*		*	*	*
LARUS	BRUNNICEPHALUS			*	*	*		*	*	*	*	*
LARUS	FUSCUS	VG			*	*		*		*	*	*
GELOCHELIDON	NILOTICA			*	*	*		*		*	*	
STERNA	HIRUNDO				*	*		*				*
<b>ORDER COLUMBIFORMES</b>												
<b>Family - Columbidae</b>												
COLUMBA	LIVIA			*	*	*	*	*	*	*	*	*
COLUMBA	RUPESTRIS							*		*	*	*
COLUMBA	LEUCONOTA						*	*	*	*	*	*
COLUMBA	PALUMBUS							*		*	*	
COLUMBA	HODGSONII						*	*	*	*	*	*

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB Status	Confined Region	We	TS Cu	Es	We	MH Cu	Es	We	HL Cu	Es
COLUMBA	PULCHRICOLLIS							*	*		*	*
STREPTOPELIA	DECAOCTO			*	*	*	*	*		*		
STREPTOPELIA	ORIENTALIS			*	*	*	*	*	*	*	*	*
STREPTOPELIA	CHINENSIS			*	*	*	*	*	*	*	*	*
MACROPYGIA	UNCHALL	V			*	*		*	*		*	*
TRERON	SPIENURA				*	*	*	*	*		*	*
ORDER	PSITTACIFORMES											
Family - Psittacidae												
PSITTACULA	HIMALAYANA	S		*	*	*	*	*	*	*	*	*
ORDER	CUCULIFORMES											
Family - Cuculidae												
CLAMATOR	JACOBINUS			*	*	*	*	*	*			*
HIEROCOCCYX	SPARVERIOIDES			*	*	*	*	*	*	*	*	*
CUCULUS	MICROPTERUS			*	*	*	*	*	*	*	*	*
CUCULUS	CANORIUS			*	*	*	*	*	*	*	*	*
CUCULUS	SATURATUS				*	*	*	*	*	*	*	*
CUCULUS	POLIOCEPHALUS						*	*	*	*	*	*
SURNICULUS	LUGUBRIS			*	*	*	*	*	*		*	*
ORDER	STRIGIFORMES											
Family - Strigidae												
OTUS	SUNIA	V		*	*	*	*	*			*	
BUBO	BUBO	V		*	*	*	*	*		*	*	*
GLAUCIDIUM	BRODIEI					*	*	*	*	*	*	*
NINOX	SCUTULATA	S		*	*	*		*	*			*
ATHENE	NOCTUA	S					*	*			*	
ATHENE	BRAMA	S		*	*	*	*	*			*	
STRIX	LEPTOGRAMMICA	V					*	*	*			*
STRIX	ALUCO						*	*	*	*	*	*
ASIO	FLAMMEUS	S		*	*	*		*	*	*	*	
ORDER	CAPRIMULGIFORMES											
Family - Caprimulgidae												
CAPRIMULGUS	INDICUS				*	*	*	*	*	*	*	*
ORDER	APODIFORMES											
Family - Apodidae												
COLLOCALIA	BREVIROSTRIS			*	*	*	*	*	*	*	*	*
HIRUNDAPUS	CAUDACUTUS				*	*	*	*	*	*	*	
APUS	APUS				*			*		*	*	
APUS	PACIFICUS			*	*	*	*	*	*	*	*	*



# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cu	Es	We	Cu	Es	We	Cu	Es
APUS	MELBA			*	*	*	*	*	*	*	*	*
ORDER	CORACIIFORMES											
Family - Alcedinidae												
HALCYON	SMYRNENSIS			*	*	*	*	*	*	*	*	*
ALCEDO	ATTIIS			*	*	*	*	*	*	*	*	*
CERYLE	LUGUBRIS			*	*	*	*	*	*	*	*	*
Family - Coraciidae												
CORACIAS	BENGHALENSIS			*	*	*	*	*	*	*	*	*
Family - Upupidae												
UPUPA	EOPS			*	*	*	*	*	*	*	*	*
ORDER	PICIFORMES											
Family - Caprimulgidae												
MEGALAIMA	VIRENS			*	*	*	*	*	*	*	*	*
Family - Indicatoridae												
INDICATOR	XANTHONOTUS							*	*		*	*
Family - Picidae												
JYNX	TORQUILLA			*	*	*		*	*		*	*
PICUS	SQUAMATUS						*	*		*	*	*
DENDROCOPOS	HIMALAYENSIS						*	*		*	*	*
DENDROCOPOS	DARJELLENSIS							*	*		*	*
DENDROCOPOS	CATHIPIARIUS							*	*		*	*
DENDROCOPOS	HYPERYTHIRUS						*	*	*	*	*	*
DENDROCOPOS	AURICEPS	S		*	*	*	*	*	*	*	*	*
ORDER	PASSERIFORMES											
Family - Alaudidae												
CALANDRELLA	BRACHYDACTYLA				*	*		*			*	*
CALANDRELLA	ACUTIROSTRIS					*	*	*		*	*	*
ALAUDA	GULGULA			*	*	*	*	*	*	*	*	*
EREMOPHILA	ALPESTRIS		#							*	*	*
Family - Hirundinidae												
RIPARIA	PALUDICOLA			*	*	*	*	*	*		*	*
RIPARIA	RIPARIA				*	*		*		*	*	*
PTYONOPROGNE	RUPESTRIS						*	*	*	*	*	*
HIRUNDO	RUSTICA			*	*	*	*	*	*	*	*	*
HIRUNDO	DAURICA			*	*	*	*	*	*	*	*	*
DELICHON	NIPALENSIS			*	*	*	*	*	*	*	*	*
DELICHON	DASYPUS			*		*	*	*	*	*	*	*
DELICHON	URBICA			*	*			*			*	*

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB Status	Confined Region	We	TS Cn	Es	We	MH Cn	Es	We	HL Cn	Es
<b>Family - Motacillidae</b>	NOVAESEELANDIAE			*	*	*	*	*	*	*	*	*
ANTHUS	GODLEWSKII				*	*		*			*	*
ANTHUS	HODGSONI			*	*	*	*	*	*	*	*	*
ANTHUS	TRIVIALIS			*	*	*	*	*	*	*	*	
ANTHUS	CERVINUS					*		*		*	*	
ANTHUS	ROSEATUS				*	*	*	*	*	*	*	*
ANTHUS	RUBESCENS				*			*			*	
ANTHUS	SYLVANUS				*	*	*	*	*	*	*	
MOTACILLA	FLAVA			*	*	*	*	*		*	*	
MOTACILLA	CITREOLA			*	*	*	*	*	*	*	*	*
MOTACILLA	CINEREA			*	*	*	*	*	*	*	*	*
MOTACILLA	ALBA			*	*	*	*	*	*	*	*	*
<b>Family - Campephagidae</b>												
PERICROCOTUS	ETHOLOGUS			*	*	*	*	*	*	*	*	*
<b>Family - Pycnonotidae</b>												
HYPSIPETES	LEUCOCEPHALUS			*	*	*	*	*	*	*	*	*
<b>Family - Bombycillidae</b>												
BOMBYCILLA	GARRULUS	UR	# Central								*	
<b>Family - Cinclidae</b>												
CINCLUS	CINCLUS						*	*	*	*	*	*
CINCLUS	PALLASII				*		*	*	*	*	*	*
<b>Family - Troglodytidae</b>												
TROGLODYTES	TROGLODYTES						*	*	*	*	*	*
<b>Family - Prunellidae</b>												
PRUNELLA	IMMACULATA							*	*		*	*
PRUNELLA	STROPHIATA				*		*	*	*	*	*	*
PRUNELLA	FULVESCENS		#							*	*	
PRUNELLA	ATROGULARIS		#							*	*	
PRUNELLA	RUBECULOIDES							*		*	*	*
PRUNELLA	HIMALAYANA						*	*	*	*	*	*
PRUNELLA	COLLARIS							*	*	*	*	*
<b>Family - Muscicapidae</b>												
BRACHYPTERYX	STELLATA	V						*			*	*
BRACHYPTERYX	MONTANA	S			*			*	*		*	*
LUSCINIA	SVECICA			*	*	*	*	*			*	*
LUSCINIA	PECTORALIS			*	*	*	*	*	*	*	*	*
LUSCINIA	BRUNNEA				*	*	*	*	*	*	*	*
TARSIGER	CYANURUS				*		*	*		*	*	*

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDI Status	Confined Region	We	TS Cn	Es	We	MH Cn	Es	We	HL Cn	Es
TARSIGER	CIIRYSAEUS						*	*	*	*	*	*
TARSIGER	INDICUS				*		*	*	*	*	*	*
TARSIGER	HYPERYTHIRUS	S						*	*	*	*	*
PHOENICURUS	ERYTHRONOTUS		#							*	*	
PHOENICURUS	CAERULEOCEPHALUS			*	*		*	*	*	*	*	*
PHOENICURUS	OCHRUROS			*	*	*	*	*	*	*	*	*
PHOENICURUS	HODGSONI			*	*		*	*	*	*	*	*
PHOENICURUS	FRONTALIS			*	*	*	*	*	*	*	*	*
PHOENICURUS	SCHISTICEPS						*	*	*	*	*	*
PHOENICURUS	ERYTHROGASTER							*		*	*	*
RHYACORNIS	FULIGINOSUS			*	*	*	*	*	*	*	*	*
HODGSONIUS	PHOENICUROIDES			*	*		*	*		*	*	*
CINCLIDIUM	LEUCURUM	S			*	*		*	*		*	*
GRANDALA	COELICOLOR							*		*	*	*
COCHOA	PURPUREA	E						*	*			*
SAXICOLA	TORQUATA			*	*	*	*	*	*	*	*	*
SAXICOLA	FERREA			*	*	*	*	*	*	*	*	*
OENANTHE	ISABELLINA	UR						*			*	
OENANTHE	OENANTHE	UR			*			*			*	
OENANTHE	PLESCHIANKA	UR		*							*	
OENANTHE	DESERTI				*		*	*		*	*	
CHAMARRORNIS	LEUCOCEPHALUS			*	*	*	*	*	*	*	*	*
MONTICOLA	CINCLORIHYNCIA			*	*	*	*	*	*	*	*	*
MONTICOLA	RUFIVENTRIS			*	*	*	*	*	*	*	*	*
MONTICOLA	SOLITARIUS			*	*	*	*	*	*	*	*	*
MYIOPHONEUS	CAERULEUS			*	*	*	*	*	*	*	*	*
ZOOTHERA	MOLLISSIMA					*	*	*	*	*	*	*
ZOOTHERA	DIXONI					*	*	*	*	*	*	*
ZOOTHERA	DAUMA			*	*	*	*	*	*	*	*	*
ZOOTHERA	MONTICOLA	V		*	*	*	*	*	*		*	*
ZOOTHERA	WARDII	S					*	*	*	*	*	
TURDUS	ALBOCINCTUS				*	*	*	*	*	*	*	*
TURDUS	BOULBOUL			*	*	*	*	*	*		*	*
TURDUS	MERULA						*	*	*	*	*	*
TURDUS	RUBROCANUS				*	*		*	*	*	*	*
TURDUS	KESSLERI	UR							*			*
TURDUS	RUFICOLLIS			*	*	*	*	*	*	*	*	*
TURDUS	VISCIVORUS						*	*		*	*	

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB Status	Confined Region	We	TS Cu	Es	We	MH Cu	Es	We	HL Cn	Es
ENICURUS	SCOULERI				*	*	*	*	*	*	*	*
ENICURUS	IMMACULATUS			*	*	*	*	*	*	*	*	*
ENICURUS	SCHISTACEUS				*	*	*	*	*	*	*	*
ENICURUS	MACULATUS			*		*	*	*	*	*	*	*
TESIA	CASTANEOCORONATA				*		*	*	*		*	*
TESIA	CYANIVENTER			*	*	*	*	*	*		*	*
CETTIA	FORTIPES			*		*	*	*	*	*	*	*
CETTIA	MAJOR				*	*		*			*	*
CETTIA	FLAVOLIVACEA			*	*	*	*	*	*		*	*
CETTIA	ACANTHIZOIDES	S					*	*	*	*	*	*
CETTIA	BRUNNIFRONS			*	*	*	*	*	*	*	*	*
BRADYPTERUS	THORACICUS			*	*	*		*			*	*
ACROCEPHALUS	DUMETORUM			*	*	*	*	*	*		*	*
HIPPOLAIS	CALIGATA				*	*		*			*	*
SEICERCUS	BURKII			*	*	*	*	*	*	*	*	*
SEICERCUS	POLIOGENYS	S			*	*		*	*		*	*
SEICERCUS	CASTANICEPS			*	*	*	*	*	*		*	*
SEICERCUS	XANTHOSCHISTOS			*	*	*	*	*	*	*	*	*
ABROSCOPUS	SCHISTICEPS				*		*	*	*		*	*
PHYLLOSCOPUS	REGULOIDES			*	*	*	*	*	*	*	*	*
PHYLLOSCOPUS	TROCHILOIDES			*	*	*	*	*	*	*	*	*
PHYLLOSCOPUS	MAGNIROSTRIS				*	*	*	*	*	*	*	*
PHYLLOSCOPUS	PULCHER			*	*	*	*	*	*	*	*	*
PHYLLOSCOPUS	MACULIPENNIS			*		*	*	*	*	*	*	*
PHYLLOSCOPUS	PROREGULUS			*	*	*	*	*	*	*	*	*
PHYLLOSCOPUS	INORNATUS			*	*	*	*	*	*	*	*	*
PHYLLOSCOPUS	FULIGIVENTER	S		*	*	*	*	*			*	*
PHYLLOSCOPUS	AFFINIS			*	*	*	*	*	*	*	*	*
PHYLLOSCOPUS	COLLYBITA			*	*	*	*	*	*		*	*
REGULUS	REGULUS						*	*	*	*	*	*
LEPTOPOECILE	SOPHIAE		#							*	*	*
NILTAVA	GRANDIS	S						*	*		*	*
NILTAVA	SUNDARA			*	*	*	*	*	*	*	*	*
CYORNIS	BANYUMAS	V						*			*	*
MUSCICAPELLA	HODGSONI	S				*		*	*		*	*
MUSCICAPA	THALASSINA			*	*	*	*	*	*	*	*	*
MUSCICAPA	FERRUGINEA	S				*		*	*		*	*
MUSCICAPA	SIBIRICA			*	*	*	*	*	*	*	*	*

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB Status	Confined Region	We	TS Cu	Es	We	MII Cu	Es	We	HL Cu	Es
MUSCICAPA	RUFICAUDA				*		*	*	*	*	*	*
FICEDULA	SAPPHIRA	V				*		*	*			*
FICEDULA	TRICOLOR			*	*	*	*	*	*	*	*	*
FICEDULA	SUPERCILIARIS			*	*	*	*	*	*	*	*	*
FICEDULA	WESTERMANNI	S		*	*	*	*	*	*	*	*	*
FICEDULA	HODGSONII				*	*		*	*		*	*
FICEDULA	HYPERYTHRA			*	*	*	*	*	*		*	*
FICEDULA	MONILEGER	V				*		*	*		*	*
FICEDULA	STROPHIATA			*	*	*	*	*	*	*	*	*
FICEDULA	SUBRUBRA	E			*	*		*				*
FICEDULA	PARVA			*	*	*		*	*		*	*
CULICICAPA	CEYLONENSIS			*	*	*	*	*	*	*	*	*
RHIPIDURA	HYPOXANTHA			*	*	*	*	*	*	*	*	*
XIPHIHYNCIUS	SUPERCILIARIS	V						*	*		*	*
PNOEPYGA	ALBIVENTER			*	*	*	*	*	*	*	*	*
PNOEPYGA	PUSILLA			*	*		*	*	*		*	*
STACHYRIS	RUFICEPS								*			*
STACHYRIS	PYRRHOPS			*	*	*	*	*	*		*	*
CONOSTOMA	AEMODIUM	V					*	*		*	*	*
PARADOXORNIS	UNICOLOR	V						*			*	*
PARADOXORNIS	FULVIFRONS	V							*		*	*
PARADOXORNIS	NIPALENSIS	S			*	*	*	*	*	*	*	*
GARRULAX	ALBOGULARIS						*	*	*	*	*	*
GARRULAX	STRIATUS						*	*	*		*	*
GARRULAX	VARIEGATUS						*	*		*	*	
GARRULAX	OCELLATUS						*	*	*	*	*	*
GARRULAX	LINEATUS			*	*	*	*	*	*	*	*	*
GARRULAX	SUBUNICOLOR	S						*	*		*	*
GARRULAX	AFFINIS							*	*	*	*	*
GARRULAX	ERYTHROCEPHALUS						*	*	*	*	*	*
LEIOTHRIX	LUTEA				*	*	*	*	*		*	*
MYZORNIS	PYRRHOURA	S						*	*		*	*
PTERUTHIUS	XANTHOCHLORIS						*	*	*		*	*
ACTINODURA	NIPALENSIS						*	*	*		*	*
MINLA	STRIGULA				*	*	*	*	*	*	*	*
MINLA	IGNOTINCTA				*	*		*	*		*	*
ALCIPPE	CHRYSOTIS	V						*			*	*
ALCIPPE	CASTANECEPS							*	*		*	*

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB Status	Confined Region	We	TS Cn	Es	We	MH Cn	Es	We	HL Cn	Es
ALCIPPE	VINIPECTUS						*	*	*	*	*	*
HETEROPHASIA	CAPISTRATA			*	*	*	*	*	*	*	*	*
YUHINA	FLAVICOLLIS			*	*	*	*	*	*	*	*	*
YUHINA	GULARIS						*	*	*	*	*	*
YUHINA	OCCIPITALIS							*	*		*	*
Family - Paridae												
AEGITHALOS	IOUSCHIISTOS							*	*		*	*
AEGITHALOS	NIVEOGULARIS						*	*		*	*	
AEGITHALOS	CONCINNUS			*	*	*	*	*	*	*	*	*
SYLVIPARUS	MODESTUS					*	*	*	*		*	*
PARUS	DICHROUS						*	*	*	*	*	*
PARUS	RUFONUCHALIS		#							*	*	
PARUS	RUBIDIVENTRIS						*	*	*	*	*	*
PARUS	MELANOLOPHUS						*	*		*	*	
PARUS	ATER							*	*		*	*
PARUS	MONTICOLUS				*	*	*	*	*	*	*	*
PARUS	XANTHOGENYS			*	*	*	*	*	*	*	*	*
CEPHALOPYRUS	FLAMMICEPS						*	*	*		*	*
Family - Sittidae												
SITTA	LEUCOPSIS						*			*		
SITTA	HIMALAYENSIS			*	*	*	*	*	*		*	*
SITTA	CASHMIRENSIS						*			*		
TICHODROMA	MURARIA			*	*	*	*	*	*	*	*	*
Family - Certhiidae												
CERTHIA	DISCOLOR			*		*		*	*		*	*
CERTHIA	HIMALAYANA			*			*	*		*	*	*
CERTHIA	NIPALENSIS						*	*	*	*	*	*
CERTHIA	FAMILIARIS						*	*	*	*	*	*
Family - Nectariniidae												
AETHOPYGA	GOULDIAE						*	*	*	*	*	*
AETHOPYGA	NIPALENSIS			*	*	*	*	*	*	*	*	*
AETHOPYGA	IGNICAUDA				*	*	*	*	*	*	*	*
Family - Dicaedidae												
DICAEUM	MELANOXANTHIUM	S						*	*		*	*
DICAEUM	IGNIPECTUS			*	*	*	*	*	*	*	*	*
Family - Laniidae												
LANIUS	CRISTATUS			*	*	*	*	*	*		*	
LANIUS	VITTATUS			*	*	*	*	*	*		*	



# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB Status	Confined Region	We	TS Cu	Es	We	MH Cu	Es	We	HL Cu	Es
LANIUS	SCHACH			*	*	*	*	*	*	*	*	*
LANIUS	TEPHRONOTUS			*	*	*	*	*	*	*	*	*
Family - Dicruridae												
DICRURUS	LEUCOPHAEUS			*	*	*	*	*	*	*	*	*
DICRURUS	HOTTENTOTTUS			*	*	*	*	*	*	*	*	*
Family - Corvidae												
GARRULUS	LANCEOLATUS						*	*	*	*	*	*
UROCISSA	FLAVIROSTRIS						*	*	*	*	*	*
PSEUDOPODOCES	IIUMILIS		#							*	*	*
NUCIFRAGA	CARYOCATACTES						*	*	*	*	*	*
PYRRHOCORAX	GRACULUS							*		*	*	*
PYRRHOCORAX	PYRRHOCORAX						*	*		*	*	*
CORVUS	MACRORHYNCHIOS			*	*	*	*	*	*	*	*	*
CORVUS	CORAX							*		*	*	*
Family - Sturnidae												
STURNUS	PAGODARUM			*	*	*	*	*	*		*	
STURNUS	VULGARIS			*	*	*		*			*	
ACRIDETHORES	TRISTIS			*	*	*	*	*	*	*	*	*
Family - Ploceidae												
PASSER	DOMESTICUS			*	*	*	*	*	*		*	
PASSER	RUTILANS			*	*	*	*	*		*	*	*
PASSER	MONTANUS			*	*	*	*	*	*	*	*	*
PETRONIA	XANTHOCOLLIS			*	*	*		*	*		*	
MONTIFRINGILLA	BLANFORDI	UR	# Central								*	
MONTIFRINGILLA	RUFICOLLIS	UR						*			*	*
MONTIFRINGILLA	TACZANOWSKII	UR	#								*	
MONTIFRINGILLA	ADAMSI							*		*	*	*
Family - Fringillidae												
FRINGILLA	COELEBS							*		*	*	
FRINGILLA	MONTIFRINGILLA							*			*	
SERINUS	PUSILLUS						*	*		*	*	
SERINUS	THIBETANUS						*	*		*	*	
CARDUELIS	SPINOIDES			*	*	*	*	*	*	*	*	*
CARDUELIS	CARDUELIS			*			*	*		*	*	
CARDUELIS	FLAVIROSTRIS		#								*	*
LOXIA	CURVIROSTRA						*	*		*	*	*
LEUCOSTICTE	NEMORICOLA						*	*	*	*	*	*
LEUCOSTICTE	BRANDTI							*		*	*	*

# APPENDIX 4-9 STATUS AND DISTRIBUTION OF BIRDS FOUND IN THE HIGHLANDS

Genus	Species	NRDB	Confined	We	TS	Es	We	MH	Es	We	HL	Es
		Status	Region		Cu			Cu			Cu	
BUCANETES	MONGOI.ICUS	UR	# Central								*	
CARPODACUS	RUBESCENS							*			*	
CARPODACUS	NIPALENSIS						*	*	*		*	*
CARPODACUS	ERYTHIRINUS			*	*	*	*	*	*	*	*	*
CARPODACUS	PULCHERRIMUS						*	*	*	*	*	*
CARPODACUS	RHODOCHROUS			*			*	*	*	*	*	*
CARPODACUS	VINACEUS	UR		*				*	*	*	*	*
CARPODACUS	EDWARDSII	UR					*	*	*		*	*
CARPODACUS	RHODOPEPLUS						*	*	*	*	*	*
CARPODACUS	THURA						*	*	*	*	*	*
CARPODACUS	RUBICILLOIDES		#							*	*	*
CARPODACUS	RUBICILLA		#							*	*	*
CARPODACUS	PUNICEUS							*		*	*	*
PROPYRRHULA	SUBHIMACHALA							*	*		*	*
HAEMATOSPIZA	SIPAHII	UR						*	*		*	*
PYRRHOPLECTES	EPAULETTA							*	*	*	*	*
PYRRHULA	NIPALENSIS						*	*	*		*	*
PYRRHULA	ERYTHROCEPHALA						*	*	*	*	*	*
MYCEROBAS	AFFINIS						*	*	*	*	*	*
MYCEROBAS	MELANOZANTHOS						*	*	*	*	*	*
MYCEROBAS	CARNIPES							*	*	*	*	*
Family - Emberizidae												
EMBERIZA	LEUCOCEPHALOS				*			*		*	*	
EMBERIZA	CITRINELLA	UR					*	*			*	
EMBERIZA	CIA						*	*		*	*	
EMBERIZA	RUSTICA	UR			*			*			*	
EMBERIZA	PUSILIA				*	*	*	*	*	*	*	*
Legend :												
S = Susceptible	TS = Terai and Siwaliks											
V = Vulnerable	MH = Midhills											
E = Endangered	HL = Highlands											
VG = Vagrant	We = Western											
UR = Under-recorded	Cn = Central											
HMG/P = Protected by NPWC Act 1973	Es = Eastern											
# = recorded from Highlands only	* = Species recorded											





## **Appendix 4-10**

---

**Status and distribution of  
mammal species found in the  
Highlands**



# **APPENDIX 4-10 STATUS AND DISTRIBUTION OF MAMMALS FOUND IN THE HIGHLANDS**

Scientific Name	Common Name	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cn	Es	We	Cn	Es	We	Cn	Es
<b>ORDER</b>	<b>INSECTIVORA</b>											
<b>Family - Talpidae</b>												
<i>Talpa micrura</i>	Himalayan Mole				*				*	*		*
<b>Family - Soricidae</b>												
<i>Sorex bedfordiae</i>	Striped-backed Shrew		# Eastern									*
<i>Sorex minutus</i>	Eurasian Pygmy Shrew						*	*		*		
<i>Soriculus baileyi</i>	Bailey's Shrew							*	*	*		
<i>Soriculus caudatus</i>	Brown-toothed Shrew							*	*	*	*	*
<i>Soriculus leucops</i>	Indian Long-tailed Shrew						*	*	*	*		
<i>Soriculus nigriscens</i>	Himalayan Shrew							*		*	*	*
<i>Suncus murinus</i>	House Shrew			*	*			*	*	*		
<i>Suncus stoliczkanus</i>	Yellow-throated Shrew				*					*		*
<i>Crossidura horsfieldi</i>	Horsfield's Shrew		# Western							*		
<b>ORDER</b>	<b>CHIROPTERA</b>											
<b>Family - Pteropodidae</b>												
<i>Cynopterus sphinx</i>	Indian Short-nosed Fruit Bat			*	*					*		*
<b>Family - Rhinolophidae</b>												
<i>Rhinolophus pearsoni</i>	Pearson's Horseshoe Bat			*	*	*	*	*	*	*	*	*
<b>Family - Hipposideridae</b>												
<i>Hipposideros armiger</i>	Himalayan Roundleaf Bat						*	*	*	*	*	*
<b>Family - Vespertilionidae</b>												
<i>Plecotus auritus</i>	Brown Long-eared Bat		#							*		*
<i>Nyctalus noctula</i>	Common Noctule				*	*		*	*		*	*
<b>ORDER</b>	<b>PRIMATES</b>											
<b>Family - Cercopithecidae</b>												
<i>Macaca mulatta</i>	Rhesus Macaque	S		*	*	*	*	*	*	*	*	*
<i>Semnopithecus entellus</i>	Hanuman Langur	S		*	*	*	*	*	*	*	*	*
<b>ORDER</b>	<b>CARNIVORA</b>											
<b>Family - Canidae</b>												
<i>Canis lupus</i>	Grey Wolf	V					*	*	*	*	*	*
<i>Canis aureus</i>	Golden Jackal			*	*	*	*	*	*	*	*	*

# APPENDIX 4-10 STATUS AND DISTRIBUTION OF MAMMALS FOUND IN THE HIGHLANDS

Scientific Name	Common Name	NRDB Status	Confined Region	TS			MH			HL		
				We	Cn	Es	We	Cn	Es	We	Cn	Es
<i>Vulpes vulpes</i>	Red Fox	S		*	*	*	*	*	*	*	*	*
<i>Vulpes ferrilata</i>	Tibetan Sand Fox	S	# Central							*		
<i>Cuon alpinus</i>	Asiatic Wild-dog, Dhole	V		*	*		*	*	*	*	*	*
<b>Family - Ursidae</b>												
<i>Ursus thibetanus</i>	Asiatic Black Bear	V		*			*	*	*	*	*	*
<i>Ursus arctos</i>	Brown Bear	V (HMG/P)	#							*	*	*
<b>Family - Ailuridae</b>												
<i>Ailurus fulgens</i>	Red Panda	E (HMG/P)					*	*	*	*	*	*
<b>Family - Mustelidae</b>												
<i>Mustela erminea</i>	Ermine		# Central								*	
<i>Mustela sibirica</i>	Siberian Weasel		#							*	*	*
<i>Mustela altaica</i>	Mountain Weasel		#							*	*	*
<i>Mustela kathia</i>	Yellow-bellied Weasel		#							*	*	
<i>Martes fiona</i>	Stone Marten (Beech)						*	*	*	*	*	*
<i>Martes flavigula</i>	Yellow-throated Marten			*	*	*	*	*	*	*	*	*
<i>Arctonyx collaris</i>	Hog Badger	S	# Western							*		
<i>Lutra lutra</i>	Common Otter	S		*	*	*	*		*	*	*	
<b>Family - Viverridae</b>												
<i>Paguma larvata</i>	Masked Palm Civet				*		*	*	*	*	*	*
<b>Family - Herpestidae</b>												
<i>Herpestes edwardsii</i>				*	*	*	*	*	*		*	
<b>Family - Felidae</b>												
<i>Felis chaus</i>	Jungle Cat	S		*	*	*	*	*	*	*	*	*
<i>Prionailurus bengalensis</i>	Leopard Cat	V		*	*	*	*	*	*	*	*	*
<i>Felis lynx</i>	Lynx	E (HMG/P)	# Central								*	
<i>Panthera pardus</i>	Spotted Leopard	S		*	*	*	*	*	*	*	*	*
<i>Panthera uncia</i>	Snow Leopard	E (HMG/P)	#							*	*	*
<b>ORDER PERISSODACTYLA</b>												
<b>Family - Equidae</b>												
<i>Equus kiang</i>	Tibetan Wild Ass		#							*	*	?

# APPENDIX 4-10 STATUS AND DISTRIBUTION OF MAMMALS FOUND IN THE HIGHLANDS

Scientific Name	Common Name	NRDB Status	Confined Region	We	TS Cn	Es	We	MH Cn	Es	We	HL Cn	Es
<b>ORDER ARTIODACTYLA</b>												
<b>Family - Suidae</b>												
<i>Sus scrofa</i>	Wild Boar			*	*	*	*	*	*	*	*	*
<b>Family - Moschidae</b>												
<i>Moschus chrysogaster</i>	Musk Deer	E (HMG/P)					*	*	*	*	*	*
<i>Moschus fuscus</i>		E							*			*
<b>Family - Cervidae</b>												
<i>Muntiacus muntjak</i>	Barking Deer			*	*	*	*	*	*	*	*	*
<b>Family - Bovidae</b>												
<i>Bos mutus</i>	Wild Yak	C (HMG/P)	#							*	*	*
<i>Hemitragus jemlahicus</i>	Himalayan Thar	S					*	*	*	*	*	*
<i>Pantholops hodgsoni</i>	Tibetan Antelope	C (HMG/P)	#							*	*	
<i>Naemorhedus goral</i>	Himalayan Goral	S		*			*	*	*	*	*	*
<i>Naemorhedus sumatraensis</i>	Mainland Serow	S		*	*		*	*	*	*	*	*
<i>Pseudois nayaur</i>	Bharal	S	#				?			*	*	*
<i>Ovis ammon</i>	Great Tibetan Sheep	C (HMG/P)	# Central								*	
<b>ORDER RODENTIA</b>												
<b>Family - Scuridae</b>												
<i>Marmota bobak</i>	Himalayan Marmot		#							*	*	*
<i>Callosciurus pygerythrus</i>	Irrawaddy Squirrel				*		*	*	*		*	*
<i>Tamias macrotis</i>	Himalayan Striped Squirrel						*	*	*	*		
<i>Dremomys lokriah</i>	Orange-bellied Himalayan Squirrel							*	*	*	*	*
<b>Family - Pteromyidae</b>												
<i>Petaurista petaurista</i>	Red Flying Squirrel			*	*				*	*	*	*
<i>Petaurista caniceps</i>	Grey-headed Flying Squirrel		# Central								*	
<i>Petaurista magnificus</i>	Hodgson's Flying Squirrel				*		*	*	*	*	*	*
<i>Petaurista nobilis</i>	Flying Squirrel							*			*	
<b>Family - Muridae</b>												
<i>Mus musculus</i>	House Rat			*	*			*	*	*	*	*
<i>Mus cervicolor</i>	Fawn Colored Mouse			*	*		*	*	*	*	*	*
<i>Rattus rattus</i>	Roof Rat			*	*			*	*	*	*	*
<i>Rattus turkestanicus</i>	Turkestan Rat							*		*	*	*

# APPENDIX 4-10 STATUS AND DISTRIBUTION OF MAMMALS FOUND IN THE HIGHLANDS

Scientific Name	Common Name	NRDB	Confined		TS			MH			HL	
		Status	Region	We	Cn	Es	We	Cn	Es	We	Cn	Es
<i>Apodemus sylvaticus</i>	Wood Rat		#							*	*	*
<i>Apodemus gorkha</i>	Himalayan Field Mouse	Endemic						*		*	*	
<i>Niviventer niviventer</i>	White-bellied Rat						*	*	*		*	
<i>Niviventer eha</i>	Smoke-bellied Rat							*	*		*	*
<i>Alticola roylei</i>	Royle's Vole		# Central								*	
<i>Alticola stoliczkanus</i>	Vole		# Eastern									*
<i>Pitymys sikimensis</i>	Vole							*	*		*	*
<i>Pitymys leucurus</i>	Vole		# Central								*	
<b>ORDER LAGOMORPHA</b>												
<b>Family - Leporidae</b>												
<i>Lepus oiostolus</i>	Woolly Hare		#							*	*	*
<b>Family - Ochotonidae</b>												
<i>Ochotona roylei</i>	Royle's Pika							*	*	*	*	*
<i>Ochotona thibetanus</i>	Muopiu Pika		# Central								*	
<i>Ochotona curzoniae</i>	Black-lipped Pika		# Central								*	
<i>Ochotona himalaya</i>	Himalayan Pika		# Eastern									*
<i>Ochotona macrotis</i>	Long-eared Pika		#							*	*	*
<i>Ochotona daurica</i>	Daurian Pika		# Central								*	
<i>Ochotona nubrica</i>	Nubrica Pika		#							*	*	*
<b>Legend:</b>												
S = Susceptible	TS = Terai and Siwaliks											
V = Vulnerable	MH = Mid-hills											
E = Endangered	HL = Highlands											
C = Critically endangered	We = West											
HMG/P = Protected by NPWC Act 1973	Ce = Central											
# = recorded from Highlands only	Es = East											
* = species recorded												



## **Appendix 4-11**

---

**List of threatened endemic  
plant species showing regional  
and altitudinal distribution in  
Nepal**



1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support effective decision-making.

3. The third part of the document describes the different types of reports and dashboards that are generated from the collected data. It explains how these visual representations help in identifying trends, patterns, and areas that require attention or improvement.

4. The fourth part of the document discusses the role of data in strategic planning and goal setting. It emphasizes that data-driven insights are essential for setting realistic and achievable goals for the organization.

5. The fifth part of the document outlines the various challenges and risks associated with data management and analysis. It provides guidance on how to mitigate these risks and ensure the integrity and security of the data.

6. The sixth part of the document discusses the importance of data literacy and training for all employees. It emphasizes that having a basic understanding of data is essential for making informed decisions in the workplace.

7. The seventh part of the document outlines the various ways in which data can be used to improve organizational performance. It provides examples of successful data-driven initiatives and the impact they have had on the organization.

8. The eighth part of the document discusses the future of data and its potential to transform organizations. It highlights emerging technologies and trends that will shape the data landscape in the coming years.

9. The ninth part of the document outlines the various ways in which data can be used to enhance customer experience and satisfaction. It provides examples of data-driven strategies that have led to improved customer loyalty and retention.

10. The tenth part of the document discusses the importance of data in risk management and compliance. It emphasizes that data is essential for identifying potential risks and ensuring that the organization is compliant with relevant regulations and standards.

11. The eleventh part of the document outlines the various ways in which data can be used to optimize resource allocation and efficiency. It provides examples of data-driven strategies that have led to cost savings and improved productivity.

12. The twelfth part of the document discusses the importance of data in innovation and new product development. It emphasizes that data is essential for understanding customer needs and identifying opportunities for new products and services.

13. The thirteenth part of the document outlines the various ways in which data can be used to improve organizational culture and employee engagement. It provides examples of data-driven strategies that have led to a more positive and productive work environment.

14. The fourteenth part of the document discusses the importance of data in sustainability and social responsibility. It emphasizes that data is essential for measuring and reporting on the organization's impact on the environment and society.

15. The fifteenth part of the document outlines the various ways in which data can be used to improve organizational governance and transparency. It provides examples of data-driven strategies that have led to more open and accountable decision-making processes.

**APPENDIX 4-11 LIST OF THREATENED ENDEMIC PLANT  
SPECIES SHOWING REGIONAL AND ALTITUDINAL  
DISTRIBUTION IN NEPAL**

Family	Species	Range (m)	West	Cent	East
ORCHIDACEAE	<i>Listera nepalensis</i>	3800	*	*	
ORCHIDACEAE	<i>Oreorchis prophyranthes</i>	3100-3800	*		
ZINGIBERACEAE	<i>Roscoeia nepalensis</i>	2450-3050	*		
IRIDACEAE	<i>Iris staintonii</i>	3500		*	
ARACEAE	<i>Arisaema vexillatum</i>	3400-3500			*
CYPERACEAE	<i>Carex himalaica</i>	3500-4200		*	*
CYPERACEAE	<i>Carex rufolistolon</i>	3100		*	
CYPERACEAE	<i>Kobresia esbirajbhandari</i>	3970-4700		*	*
CYPERACEAE	<i>Kobresia fissiglumis</i>	3650-3950	*	*	*
CYPERACEAE	<i>Kobresia harae</i>	3400-3960		*	
CYPERACEAE	<i>Kobresia kanaii</i>	4150-4800		*	*
CYPERACEAE	<i>Kobresia mallae</i>	3550-4570	*	*	
GRAMINEAE	<i>Bomus nepalensis</i>	3000	*		
GRAMINEAE	<i>Deyeuxia nepalensis</i>	3500-4600	*	*	
GRAMINEAE	<i>Duthiea nepalensis</i>	4500	*	*	
GRAMINEAE	<i>Elymus microlepis</i>	4000	*		
GRAMINEAE	<i>Poa arnoldii</i>	5600	*		
GRAMINEAE	<i>Poa x digena</i>	3800		*	
GRAMINEAE	<i>Poa harae</i>	4450-4600			*
GRAMINEAE	<i>Poa hylobatis</i>	3000-3200	*		
GRAMINEAE	<i>Poa imperialis</i>	4400			*
GRAMINEAE	<i>Poa kanaii</i>	4600-5200		*	
GRAMINEAE	<i>Poa langtangensis</i>	4000		*	
GRAMINEAE	<i>Poa mustangensis</i>	4800-4900		*	
GRAMINEAE	<i>Stipa staintonii</i>	*	*		
RANUNCULACEAE	<i>Aconitum angulatum</i>	3800-4200		*	*
RANUNCULACEAE	<i>Aconitum balangrense</i>	3300-3900	*		
RANUNCULACEAE	<i>Aconitum dhwojii</i>	4500-4800		*	
RANUNCULACEAE	<i>Aconitum nepalense</i>	4000-6000		*	

RANUNCULACEAE	<i>Aconitum poluninii</i>	3800	*		
RANUNCULACEAE	<i>Aconitum staintonii</i>	3500-4100			*
RANUNCULACEAE	<i>Aconitum tabatae</i>	3850-3910	*	*	
RANUNCULACEAE	<i>Aconitum tamuranum</i>	3900-4800	*		
RANUNCULACEAE	<i>Aconitum williamsii</i>	3300		*	
RANUNCULACEAE	<i>Anemone fuscopurpurea</i>	3600-4400			*
RANUNCULACEAE	<i>Clematis bracteolata</i>	3700		*	
RANUNCULACEAE	<i>Clematis phlebantha</i>	2600-3700	*	*	
RANUNCULACEAE	<i>Delphinium himalayai</i>	2400-4500	*	*	
RANUNCULACEAE	<i>Ranunculus himalaicus</i>	4600-4900			*
RANUNCULACEAE	<i>Ranunculus makaluensis</i>	4340			*
BERBERIDACEAE	<i>Berberis hamiltoniana</i>	2700-4200	*	*	
BERBERIDACEAE	<i>Berberis mucrifolia</i>	2100-4500	*	*	*
BERBERIDACEAE	<i>Berberis poluninii</i>	2400-4100		*	*
PAPAVERACEAE	<i>Corydalis alburyi</i>	5000		*	
PAPAVERACEAE	<i>Corydalis brevicarata</i>	3700	*		
PAPAVERACEAE	<i>Corydalis clavibracteata</i>	3660-4700	*		
PAPAVERACEAE	<i>Corydalis megacalyx</i>	3600-4570	*	*	
PAPAVERACEAE	<i>Corydalis staintonii</i>	3800-4100	*		
PAPAVERACEAE	<i>Corydalis sykesii</i>	4250		*	
PAPAVERACEAE	<i>Meconopsis dhwojii</i>	2950-5600		*	*
PAPAVERACEAE	<i>Meconopsis regia</i>	2700-4600	*	*	
PAPAVERACEAE	<i>Meconopsis taylorii</i>	3600-4570		*	
CRUCIFERAE	<i>Cardamine nepalensis</i>	3000-3720		*	
CRUCIFERAE	<i>Desideria nepalensis</i>	5400-5700			*
CRUCIFERAE	<i>Draba staintonii</i>	3960-4600	*	*	
CRUCIFERAE	<i>Ermaniopsis pumila</i>	5000-5900	*		
CRUCIFERAE	<i>Erysimum dlopoense</i>	4200-4900		*	
CRUCIFERAE	<i>Glaribraya lowndesii</i>	5000		*	
CRUCIFERAE	<i>Staintoniella nepalensis</i>	4900-5800	*		
FLACOURTIACEAE	<i>Homalium nepaulense</i>	700-4500	*	*	*
CARYOPHYLLACEAE	<i>Arenaria mukerjeeana</i>	3200-4400	*	*	
CARYOPHYLLACEAE	<i>Arenaria paramelanandra</i>	4200-5200	*	*	
CARYOPHYLLACEAE	<i>Silene fissicalyx</i>	4100-4600		*	

CARYOPHYLLACEAE	<i>Silene helleboriflora</i>	3000-5500	*	*	
CARYOPHYLLACEAE	<i>Silene holosteifolia</i>	2700-3600		*	
CARYOPHYLLACEAE	<i>Silene vautierae</i>	3500-5000	*	*	
CARYOPHYLLACEAE	<i>Stellaria congestiflora</i>	4000-4700	*	*	
BALSAMINACEAE	<i>Impatiens kharensis</i>	3300-4100		*	
BALSAMINACEAE	<i>Impatiens sunkoshiensis</i>	2550-3200	*	*	
BALSAMINACEAE	<i>Impatiens williamsii</i>	2400-3200	*	*	
RUTACEAE	<i>Ruta cordata</i>	4500		*	
LEGUMINOSAE	<i>Astragalus nakaoi</i>	3800		*	
LEGUMINOSAE	<i>Caragana campanulata</i>	3200-3500		*	
LEGUMINOSAE	<i>Oxytropis arenae-ripariae</i>	4500-4700	*		*
LEGUMINOSAE	<i>Oxytropis fasciculiflorum</i>	5600		*	
LEGUMINOSAE	<i>Oxytropis graminetorum</i>	3800-4300	*	*	
LEGUMINOSAE	<i>Oxytropis morenarum</i>	4000-4600		*	
LEGUMINOSAE	<i>Oxytropis nepalensis</i>	3500-4100		*	*
LEGUMINOSAE	<i>Oxytropis torrentium</i>	4200	*		
LEGUMINOSAE	<i>Oxytropis williamsii</i>	2500-4400	*	*	
ROSACEAE	<i>Cotoneaster bisramianus</i>	3000-4000	*		
ROSACEAE	<i>Cotoneaster papadoxus</i>	3100	*		
ROSACEAE	<i>Cotoneaster staintonii</i>	3650			*
ROSACEAE	<i>Cotoneaster virgatus</i>	3000-3200	*		
ROSACEAE	<i>Prunus Himalaica</i>	3900		*	
ROSACEAE	<i>Sibbaldia minutissima</i>	2800-3800		*	
SAXIFRAGACEAE	<i>Saxifraga alpigena</i>	3450-4250		*	
SAXIFRAGACEAE	<i>Saxifraga cinerea</i>	2700-3250		*	
SAXIFRAGACEAE	<i>Saxifraga excellens</i>	3600-4700		*	*
SAXIFRAGACEAE	<i>Saxifraga hypostoma</i>	3900-5250	*	*	
SAXIFRAGACEAE	<i>Saxifraga lowndesii</i>	3800-4100		*	*
SAXIFRAGACEAE	<i>Saxifraga micans</i>	3700		*	
SAXIFRAGACEAE	<i>Saxifraga mira</i>	4350	*		
SAXIFRAGACEAE	<i>Saxifraga namdoensis</i>	4500		*	
SAXIFRAGACEAE	<i>Saxifraga neopropagulifera</i>	4500-5600	*	*	
SAXIFRAGACEAE	<i>Saxifraga poluninae</i>	2250-3500	*	*	
SAXIFRAGACEAE	<i>Saxifraga rhodopetala</i>	3900-4560	*		

SAXIFRAGACEAE	<i>Saxifraga rolwalingensis</i>	4200-4300		*	
SAXIFRAGACEAE	<i>Saxifraga roylei</i>	3300-3800		*	
SAXIFRAGACEAE	<i>Saxifraga staintonii</i>	4800-4900		*	
SAXIFRAGACEAE	<i>Saxifraga williamsii</i>	4000-4800		*	
SAXIFRAGACEAE	<i>Saxifraga zimmermannii</i>	4100		*	
CRASSULACEAE	<i>Rhodiola amabilis</i>	2300-3900		*	*
CRASSULACEAE	<i>Rhodiola bouvieri</i>	3600-3900		*	
CRASSULACEAE	<i>Rhodiola nepalica</i>	3700-5400	*	*	
CRASSULACEAE	<i>Rosularia marnieri</i>	3500-4300	*	*	
ONAGRACEAE	<i>Epilobium brevisquamatum</i>	3200		*	
ONAGRACEAE	<i>Epilobium staintonii</i>	3600-3650		*	
UMBELLIFERAE	<i>Heracleum lallii</i>	3000-4400	*	*	
UMBELLIFERAE	<i>Pleurospermum rotundatum</i>	3800-4300		*	*
COMPOSITAE	<i>Artemisia tukuchaensis</i>	3150-3700	*	*	
COMPOSITAE	<i>Cirsium flavisquamatum</i>	3300	*		
COMPOSITAE	<i>Cirsium nishiokae</i>	2350-4000		*	*
COMPOSITAE	<i>Cremanthodium nepalense</i>	2800-4900	*	*	*
COMPOSITAE	<i>Crepis himalaica</i>	3300		*	
COMPOSITAE	<i>Leontopodium makianum</i>	4000		*	
COMPOSITAE	<i>Saussurea chrysotricha</i>	4300-4500	*	*	
COMPOSITAE	<i>Saussurea dhwojii</i>	4500		*	
COMPOSITAE	<i>Saussurea laminamaensis</i>	3400-4900			*
COMPOSITAE	<i>Saussurea linearifolia</i>	3300-4600	*	*	
COMPOSITAE	<i>Saussurea platyphyllaria</i>	4400-4700	*	*	
COMPOSITAE	<i>Saussurea spicata</i>	4000-5500	*	*	
COMPOSITAE	<i>Senecio topkegolensis</i>	3600-4350			*
COMPOSITAE	<i>Taraxacum amabile</i>	3000		*	*?
COMPOSITAE	<i>Taraxacum mucronulatum</i>	3000	*		
COMPOSITAE	<i>Taraxacum nepalense</i>	2700-3400	*	*	
COMPOSITAE	<i>Taraxacum staintonii</i>	2700-2900		*	
CAMPANULACEAE	<i>Codonopsis nepalensis</i>	3200		*	
CAMPANULACEAE	<i>Cyananthus hayanus</i>	2900-4500		*	
ERICACEAE	<i>Rhododendron lowndesii</i>	2450-4500	*	*	
PRIMULACEAE	<i>Primula aureata</i>	4500		*	

PRIMULACEAE	<i>Primula didyma</i>	3200-4300		*	*
PRIMULACEAE	<i>Primula poluninii</i>	4500-5100	*		
PRIMULACEAE	<i>Primula ramzanae</i>	4250-5200	*		
PRIMULACEAE	<i>Primula sharmae</i>	2500-5300	*	*	
PRIMULACEAE	<i>Primula wigramiana</i>	3600-5200		*	
ASCLEPIADACEAE	<i>Riocreuxia nepalensis</i>	2600-3500	*		
GENTIANACEAE	<i>Swertia gracilescens</i>	2000-3700		*	
BORAGINACEAE	<i>Arnebia nepalensis</i>	4100		*	
BORAGINACEAE	<i>Maharanga wallichiana</i>	2400-3600	*		
SCROPHULARIACEAE	<i>Euphrasia nepalensis</i>	2800-4300	*	*	
SCROPHULARIACEAE	<i>Lagotis nepalensis</i>	5700-5800	*		
SCROPHULARIACEAE	<i>Oreosolen williamsii</i>	4500-5800	*	*	
SCROPHULARIACEAE	<i>Pedicularis annapurnensis</i>	4150-4250		*	
SCROPHULARIACEAE	<i>Pedicularis anserantha</i>	3600-4000	*	*	
SCROPHULARIACEAE	<i>Pedicularis breviscaposa</i>	3000-4000		*	
SCROPHULARIACEAE	<i>Pedicularis chamissonoides</i>	3800		*	
SCROPHULARIACEAE	<i>Pedicularis cornigera</i>	4000-4900			*
SCROPHULARIACEAE	<i>Pedicularis elevatogaleata</i>	3800-4600	*	*	
SCROPHULARIACEAE	<i>Pedicularis mugensis</i>	3600-4350	*		
SCROPHULARIACEAE	<i>Pedicularis odontoloma</i>	4700	*		
SCROPHULARIACEAE	<i>Pedicularis oxyrhyncha</i>	3900-4570		*	*
SCROPHULARIACEAE	<i>Pedicularis poluninii</i>	4400		*	*
SCROPHULARIACEAE	<i>Pedicularis pseudoregeliana</i>	4000-4700		*	*
SCROPHULARIACEAE	<i>Pedicularis sectifolia</i>	3000-5600	*	*	
SCROPHULARIACEAE	<i>Pedicularis tamurensis</i>	3300-3400			*
SCROPHULARIACEAE	<i>Pedicularis tsoongii</i>	3800-4270	*		
SCROPHULARIACEAE	<i>Pedicularis wallichii</i>	4000-4700	*	*	*
SCROPHULARIACEAE	<i>Pedicularis yalungensis</i>	4300-5300		*	
SCROPHULARIACEAE	<i>Veronica emodi</i>	3700-5500	*		
LABIATAE	<i>Elsholtzia concinna</i>	3200-3400			*
LABIATAE	<i>Lamium nepalense</i>	4000-5000		*	*
LABIATAE	<i>Lamium staintonii</i>	3350-4250		*	*
LABIATAE	<i>Lamium tuberosum</i>	3600-4800	*	*	
LABIATAE	<i>Micromeria nepalensis</i>	1900-3600	*	*	

LABIATAE	<i>Nepeta staintonii</i>	4100-5000	*		
POLYGONACEAE	<i>Eskemukerjea megacarpum</i>	2400-3050	*	*	
SALICACEAE	<i>Salix eriostachya</i>	3200-4500	*	*	

Source: Shrestha and Joshi, 1992

## **Appendix 4-12**

---

### **List of non-endemic threatened plant species occurring in the Highlands**





**APPENDIX 4-12 LIST OF NON-ENDEMIC THREATENED PLANTS SHOWING REGIONAL AND ALTITUDINAL DISTRIBUTION AND THEIR THREAT CATEGORIES**

Family	Scientific Name	Altitude (m)	Distribution in Nepal			IUCN category						
			West	Cent	East	EX	E	V	R	CT	I	K
AMARYLLIDACEAE	<i>Allium przewalskianum</i>	2700-4300		+				+				
ANACARDIACEAE	<i>Choerospondias axillaris</i>	1200-1500		+	+				+			
ANACARDIACEAE	<i>Pistacia chinensis</i> subsp. <i>integerrima</i>	600-2400	+						+			
APOCYNACEAE	<i>Alstonia neriifolia</i>	500-1200		+	+				+			
APOCYNACEAE	<i>Alstonia scholaris</i>	100-1270		+	+				+			
APOCYNACEAE	<i>Beaumontia grandiflora</i>	150-1400		+				+				
APOCYNACEAE	<i>Rauwolfia serpentina</i>	100-1150		+	+		+					
ARACEAE	<i>Arisaema utile</i>	2400-4300	+	+	+						+	
ARALIACEAE	<i>Helwingia himalaica</i>	2100-2700		+	+						+	
ASCLEPIADACEAE	<i>Hoya arnottiana</i>	300-950		+	+							+
ASCLEPIADACEAE	<i>Tylophora belostemma</i>	600-1200		+		?+						
BERBERIDACEAE	<i>Podophyllum hexandrum</i>	2400-4500	+	+	+			+				
BETULACEAE	<i>Alnus nitida</i>	1800-2800	+	+					+			
BIGNONIACEAE	<i>Oroxylum indicum</i>	200-1400	+	+	+			+				
BORAGINACEAE	<i>Maharanga bicolor</i>	1700-3600	+	+								+
BORAGINACEAE	<i>Maharanga emodi</i>	2200-4500	+	+	+							+
CAPPARACEAE	<i>Crateva unilocularis</i>	100-1800		+	+				+			

Family	Scientific Name	Altitude (m)	Distribution in Nepal			IUCN category						
			West	Cent	East	EX	E	V	R	CT	I	K
CRUCIFERAE	<i>Megacarpaea polyandra</i>	2700-4500	+	+				+				
CYCADACEAE	<i>Cycas pectinata</i>	300-660			+		+					
DIOSCOREACEAE	<i>Dioscorea deltoidea</i>	450-3100	+	+	+					+		
DIOSCOREACEAE	<i>Dioscorea prazeri</i>	910-1600	+	+						+		
ELAEOCARPACEAE	<i>Elaeocarpus sphaericus</i>	650-1700		+	+			+				
FAGACEAE	<i>Lithocarpus fenestrata</i>	1500-2000			+							+
GENTIANACEAE	<i>Swertia chirayita</i>	1500-2500		+	+			+				
GNETACEAE	<i>Gnetum montanum</i>	300-1800		+	+		+					
LEGUMINOSAE	<i>Acacia catechu</i>	200-1400	+	+	+					+		
LEGUMINOSAE	<i>Butea monosperma</i>	150-1200	+	+	+		+					
LEGUMINOSAE	<i>Dalbergia latifolia</i>	300-1000	+	+	+			+				
LILIACEAE	<i>Gloriosa superba</i>	200-2200		+	+				+			
LILIACEAE	<i>Lilium wallichianum</i>	1100-2400	+	+					+			
LILIACEAE	<i>Paris polyphylla</i>	1800-3500		+	+			+				
MAGNOLIACEAE	<i>Magnolia globosa</i>	3200-3400			+				+			
MAGNOLIACEAE	<i>Michelia champaca</i>	600-1300		+	+		+					
MAGNOLIACEAE	<i>Michelia kisopa</i>	1400-2800	+	+	+		+					
MAGNOLIACEAE	<i>Talauma hodgsonii</i>	900-1800		+	+		+					
OLEACEAE	<i>Olea ferruginea</i>	500-2600	+						+			
PAEONIACEAE	<i>Paeonia emodi</i>	1800-2500	+						+			

Family	Scientific Name	Altitude (m)	Distribution in Nepal			IUCN category						
			West	Cent	East	EX	E	V	R	CT	I	K
PALMAE	<i>Calamus acanthospathus</i>	400-1500			+		+					
PALMAE	<i>Calamus latifolius</i>	600			+		+					
PALMAE	<i>Calamus leptospathus</i>	< 800			+		+					
PALMAE	<i>Wallichia densiflora</i>	250-1400	+	+					+			
PASSIFLORACEAE	<i>Passiflora napalensis</i>	1000-2400		+	+		+					
PINACEAE	<i>Larix griffithiana</i>	1100-4000			+				+			
PINACEAE	<i>Larix himalaica</i>	2400-3600		+								+
PLUMBAGINACEAE	<i>Ceratostigma ulicinum</i>	3500-4000	+	+					+			
PODOCARPACEAE	<i>Podocarpus neriifolius</i>	850-1530		+	+		+					
PODOSTEMACEAE	<i>Hydrobryum griffithii</i>	1000-2000	+	+	+				+			
POLYGONACEAE	<i>Rheum nobile</i>	3600-5000			+				+			
PROTEACEAE	<i>Helicia nilagirica</i>	450-1740			+				+			
RANUNCULACEAE	<i>Aconitum ferox</i>	2100-3800		+	+					+		
RANUNCULACEAE	<i>Aconitum gammiei</i>	3300-4300		+	+				+			
RANUNCULACEAE	<i>Aconitum heterophyllum</i>	2400-4000		+					+			
RANUNCULACEAE	<i>Aconitum laciniatum</i>	2800-4600		+	+					+		
RANUNCULACEAE	<i>Aconitum spicatum</i>	1800-4300	+	+	+					+		
ROSACEAE	<i>Prunus carmesina</i>	2300-2600	+	+					+			
SAXIFRAGACEAE	<i>Bergenia ciliata</i>	900-4300	+	+						+		
SCROPHULARIACEAE	<i>Picrorhiza scrophulariaefolia</i>	3500-4800	+	+	+			+				

Family	Scientific Name	Altitude (m)	Distribution in Nepal			IUCN category						
			West	Cent	East	EX	E	V	R	CT	I	K
TETRACENTRACEAE	<i>Tetracentron sinense</i>	2150-3200			+				+			
ULMACEAE	<i>Ulmus wallichiana</i>	1800-3000	+	+					+			
VALERIANACEAE	<i>Nardostachys grandiflora</i>	3200-5300	+	+	+			+				

+ = Yes

Source: Shrestha & Joshi, 1992. Materials for Plant Red Data Book of Nepal

## **Appendix 4-13**

---

### **Protected fauna under the 1973 NPWC Act**





## **Appendix 5-2**

---

**Data sheets on protected areas  
along the Nepalese border with  
China and India**





## QOMOLANGMA NATURE RESERVE

**IUCN Management Category:** IV (Managed nature reserve)

**Biogeographical Province:** 2.38.12 (Himalayan Highlands)

**Geographical Location:** Lies in the Rikize (Shigote) Prefecture of southern Tibet. The reserve includes Dingri (Tingri), Nilamu (Nyelam) and part of Dingjie (Dinggue) and Jilong (Kyirong) countries. It extends from the easternmost bend of the Pengqa (Punychu or Arun) River near Dingqye to the Jilongzangbu (Trisuli) River near Jilong in the west. The reserve is accessible by the Friendship Highway linking Lhasa with Kathmandu, Nepal. The northern boundary roughly parallels the 29°N latitude line just south of Lhasa, and the southern boundary is delimited by the international border with Nepal. 28°30'N, 86°10'E.

**Date and History of Establishment:** Establishment in 1989 by the Government of the Xizang Zizhiqu Autonomous Region. Two regions within Jilong and Zhangmu valleys had previously been gazetted as nature reserves in 1985, namely Jiangcun and Zham.

**Area:** 3,500,000 ha. The reserve is part of a 4,008,800 ha. protected areas complex, being contiguous to Nepal's Langtang and Sagarmatha National Parks, as well as the Makalu-Barun National Park and Conservation Area.

**Land Tenure:** State

**Altitude:** Range from 1,433 m. to 8,848 m.

**Physical Features:** The southernmost boundary comprises the High Himalaya which is an east-west oriented, geologically young and seismically active range formed through the collision of the Indian shield and Eurasian mainland plate at the beginning of the Tertiary (BP 63 million years). The presence of antecedent rivers, such as the Pengqu, glacial advances and retreats, and physical and chemical weathering processes have created the present topography, with schist, gneiss, granite and limestone peaks. The rate of uplift of the High Himalayan and Tibetan Plateau is estimated to be 0.7-10 mm per year. Five valleys penetrate the Himalaya: these are, from east to west, Pengqu (Chentang), Rongxia (Rongshan), Poqu (Nielamu), Jilong and Gongdang. North of the High Himalayan chain is a plateau with numerous lakes, such as the 26,800 ha Peikucuo, Meteli Tso and Duquin Tso. Large lake basins occur from west to east, including Jilong, Selong, Jenmu, Dingri, Dingjie and Takexun. Extensive plains are found along the northern slopes of Mount Xixiabangma (Shishapangma), the basin surrounding Peikucuo and the river valley of the Yarlung Tsangpo. To the west are steeply dissected mountains. The southern region is drained by the Pengqu River, which flows 275 km river westward from its headwaters near Siling and the northern slopes of Mount Xixiabangma to become the Arun River as it cuts southward through the High Himalaya (Woodlands Mountain Institute, 1991).

**Climate:** Conditions are influenced by the Himalaya which acts as a meteorological barrier to the south-west monsoon. Mean annual precipitation ranges from 2,000-2,500 mm on the southern aspects of the Himalaya exposed to the monsoon and 600-800 mm in the Pengqu catchment to less than 250 mm in the northern plateau region, where conditions are continental and semi-arid. There is a north-south temperature gradient, with lower mean annual air temperatures of 2-3°C north of the Himalayan chain (Woodlands Mountain Institute, 1991).

**Vegetation:** The vegetation is summarized by Jackson (1991 c) and comprises: an upper sub-tropical zone evergreen broad-leaf forest, dominant species including *Castanopsis hystrix*, *Engelhardia sp.*, and *Machilus sp.*; lower temperate zone of mixed evergreen oak forest, with *Quercus oxydon*, *C. hystrix*, *Engelhardia sp.*, and *Machilus sp.*; upper temperate zone oak, hemlock *Tsuga dumosa*, blue pine *Pinus wallichiana*, and chir pine *P. roxburghii*; sub-alpine zone of spruce *Picea smithiana*, silver fir *Abies spectabilis*, larch *Larix griffithiana*, birch *Betula utilis*, perennial grassland *Stipa/Pennisetum spp.*, and riverine scrub *Hippophae spp.*; alpine zone of grassland *Orinus thoroldii*, low sage *Artemisia spp.*, rhododendron *Rhododendron spp.*, juniper *Sabina spp.*, birch/willow *Betula/Salix spp.* and wet meadow *Kobresia-Carex spp.*; and a nival zone of pincushion plants, dominated by species of *Androsace* and *Arenaria*. In the southern region, sub-tropical forests occur between 1,100 m and 1,800 m, dominated by *Castanopsis hystrix*, *C. tribuloides*, *Lithocarpus spp.*, *Schima sp.*, *Machilus sp.*, *Michelia sp.*, *Engelhardia sp.*, and *Olea sp.* Understorey shrubs include *Ardisia sp.*, *Vaccinium spp.*, *Symplocos sp.*, and *Viburnum sp.* Some areas support rich stands of laurel *Machilus yunnanensis*. where oaks have adapted to moist conditions, species include *Quercus oxydon* and *Q. annulata*. The Kama Valley in the south-west is renowned for its coniferous forests, dominated by blue pine *Pinus wallichiana*, spruce *Picea smithiana*, and silver fir *Abies spectabilis*. Chir pine *Pinus roxburghii* occurs in the forests of Jilong, while at Chentang deciduous larch *Larix griffithiana* is found as high as 4,000 m. Hemlock *Tsuga dumosa* occurs in the more humid valleys and mountain slopes. In the northern region, vegetation in the semi-arid plateau consists of steppe grassland and shrub trees, dominated by grasses such as *Stipa purpurea*, *Orinus thoroldii*, and *Pennisetum flaccidum*, and shrubs such as *Artemisia spp.*, *Potentilla fruticosa*, and *Caragana versicolor*. River valleys and high mountain basins support a lush growth of the sedges *Kobresia pyraea*, *Carex moorcroftii*, and *C. montis-everestii*.

**Fauna:** Primates include langur *Presbytis entellus*, Assam macaque *Macaca assamensis*, and rhesus macaque *M. mulatta*. Carnivores include Himalayan black bear *Selenarctos thibetanus* (V); brown bear *Ursus arctos*, snow leopard *Panthera uncia* (E), leopard *Panthera pardus* (T), clouded leopard *Neofelis nebulosa* (V), Pallas's cat *Felis manul*, wolf *Canis lupus* (V), Asiatic cat *Felis temmincki* (I), jungle cat *Felis chaus*, wild dog *Cuon alpinus* (V), leopard cat *Felis bengalensis*, and jackal *Canis aureus*. Lynx *Felix lunx* is found lower forested valleys, while fox *Vulpes* and Tibetan fox *Vulpes ferrilata* are widespread. Mountain weasel *Mustela altaica*, Siberian weasel *M. sibirica*, beech marten *Martes foina*, and yellow-throated marten *M. flavigula* are present, and European otter *Lutra lutra* (V) occurs in rivers at lower elevations (Jackson, 1991c). Herbivores include red panda *Ailurus fulgens* (K) and Asiatic wild ass *Equus hemionus* (V), of which 50 now roam the plains surrounding Pegu Tso (Jackson, 1991c), Tibetan gazelle *Procapra piticaudata*, bharal *Pseudois nayaur*, serow *Capricornis sumatraensis* which is common in forested gorges, goral *Nemorhaedus goral*, Himalayan tahr *Hemitragus jemlahicus*, Indian muntjac *Muntiacus muntjak*, and musk deer *Mischus chrysogaster*. Other species include Himalayan marmot *Marmota bobak*, black-lipped pika *Ochotona curzoniae*, Moupin pika *O. thibetana*, Royle's pika *O. roylei*, Stoliczka's mountain vole *Alticola stoliczkanus*, Sikkim vole *Pitymys sikkimensis*, Blyth's vole *P. leucurus*. Hodgson's flying squirrel *Petaurista magnificus*, and Himalayan striped squirrel *Callosciurus maccllellndi*. Orange-bellied Himalayan squirrel *Dremomys lokriah* is found in low elevation forests, together with wild boar *Sus scrofa* (Jackson, 1991c).

Birds are distributed according to habitat and altitude. Species include peregrine falcon *Falco peregrinus*, lammergeier *Gypaetus barbatus*, Eurasian griffon culture *Gyps fulvus*, Himalayan monal pheasant *Lophophorus impejanus*, satyr tragopan *Tragopan satyra*, blood pheasant *Ithaginis cruentus*, koklass pheasant *Pucrasia macrolopha*, Tibetan snowcock *Tetraogallus tibetanus*, and Himalayan snoecock *T. himalayensis*. West of Peku Tso a small freshwater lake supports oriental white stork *Ciconia boyciana* (R), blacked-necked crane *Grus nigricollis* (R), and brown-headed gull *Larus brunnicephalus*. Python *Python molurus* (V), is present (Jackson, 1991c).

**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Fish Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SAGARMATHA NATIONAL PARK  
**Number of Species** : 1  
**NRDB status** : 1  
**Pages** : 1

---

Family	Scientific Name	NRDB
PSILO RHYNCHIDAE	Psilorhynchus pseudocheneis	V



**Cultural Heritage:** Qomolangma is rich in cultural sites and artifacts, human activities having been traced back 50,000 years with the discovery of Palaeolithic stone tools near Dingri. Recorded history in the region dates back to before AD 700, based upon the mention of the Xiangxiong culture in Tibetan literature. Several monasteries (*gompas*) occur within the reserve, including *Lapchi*, *Tho-sam-ling*, the 575-year old *Laangkhor*, *Ronbuk (Dzasong)* and *Milarepa's hermitage in the village of Changdong* (Woodlands Mountain Institute, 1991).

**Local Human Population:** Tibetan is the major ethnic group, according for 99% of the population (Working Commission, 1991). Approximately 12,000 families (total population 67,468) live within the reserve, involved mainly in agriculture and animal husbandry. The livestock population totalled 182,518 animals in 1989, with yak grazed seasonally in summer pastures by semi-nomadic groups of pastoralists (Woodlands Mountain Institute, 1991).

**Visitors and Visitor Facilities:** Since 1985, tourism has expanded significantly, with lodges and hotels now located in Dingri, Neilamu, Pazhuo (Paljor), Rongbu, Xegar, and Zhangmar (Woodlands Mountain Institute, 1991).

**Scientific Research and Facilities:** A number of scientific surveys have been carried out, including floral studies by Zhang et al. (1988). Scientific expeditions have been conducted by the Chinese Academy of Sciences. Surveys have been instigated by the participating agencies and include a socio-economic survey by the Tibet Academy of Social Sciences, vegetation mapping and geographical surveys by the Chinese Academy of Sciences, a cultural survey by the Culture Department, a health survey by the Health Department, an education survey by the Education Department, a tourism survey by the Tibet Mountaineering Association, an environmental pollution survey by the Environmental Protection Bureau, and a management survey by the Management Bureau, resulting in a number of reports being published in 1989 (Working Commission, 1991).

**Conservation Value:** Qomolangma is among the world's largest protected areas and together with three adjacent protected areas in Nepal, protects much of the Everest ecosystem. It has a high biological diversity due to its location at juxtaposition of the Palaearctic and Oriental biogeographical realms. Species diversity is particularly high in the temperate forests of the Karma and Kyirong valleys, and pristine forests occur in Chentang and Kyirong valleys. Other habitats range from grassland or wetland and alpine shrubland, and from cliffs to large lakes and rivers. Its spatial continuity with three Himalayan parks in Nepal enhances the long-term genetic viability of otherwise isolated plant and animal populations. The reserve also presents an opportunity to implement management using a participatory model of land management which integrates the needs of local people with the protection of the environment (Woodlands Mountain Institute, 1991; Jackson, 1991c).

**Conservation Management:** The reserve was established through the efforts of the Working Commission of the Qomolangma Nature Reserve and Woodlands Mountain Institute, in conjunction with the Chinese Academy of Sciences and the Tibet Academy of Social Sciences, under a co-operative agreement signed on 26 October 1989 and effective until 31 December 2000. Overall authority lies with the Working Commission which includes representatives from 13 governmental departments holding executive powers. An eight-member 'Expert Group' of key scientists, planners and administrators, appointed by the Working Commission, is responsible for the project's applied research and planning needs. A management bureau, established in Xikeze Prefecture, is responsible for the administration of the reserve. Officials from the Bureau of Agriculture, Animal Husbandry and Forestry, run the management bureau through each county government. Two branch offices have been established: one in Xegar, the administrative centre of Dingri County, and one in Jilong (Working Commission, 1991). In Kyirong a

system of recruiting village leaders as forest and wildlife guards has been successfully employed to protect the forests. Other employment opportunities include training Tibetans and Chinese as tour guides and support staff (Jackson, 1991c).

A management plan is due to be completed in 1991 and will cover management, research, community development, cultural conservation and tourism development. Six core zones of minimally disturbed and largely intact ecosystems are proposed within the reserve: Shishapangma (Xixibangma), Jiangum, Gongdang (Guntan) and Qomolangma (Jackson, 1991c). Immediate management objectives include regulating hunting by terminating all predators bounty programmes, banning the hunting of snow leopard and lynx, and protecting native ungulate populations.

**Management Constraints:** Hunting is a major problem and has led to the decimation of population of snow leopard, lynx, wolf, argali, and brown bear. This is partly due to financial incentives: for example, a snow leopard is worth 400 yuan (US \$ 85). Also herdsman protect their livestock from predation, and from crop damage by wildlife such as wild boar, black bear, monkey and pheasant (Jackson, 1991c).

**Staff:** Over 40 people were employed during 1989-90.

**Budget:** In 1989 the allocated budget was US \$ 224,821 (838,582 yuan) of which capital costs accounted for US \$ 61,293 (228,623 yuan) and recurrent costs US \$ 163,528 (609,959 yuan). In 1990 the planned budget totalled US \$ 428,700 (1,599,051 yuan) with capital costs of US \$ 131,000 (488,630 yuan) and recurrent costs US\$ 297,700 (1,110,421 yuan). The budget for 1991 is US \$ 604,000 (2,252,920 yuan), with capital costs of US \$ 192,500 (715,025 yuan) and recurrent costs US \$ 425,000 (1,585,250 yuan). The reserve has received funding from international donors such as International Development Research Centre (Canada), Funding Exchange, Needmor Foundation, Sequoia Foundation, International Fund for Animal Welfare (England), and the Miflin Trust (Working Commission, 1991).

#### **Local Addresses**

Director. Qomolangma Nature Reserve, Shigatse, Xizhiqu Autonomous Region

#### **Reference**

Jackson, R. (1991a). Snow leopards on the roof of the world. *Cat News* (14): 16-17.

Jackson, R. (1991b). Snow leopards and other wildlife in the Qomolangma Nature Preserve Tibet *Snow Line* 9(1): 9-12.

Jackson, R. (1991c). A wildlife survey of the Qomolangma Nature Preserve, Tibet Autonomous Region, People's Republic of China. Report prepared for Working Commission, Qomolangma Nature Preserve and Chinese Academy of Sciences, Beijing. 15 March 35 pp.

Woodlands Mountain Institute (1991). The Qomolangma Nature Preserve physical setting culture and contemporary environmental and community issues. Woodlands Mountain Institute, Franklin, USA, Unpublished. 10 pp.

Working Commission. (1991). The Qomolangma Nature Preserve of the Tibet Autonomous Region of China. The Working Commission, Qomolangma Nature Preserve, Tibet Autonomous Region of China. Unpublished. 61 pp..

Source: Green, 1993.

## KHANGCHENDZONGA (KANCHENJUNGA) NATIONAL PARK

**IUCN Management Category:** II (National Park).

**Biogeographical Province:** 2.38.12 (Himalayan Highlands).

**Geographical Location:** Situated in North Sikkim District adjacent to the Nepal border and about 103 km from Gantok. The nearest town is Chungthang, some 20 km away. 27°30'-27°50'N, 88°05'-88°40'E

**Date and History of Establishment:** Notified a national park on 26 August 1977, having originally been established as reserved forest. Details of former individual reserved forests are given in the management plan (Anon., 1977). It is proposed to extend the park to the north and establish two sanctuaries in adjacent areas (Rodgers and Panwar, 1988).

**Area:** 84,950 ha (Anon., 1977). Notifies as "about 850 sq.km."

**Land Tenure:** Provincial government. There are no local rights because of the area's former reserved forest status.

**Altitude:** Ranges from about 1,830 to 8,586 m.

**Physical Features:** The national park is enclosed by some impressive mountain peaks and glaciers on all but its eastern side. A series of peaks above 7,000 m. flank its western border, namely Kanchenjunga (third highest mountain in the world and India's highest), Nepal Peak, Talung and Tent Peak. Mount Narsing (5,825m) and Pandim on the southern boundary, and Mount Siniolchu (6,888m) in the north of the park add further to the dramatic scenery. Kanchenjunga and its satellite peaks from a huge mountain massif pushed southwards from the main Himalayan Range. The area is divided into northern and southern portions by an east-west ridge of high peaks. The northern portion features Tent Peak, Nepal Gap, Zemu and Simyo glaciers, which are drained by the eastward-flowing Zemu Chhu. Rukel Chhu, Uma Ram Chhu and Zumthulphuk and their associated network of deep ravines and side-valleys drain the southern portion and flow south-east to join the Teesta River at Mangan. Muletingtso, a large lake, lies at the head of the Ringi Chhu.

**Climate:** Snowfall is heavy during winter. Showers in May and June herald the arrival of the monsoon, which continues until mid-October. Mean annual precipitation is about 3800 mm. and 2540 mm. below and above 2,440 m., respectively (Anon., 1977). Kanchenjunga is massive enough not only to generate its own climate but to attract the full force of the monsoon, with warm moist air from the Bay of Bengal travelling unimpeded up the Teesta Valley. Consequently, humidity is very high and annual snowfall on Kanchenjunga itself is probably higher than for any other peak in the Himalaya (Smythe, 1930; Lavkumar, 1980).

**vegetation:** Comprises temperate forest and alpine scrub. Temperate broadleaved forests are dominated by oaks *Quercus lineata*, *Q. lamellosa*, *Q. pachyphylla*. Mixed coniferous forests occur at higher altitudes, with fir *Abies densa*, birch *Betula* spp., maple *Acer* spp., and willow *Salix* spp. up to 3,660 m. Patches of eastern Himalayan larch *Larix griffithii*, spruce *Picea spinolosa* and junipers *Juniperus* spp. occur at 2,740 m. There is a belt of juniper *Juniperus* spp. with *Rhododendron* spp. associates from 3,660 m. to 4,270 m., above which are alpine scrub and meadows (Anon., 1977).

**Fauna:** The area supports a diverse fauna, including a number of threatened species such as wild dog *Cuon alpinus* (V), red panda *Ailurus fulgens* (K), snow leopard *Panthera uncia* (E), clouded leopard *Neofelis nebulosa* (V), marbled cat *Felis marmorata* (I), Tibetan wild ass *Equus hemionus* (V),



Himalayan musk deer *Moschus chrysogaster* and Tibetan argali *Ovis ammon hodgsoni* (I). Other large mammals are common langur *Presbytis entellus*, red fox *Vulpes vulpes*, large Indian civet *Viverra zibetha*, binturong *Arctictis binturong* and an interesting variety of ungulates, namely: Indian muntjac *Muntiacus muntjak*, goral *Nemorhaedus goral*, serow *Capricornis sumatraensis*, Himalayan tahr *Hemitragus jemlahicus*, bharal *Pseudois nayaur* and takin *Budorcas taxicolor* (Anon., 1977).

Of the avifauna, noteworthy species include ibisbill *Ibidorhynchus struthersii*, blood pheasant *Ithaginis cruentus*, satyr tragopan *Tragopan satyra*, Asian emerald cuckoo *Chrysococcyx maculatus*, red-headed trogon *Harpactes erythrocephalus*, great slaty woodpecker *Mulleripicus pulverulentus*, rufous piculet *Sasia abnormis* and long-tailed broadbill *Psarisomus dalhousiae* (Anon., 1977).

Reptiles found at lower altitudes include rat snake *Ptyas mucosus* and Russell's viper *Viper russelli* (Anon., 1977).

**Cultural Heritage:** The centuries old Tolung Gumpa is just south of the national park. To the local people the five summits of Kanchenjunga are the 'five treasures of the snow' on which rests the throne of their God. There are even tales of human sacrifices having been made to this deity in the distant past (Smythe, 1930).

**Local Human Population:** There are a few Lepcha settlements within the national park (Lavkumar, 1980).

**Visitors and Visitor Facilities:** There are four resthouses.

**Scientific Research and Facilities:** The first European to undertake serious exploration in the area was the botanist Sir Joseph Hooker in 1848-1849 (Smythe, 1930). The vegetation of most (70%) of the park is to be mapped.

**Conservation Value:** The area is a spectacular wilderness, with one of the world's highest peaks towering above some fine forests that remain virtually undisturbed (Lavkumar, 1980). The park must rank as one of the most important protected areas in the entire Himalayan (Rogers and Panwar, 1988). Kanchenjunga is considered to be the finest example of an independent mountain having its own glacial system radiating from its several summits. It also boasts some of the most magnificent snow and ice scenery in the world (Smythe, 1930).

**Conservation Management:** Following the park's establishment, a large-scale operation was mounted by the wildlife authorities in cooperation with the Sikkim Armed Police to demolish some 5,000 km. of traplines, constructed for capturing musk deer and pheasants. Such operations have been repeated annually. Wildlife conservation films are screened in peripheral villages. Efforts to remove a herd of 70 yak from the peak have failed, and it is proposed to use them for transport purposes (IIPA/Environmental Studies Division, pers.comm., 1990). The first management plan covered the period 1977/1978-1978/1979 (Anon., 1977). A new management plan was drafted by the Chief Wildlife Warden for 1980-1985 (Anon., 1984). A small extension of 9,700 ha. to the north of the park has been proposed to increase representation of Tibetan faunal elements (Anon., 1988; Rodgers and Panwar, 1988). It has also been proposed that two sanctuaries, Tolung (23,000 ha) and Dzongri (46,800 ha) be established as buffer to provide low altitude winter refuges for animals from the park (Rodgers and Panwar, 1988).

**Management Constraints:** There was some poaching and encroachment by grazier (Anon., 1977) but, in general, the level of disturbance was minimal (Lavkumar., 1980). Pastoralists from across the border with Nepal continue to enter the park to hunt musk deer, often with sophisticated weapons. The location of the Assam Rifles Firing Range within the park is a source of disturbance (IIPA/Environmental Studies Division, pers. comm., 1990).

**Staff:** Two wildlife wardens, three assistant wildlife wardens, 15 wildlife guards (1984)

**Budget:** Rs 886,500 (1983/1984)

**Local Addresses:** Wildlife Warden, Kanchenjunga National Park, Forest Department, Deorali 737102, Sikkim

**References:** Anon. (1977). Management plan of Kanchenjunga National Park, Government of Sikkim, Gantok, Unpublished. 13 pp.

Anon. (1984). Draft management plan of Kanchenjunga National Park. Government of Sikkim, Gantok. Unpublished. (Unseen)

Anon. (1988). *The snow leopard conservation scheme*. Ministry of Environment and Forests, Government of India, New Delhi. (Unseen).

Lavkumar, Khacher (1980). Kanchenjunga. *WWF-India Newsletter* 33: 8-10.

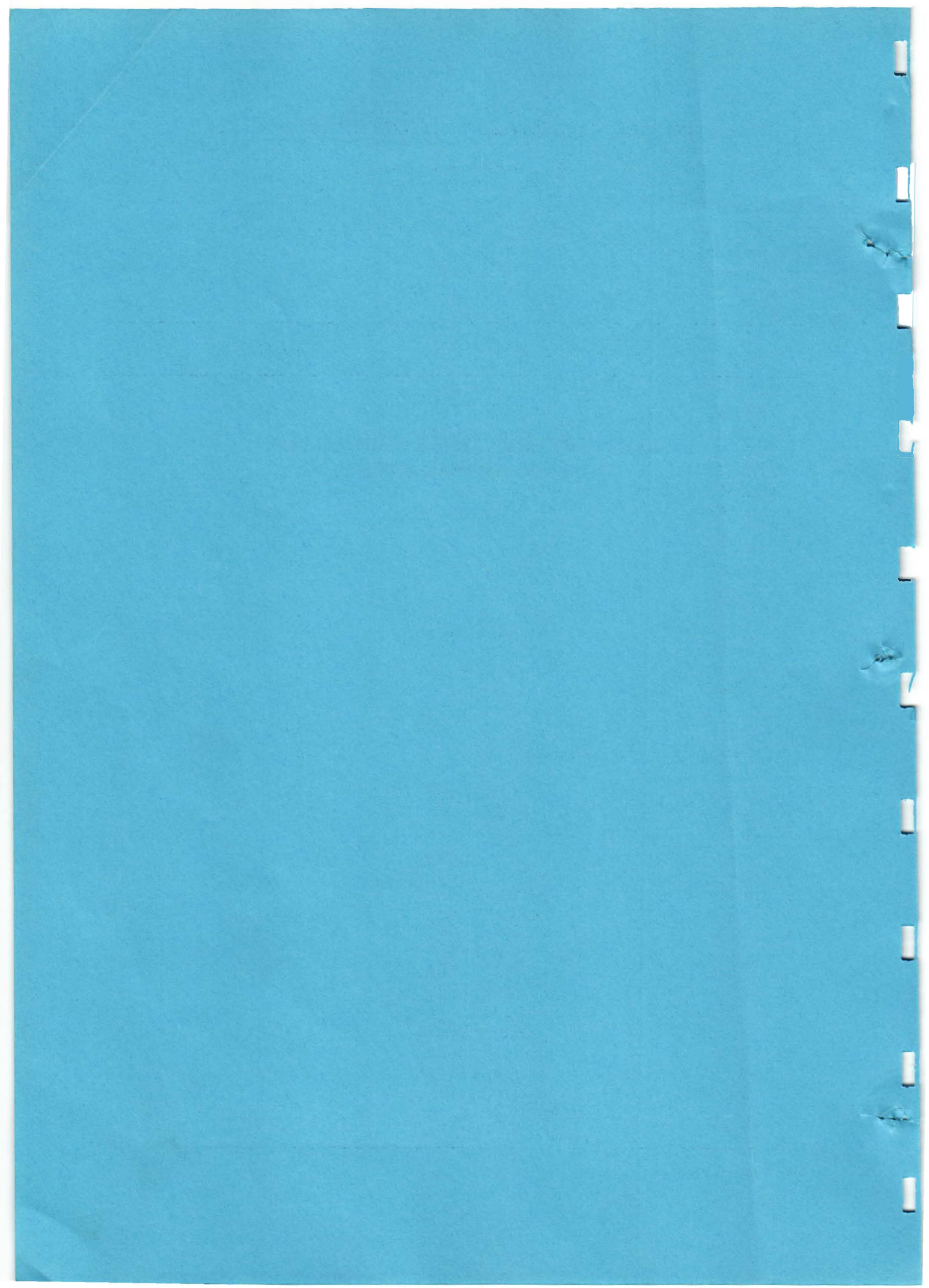
Rodgers, W.A. and Panwar, H.S. (1988). *Planning a wildlife protected area network in India*. 2 vols. Project FO: IND/82/003. FAO, Dehra Dun.

Smythe, F.S. (1930). *The Kanchenjunga adventure*. Victor Gollanz, London. pp. 18-23.

**Date:** October 1981, reviewed May 1988, updated July 1991.



**LIST OF VERTEBRATES RECORDED FOR  
RARA NATIONAL PARK**





**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Mammal Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> RARA NATIONAL PARK  
**Number of Species** : 51  
**NRDB status** : 24  
**Pages** : 2

Family	Scientific Name	NRDB
AILURIDAE	Ailurus fulgens	E
BOVIDAE	Hemitragus jemlahicus	S
BOVIDAE	Naemorhedus goral	S
BOVIDAE	Naemorhedus sumatraensis	S
CALLOSCIURINAE	Dremomys lokriah	
CALLOSCIURINAE	Tamias maclellandi	
CANIDAE	Canis aureus	
CANIDAE	Canis lupus	V
CANIDAE	Cuon alpinus	V
CANIDAE	Vulpes bengalensis	S
CANIDAE	Vulpes vulpes	S
CERCOPITHECIDAE	Macaca assamensis	V
CERCOPITHECIDAE	Macaca mulatta	S
CERCOPITHECIDAE	Semnopithecus entellus	\$
CERVIDAE	Muntiacus muntjak	
FELIDAE	Catopuma temminckii	V
FELIDAE	Felis chaus	S
FELIDAE	Panthera pardus	S
FELIDAE	Panthera uncia	E
FELIDAE	Pardofelis marmorata	V
FELIDAE	Pardofelis nebulosa	V
FELIDAE	Prionailurus bengalensis	V
HIPPOSIDERIDAE	Hipposideros armiger	
LUTRANAE	Lutra lutra	S
MANIDAE	Manis pentadactyla	S
MOSCHIDAE	Moschus chrysogaster	E
MURIDAE	Mus musculus	
MUSTELIDAE	Martes flavigula	
MUSTELIDAE	Mustela altaica	
MUSTELIDAE	Mustela sibirica	
OCHOTONIDAE	Ochotona macrotis	
PTEROMYIDAE	Hylopetes alboniger	
PTEROMYIDAE	Petaurista magnificus	
PTEROMYIDAE	Petaurista petaurista	
PTEROMYIDAE	Trogopterus pearsonii	
SCIURIDAE	Ratufa bicolor	S

Family	Scientific Name	NRDB
SORICIDAE	Chimarrogale himalayica	
SORICIDAE	Nectogale elegans	
SORICIDAE	Soriculus baileyi	
SORICIDAE	Soriculus caudatus	
SORICIDAE	Soriculus gruberi	
SORICIDAE	Soriculus leucops	
SORICIDAE	Soriculus nigrescens	
SORICIDAE	Suncus murinus	
SORICIDAE	Suncus stoliczkanus	
SUIDAE	Sus scrofa	
TALPIDAE	Talpa micrura	
URSIDAE	Ursus arctos	V
URSIDAE	Ursus thibetanus	V
VESPERTILIONIDAE	Barbastella leucomelas	
VESPERTILIONIDAE	Plecotus auritus	

**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Bird Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> RARA NATIONAL PARK  
**Number of Species** : 212  
**NRDB status** : 20  
**Pages** : 5

Family	Scientific Name	NRDB
ACCIPITRIDAE	Accipiter gentilis	
ACCIPITRIDAE	Accipiter nisus	
ACCIPITRIDAE	Accipiter trivirgatus	S
ACCIPITRIDAE	Accipiter virgatus	S
ACCIPITRIDAE	Aquila chrysaetos	S
ACCIPITRIDAE	Buteo buteo	S
ACCIPITRIDAE	Buteo hemilasius	S
ACCIPITRIDAE	Buteo rufinus	S
ACCIPITRIDAE	Circus aeruginosus	
ACCIPITRIDAE	Circus cyaneus	
ACCIPITRIDAE	Circus macrourus	S
ACCIPITRIDAE	Gypaetus barbatus	S
ACCIPITRIDAE	Gyps himalayensis	
ACCIPITRIDAE	Hieraaetus fasciatus	
ACCIPITRIDAE	Hieraaetus pennatus	
ACCIPITRIDAE	Ictinaetus malayensis	
ACCIPITRIDAE	Milvus migrans	
ACCIPITRIDAE	Pandion haliaetus	S
ACCIPITRIDAE	Spilornis cheela	S
ALAUDIDAE	Alauda gulgula	
ALAUDIDAE	Calandrella acutirostris	
ALCEDINIDAE	Alcedo atthis	
ALCEDINIDAE	Ceryle lugubris	
ANATIDAE	Anas acuta	
ANATIDAE	Anas clypeata	
ANATIDAE	Anas crecca	
ANATIDAE	Anas formosa	
ANATIDAE	Anas penelope	S
ANATIDAE	Anas platyrhynchos	
ANATIDAE	Anas strepera	
ANATIDAE	Anser anser	
ANATIDAE	Anser indicus	S
ANATIDAE	Aythya ferina	S
ANATIDAE	Aythya fuligula	



Family	Scientific Name	NRDB
ANATIDAE	Aythya nyroca	S
ANATIDAE	Bucephala clangula	VG
ANATIDAE	Mergus merganser	
ANATIDAE	Netta rufina	
ANATIDAE	Tadorna ferruginea	
APODIDAE	Apus apus	
APODIDAE	Hirundapus caudacutus	
ARDEIDAE	Ardea cinerea	
ARDEIDAE	Botaurus stellaris	
ARDEIDAE	Egretta alba	
CAMPEPHAGIDAE	Pericrocotus ethologus	
CAPITONIDAE	Megalaima virens	
CAPRIMULGIDAE	Caprimulgus indicus	
CERTHIIDAE	Certhia familiaris	
CERTHIIDAE	Certhia himalayana	
CERTHIIDAE	Certhia nipalensis	
CHARADRIIDAE	Actitis hypoleucos	
CHARADRIIDAE	Calidris minuta	
CHARADRIIDAE	Calidris temminckii	
CHARADRIIDAE	Charadrius mongolus	
CHARADRIIDAE	Gallinago gallinago	
CHARADRIIDAE	Phalaropus lobatus	
CHARADRIIDAE	Scolopax rusticola	
CHARADRIIDAE	Tringa glareola	
CHARADRIIDAE	Tringa nebularia	
CHARADRIIDAE	Tringa ochropus	
CHARADRIIDAE	Tringa totanus	
CINCLIDAE	Cinclus pallasii	
COLUMBIDAE	Columba hodgsonii	
COLUMBIDAE	Columba leuconota	
COLUMBIDAE	Columba livia	
COLUMBIDAE	Columba rupestris	
COLUMBIDAE	Streptopelia chinensis	
COLUMBIDAE	Streptopelia orientalis	
CORVIDAE	Corvus corax	
CORVIDAE	Corvus macrorhynchos	
CORVIDAE	Garrulus lanceolatus	
CORVIDAE	Nucifraga caryocatactes	
CORVIDAE	Pyrrhocorax pyrrhocorax	
CORVIDAE	Urocissa erythrorhyncha	
CORVIDAE	Urocissa flavirostris	
CUCULIDAE	Cuculus canorus	
CUCULIDAE	Cuculus poliocephalus	
CUCULIDAE	Cuculus saturatus	
CUCULIDAE	Hierococyx sparveroides	
DICRURIDAE	Dicrurus leucophaeus	

Family	Scientific Name	NRDB
EMBERIZIDAE	Emberiza cia	
FALCONIDAE	Falco subbuteo	
FALCONIDAE	Falco tinnunculus	
FRINGILLIDAE	Carduelis carduelis	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus erythrinus	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus puniceus	
FRINGILLIDAE	Carpodacus rhodochrous	
FRINGILLIDAE	Carpodacus rubicilloides	
FRINGILLIDAE	Fringilla coelebs	
FRINGILLIDAE	Fringilla montifringilla	
FRINGILLIDAE	Leucosticte nemoricola	
FRINGILLIDAE	Mycerobas affinis	
FRINGILLIDAE	Pyrrhula erythrocephala	
FRINGILLIDAE	Serinus pusillus	
FRINGILLIDAE	Serinus thibetanus	
GRUIDAE	Anthropoides virgo	
HIRUNDINIDAE	Ptyonoprogne rupestris	
HIRUNDINIDAE	Riparia riparia	
JACANIDAE	Hydrophasianus chirurgus	
LANIIDAE	Lanius schach	
LANIIDAE	Lanius tephronotus	
LARIDAE	Gelochelidon nilotica	
LARIDAE	Larus argentatus	
LARIDAE	Larus brunnicephalus	
LARIDAE	Larus fuscus	VG
LARIDAE	Larus ichthyaetus	VG
LARIDAE	Larus ridibundus	
MOTACILLIDAE	Anthus cervinus	
MOTACILLIDAE	Anthus hodgsoni	
MOTACILLIDAE	Anthus roseatus	
MOTACILLIDAE	Motacilla alba	
MOTACILLIDAE	Motacilla cinerea	
MOTACILLIDAE	Motacilla citreola	
MOTACILLIDAE	Motacilla flava	
MUSCICAPIDAE	Alcippe vinipectus	
MUSCICAPIDAE	Cettia acanthizoides	
MUSCICAPIDAE	Cettia brunnifrons	
MUSCICAPIDAE	Cettia fortipes	
MUSCICAPIDAE	Chaimarrornis leucocephalus	
MUSCICAPIDAE	Enicurus maculatus	
MUSCICAPIDAE	Enicurus scouleri	
MUSCICAPIDAE	Ficedula strophliata	
MUSCICAPIDAE	Ficedula superciliaris	
MUSCICAPIDAE	Ficedula tricolor	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Ficedula westermanni	
MUSCICAPIDAE	Garrulax erythrocephalus	
MUSCICAPIDAE	Garrulax lineatus	
MUSCICAPIDAE	Garrulax ocellatus	
MUSCICAPIDAE	Garrulax variegatus	
MUSCICAPIDAE	Heterophasia capistrata	
MUSCICAPIDAE	Luscinia cyane	
MUSCICAPIDAE	Minla strigula	
MUSCICAPIDAE	Monticola cinclorhyncha	
MUSCICAPIDAE	Muscicapa ruficauda	
MUSCICAPIDAE	Muscicapa sibirica	
MUSCICAPIDAE	Myiophoneus caeruleus	
MUSCICAPIDAE	Oenanthe deserti	
MUSCICAPIDAE	Phoenicurus caeruleocephalus	
MUSCICAPIDAE	Phoenicurus erythronotus	
MUSCICAPIDAE	Phoenicurus frontalis	
MUSCICAPIDAE	Phoenicurus ochruros	
MUSCICAPIDAE	Phylloscopus affinis	
MUSCICAPIDAE	Phylloscopus fuscatus	
MUSCICAPIDAE	Phylloscopus inornatus	
MUSCICAPIDAE	Phylloscopus maculipennis	
MUSCICAPIDAE	Phylloscopus magnirostris	
MUSCICAPIDAE	Phylloscopus occipitalis	
MUSCICAPIDAE	Phylloscopus proregulus	
MUSCICAPIDAE	Phylloscopus pulcher	
MUSCICAPIDAE	Phylloscopus trochiloides	
MUSCICAPIDAE	Pnoepyga albiventer	
MUSCICAPIDAE	Regulus regulus	
MUSCICAPIDAE	Rhipidura albicollis	
MUSCICAPIDAE	Rhipidura hypoxantha	
MUSCICAPIDAE	Ryacornis fuliginosus	
MUSCICAPIDAE	Saxicola ferrea	
MUSCICAPIDAE	Saxicola torquata	
MUSCICAPIDAE	Seicercus burkii	
MUSCICAPIDAE	Seicercus xanthoschistos	
MUSCICAPIDAE	Tarsiger cyanurus	
MUSCICAPIDAE	Turdus albocinctus	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Turdus unicolor	
MUSCICAPIDAE	Turdus viscivorus	
MUSCICAPIDAE	Yuhina gularis	
MUSCICAPIDAE	Zoothera dauma	
MUSCICAPIDAE	Zoothera dixonii	
NECTARINIIDAE	Aethopyga gouldiae	
NECTARINIIDAE	Aethopyga nipalensis	
PARIDAE	Aegithalos concinnus	

Family	Scientific Name	NRDB
PARIDAE	Aegithalos niveogularis	
PARIDAE	Cephalopyrus flammiceps	
PARIDAE	Parus dichrous	
PARIDAE	Parus major	
PARIDAE	Parus melanolophus	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PARIDAE	Parus rufonuchalis	
PARIDAE	Parus xanthogenys	
PHALACROCORACIDAE	Phalacrocorax carbo	
PHASIANIDAE	Alectoris chukar	
PHASIANIDAE	Catreus wallichii	E (HMG/P)
PHASIANIDAE	Ithaginis cruentus	S
PHASIANIDAE	Lophophorus impejanus	S (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Pucrasia macrolopha	S
PHASIANIDAE	Tetraogallus himalayensis	
PICIDAE	Dendrocopos himalayensis	
PICIDAE	Picus squamatus	
PLOCEIDAE	Passer montanus	
PODICIPEDIDAE	Podiceps cristatus	S
PODICIPEDIDAE	Podiceps nigricollis	VG
PODICIPEDIDAE	Tachybaptus ruficollis	
PRUNELLIDAE	Prunella atrogularis	
PRUNELLIDAE	Prunella collaris	
PRUNELLIDAE	Prunella fulvescens	
PRUNELLIDAE	Prunella himalayana	
PRUNELLIDAE	Prunella strophiatea	
PYCNONOTIDAE	Hypsipetes leucocephalus	
PYCNONOTIDAE	Pycnonotus leucogenys	
RALLIEDAE	Fulica atra	
RALLIEDAE	Gallinula chloropus	
SITTIDAE	Sitta cashmirensis	
SITTIDAE	Sitta leucopsis	
STRIGIDAE	Glaucidium brodiei	
STRIGIDAE	Strix aluco	
STURNIDAE	Acridotheres tristis	
TROGLODYTIDAE	Troglodytes troglodytes	
TURDIDAE	Rhyacornis fuliginosus	
UPUPIDAE	Upupa epops	



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Reptile Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> RARA NATIONAL PARK  
**Number of Species** : 1  
**NRDB status** : 0  
**Pages** : 1

---

Family	Scientific Name	NRDB
COLUBRIDAE	Amphiesma platyceps	

---



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Amphibian Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> RARA NATIONAL PARK  
**Number of Species** : 1  
**NRDB status** : 1  
**Pages** : 1

---

Family	Scientific Name	NRDB
RANIDAE	Rana rara	S

---





**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Fish Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> RARA NATIONAL PARK  
**Number of Species** : 3  
**NRDB status** : 0  
**Pages** : 1

---

Family	Scientific Name	NRDB
CUPRINIDAE	Schizothorax macrophthalmus	
CUPRINIDAE	Schizothorax nepalensis	
CUPRINIDAE	Schizothorax raraensis	



**LIST OF VERTEBRATES RECORDED FOR  
SHEY-PHOKSUNDO NATIONAL PARK**



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Mammal Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SHEY-PHOKSUNDO NATIONAL PARK  
**Number of Species** : 26  
**NRDB status** : 16  
**Pages** : 1

Family	Scientific Name	NRDB
AILURIDAE	Ailurus fulgens	E
BOVIDAE	Bos mutus	C
BOVIDAE	Hemitragus jemlahicus	S
BOVIDAE	Naemorhedus goral	S
BOVIDAE	Ovis ammon	C
BOVIDAE	Pantholops hodgsoni	C
BOVIDAE	Pseudois nayaur	S
CANIDAE	Canis aureus	
CANIDAE	Canis lupus	V
CANIDAE	Vulpes vulpes	S
CERCOPITHECIDAE	Macaca mulatta	S
CERCOPITHECIDAE	Semnopithecus entellus	S
FELIDAE	Panthera pardus	S
FELIDAE	Panthera uncia	E
LEPORIDAE	Lepus oiostolus	
MOSCHIDAE	Moschus chrysogaster	E
MURIDAE	Apodemus sylvaticus	
MURIDAE	Rattus turkestanicus	
MUSTELIDAE	Arctonyx collaris	S
MUSTELIDAE	Martes flavigula	
MUSTELIDAE	Martes foina	
MUSTELIDAE	Mustela sibirica	
OCHOTONIDAE	Ochotona roylei	
SCIURIDAE	Marmota himalaya	
SUIDAE	Sus scrofa	
URSIDAE	Ursus arctos	V

**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Bird Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SHEY-PHOKSUNDO NATIONAL PARK  
**Number of Species** : 176  
**NRDB status** : 17  
**Pages** : 4

Family	Scientific Name	NRDB
ACCIPITRIDAE	Accipiter gentilis	
ACCIPITRIDAE	Accipiter nisus	
ACCIPITRIDAE	Aquila chrysaetos	S
ACCIPITRIDAE	Aquila nipalensis	S
ACCIPITRIDAE	Buteo buteo	S
ACCIPITRIDAE	Buteo hemilasius	S
ACCIPITRIDAE	Circus cyaneus	
ACCIPITRIDAE	Gypaetus barbatus	S
ACCIPITRIDAE	Gyps himalayensis	
ACCIPITRIDAE	Hieraaetus pennatus	
ACCIPITRIDAE	Milvus migrans	
ACCIPITRIDAE	Neophron percnopterus	S
ALAUDIDAE	Alauda gulgula	
ALAUDIDAE	Calandrella acutirostris	
ALAUDIDAE	Calandrella brachydactyla	
ALAUDIDAE	Eremophila alpestris	
ANATIDAE	Anser indicus	S
ANATIDAE	Aythya fuligula	
ANATIDAE	Tadorna ferruginea	
APODIDAE	Apus apus	
APODIDAE	Apus melba	
APODIDAE	Collocalia brevirostris	
CAMPEPHAGIDAE	Pericrocotus ethologus	
CAPRIMULGIDAE	Caprimulgus macrurus	
CERTHIIDAE	Certhia familiaris	
CERTHIIDAE	Certhia himalayana	
CHARADRIIDAE	Gallinago nemoricola	V
CINCLIDAE	Cinclus cinclus	
CINCLIDAE	Cinclus pallasii	
COLUMBIDAE	Columba hodgsonii	
COLUMBIDAE	Columba leuconota	
COLUMBIDAE	Columba livia	

Family	Scientific Name	NRDB
COLUMBIDAE	Columba rupestris	
COLUMBIDAE	Streptopelia orientalis	
CORVIDAE	Corvus corax	
CORVIDAE	Corvus macrorhynchos	
CORVIDAE	Nucifraga caryocatactes	
CORVIDAE	Pseudopodoces humilis	
CORVIDAE	Pyrrhonorax graculus	
CORVIDAE	Pyrrhonorax pyrrhonorax	
CUCULIDAE	Cuculus canorus	
CUCULIDAE	Cuculus poliocephalus	
DICAEIDAE	Dicaeum ignipectus	
DICRURIDAE	Dicrurus hottentottus	
DICRURIDAE	Dicrurus leucophaeus	
EMBERIZIDAE	Emberiza cia	
EMBERIZIDAE	Emberiza leucocephalos	
EMBERIZIDAE	Emberiza pusilla	
FALCONIDAE	Falco amurensis	S
FALCONIDAE	Falco columbarius	
FALCONIDAE	Falco tinnunculus	
FRINGILLIDAE	Carduelis carduelis	
FRINGILLIDAE	Carduelis flavirostris	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus erythrinus	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus puniceus	
FRINGILLIDAE	Carpodacus rhodochrous	
FRINGILLIDAE	Carpodacus rubicilla	
FRINGILLIDAE	Carpodacus rubicilloides	
FRINGILLIDAE	Carpodacus thura	
FRINGILLIDAE	Fringilla coelebs	
FRINGILLIDAE	Leucosticte brandti	
FRINGILLIDAE	Leucosticte nemoricola	
FRINGILLIDAE	Mycerobas affinis	
FRINGILLIDAE	Mycerobas carnipes	
FRINGILLIDAE	Mycerobas melanozanthos	
FRINGILLIDAE	Pyrrhula erythrocephala	
FRINGILLIDAE	Serinus pusillus	
GRUIDAE	Grus grus	E (HMG/P)
HIRUNDINIDAE	Delichon dasypus	
HIRUNDINIDAE	Ptyonoprogne rupestris	
IBIDORHYNCHIDAE	Ibidorhyncha struthersii	
LANIIDAE	Lanius schach	
LANIIDAE	Lanius tephronotus	
MEROPIDAE	Merops orientalis	S



Family	Scientific Name	NRDB
MOTACILLIDAE	Anthus hodgsoni	
MOTACILLIDAE	Anthus roseatus	
MOTACILLIDAE	Anthus sylvanus	
MOTACILLIDAE	Motacilla alba	
MOTACILLIDAE	Motacilla cinerea	
MOTACILLIDAE	Motacilla citreola	
MUSCICAPIDAE	Ficedula strophia	
MUSCICAPIDAE	Ficedula superciliaris	
MUSCICAPIDAE	Ficedula tricolor	
MUSCICAPIDAE	Muscicapa ruficauda	
MUSCICAPIDAE	Cettia brunnifrons	
MUSCICAPIDAE	Hippolais caligata	
MUSCICAPIDAE	Leptopoecile sophiae	
MUSCICAPIDAE	Phylloscopus affinis	
MUSCICAPIDAE	Phylloscopus griseolus	
MUSCICAPIDAE	Phylloscopus inornatus	
MUSCICAPIDAE	Phylloscopus magnirostris	
MUSCICAPIDAE	Phylloscopus proregulus	
MUSCICAPIDAE	Phylloscopus pulcher	
MUSCICAPIDAE	Phylloscopus reguloides	
MUSCICAPIDAE	Phylloscopus trochiloides	
MUSCICAPIDAE	Prinia criniger	
MUSCICAPIDAE	Regulus regulus	
MUSCICAPIDAE	Seicercus burkii	
MUSCICAPIDAE	Seicercus xanthoschistos	
MUSCICAPIDAE	Alcippe vinipectus	
MUSCICAPIDAE	Garrulax lineatus	
MUSCICAPIDAE	Garrulax variegatus	
MUSCICAPIDAE	Pteruthius xanthochloris	
MUSCICAPIDAE	Chaimarrornis leucocephalus	
MUSCICAPIDAE	Enicurus scouleri	
MUSCICAPIDAE	Hodgsonius phoenicuroides	
MUSCICAPIDAE	Luscinia brunnea	
MUSCICAPIDAE	Luscinia pectoralis	
MUSCICAPIDAE	Monticola rufiventris	
MUSCICAPIDAE	Monticola solitarius	
MUSCICAPIDAE	Myiophoneus caeruleus	
MUSCICAPIDAE	Oenanthe deserti	
MUSCICAPIDAE	Phoenicurus caeruleocephalus	
MUSCICAPIDAE	Phoenicurus erythrogaster	
MUSCICAPIDAE	Phoenicurus erythronotus	
MUSCICAPIDAE	Phoenicurus frontalis	
MUSCICAPIDAE	Phoenicurus hodgsoni	
MUSCICAPIDAE	Phoenicurus ochruros	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Phoenicurus schisticeps	
MUSCICAPIDAE	Rhyacornis fuliginosus	
MUSCICAPIDAE	Saxicola ferrea	
MUSCICAPIDAE	Saxicola torquata	
MUSCICAPIDAE	Tarsiger chrysaeus	
MUSCICAPIDAE	Tarsiger cyanurus	
MUSCICAPIDAE	Tarsiger indicus	
MUSCICAPIDAE	Turdus albocinctus	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Turdus unicolor	
MUSCICAPIDAE	Turdus viscivorus	
MUSCICAPIDAE	Muscicapa sibirica	
MUSCICAPIDAE	Rhipidura hypoxantha	
NECTARINIIDAE	Aethopyga gouldiae	
NECTARINIIDAE	Aethopyga nipalensis	
PARIDAE	Aegithalos concinnus	
PARIDAE	Aegithalos niveogularis	
PARIDAE	Parus dichrous	
PARIDAE	Parus melanolophus	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PARIDAE	Parus rufonuchalis	
PHASIANIDAE	Alectoris chukar	
PHASIANIDAE	Lerwa lerwa	
PHASIANIDAE	Lophophorus impejanus	S (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Pavo cristatus	
PHASIANIDAE	Perdix hodgsoniae	
PHASIANIDAE	Pucrasia macrolopha	S
PHASIANIDAE	Tetraogallus himalayensis	
PHASIANIDAE	Tetraogallus tibetanus	S
PICIDAE	Dendrocopos himalayensis	
PICIDAE	Picus squamatus	
PLOCEIDAE	Montifringilla adamsi	
PLOCEIDAE	Passer domesticus	
PLOCEIDAE	Passer montanus	
PLOCEIDAE	Passer rutilans	
PRUNELLIDAE	Prunella atrogularis	
PRUNELLIDAE	Prunella collaris	
PRUNELLIDAE	Prunella fulvescens	
PRUNELLIDAE	Prunella rubeculoides	
PRUNELLIDAE	Prunella strophiatea	
PYCNONOTIDAE	Hypsipetes leucocephalus	
PYCNONOTIDAE	Pycnonotus leucogenys	

Family	Scientific Name	NRDB
RALLIDAE	Fulica atra	
SITTIDAE	Sitta cashmirensis	
SITTIDAE	Sitta leucopsis	
SITTIDAE	Tichodroma muraria	
STRIGIDAE	Asio flammeus	S
STRIGIDAE	Athene noctua	S
STRIGIDAE	Strix aluco	
STURNIDAE	Sturnus pagodarum	
TROGLODYTIDAE	Troglodytes troglodytes	
UPUPIDAE	Upupa epops	
ZOSTEROPIDAE	Zosterops palpebrosus	

**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

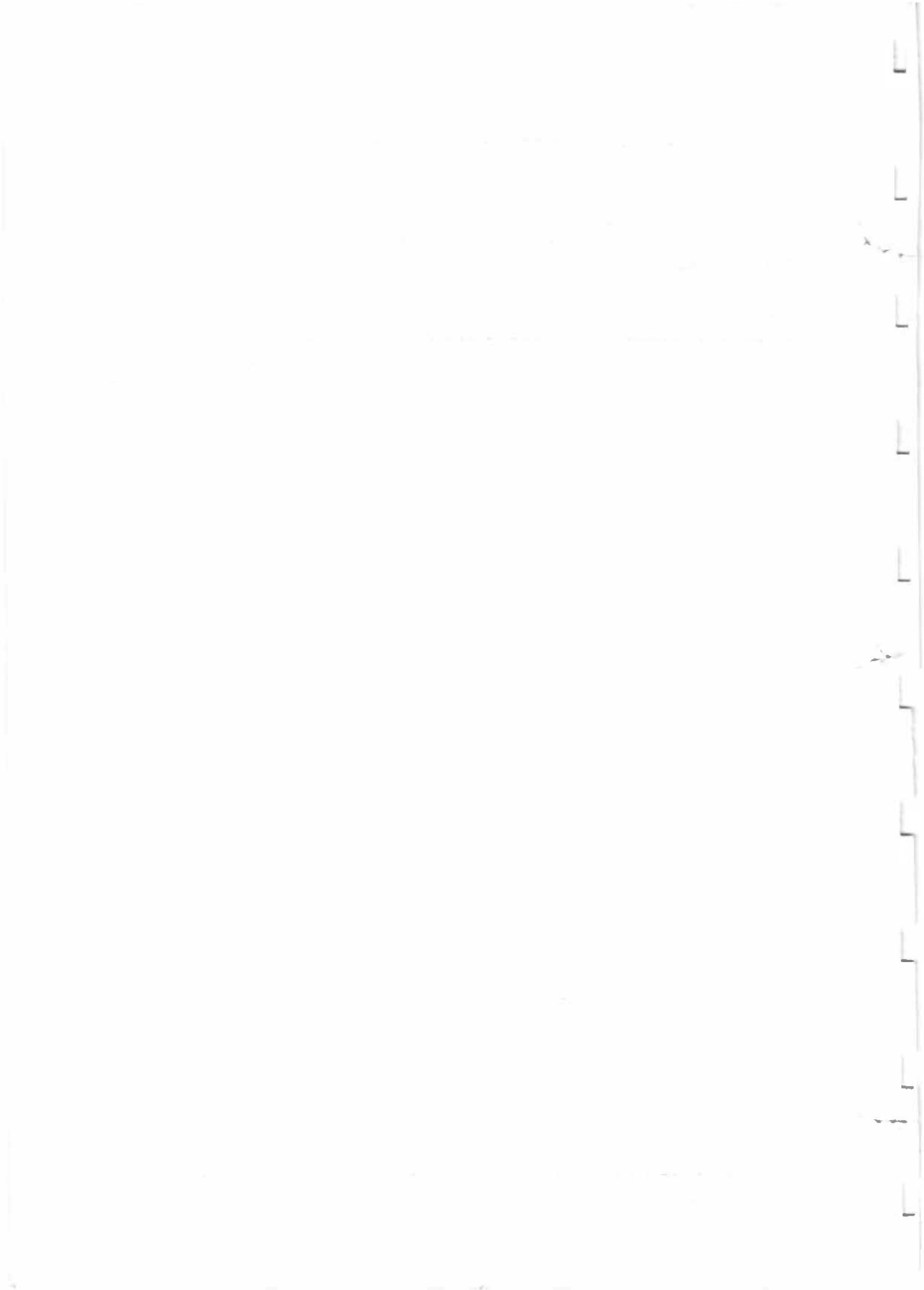
**Reptile Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SHEY-PHOKSUNDO NATIONAL PARK  
**Number of Species** : 1  
**NRDB status** : 0  
**Pages** : 1

---

<b>Family</b>	<b>Scientific Name</b>	<b>NRDB</b>
SCINCIDAE	Scincella ladacensis	

---



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Fish Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SHEY-PHOKSUNDO NATIONAL PARK  
**Number of Species** : 0  
**NRDB status** : 0  
**Pages** : 1

---

<b>Family</b>	<b>Scientific Name</b>	<b>NRDB</b>
---------------	------------------------	-------------

---



**LIST OF VERTEBRATES RECORDED FOR  
DHORPATAN HUNTING RESERVE**





**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Mammal Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> DHORPATAN HUNTING RESERVE  
**Number of Species** : 18  
**NRDB status** : 13  
**Pages** : 1

Family	Scientific Name	NRDB
AILURIDAE	Ailurus fulgens	E
BOVIDAE	Hemitragus jemlahicus	S
BOVIDAE	Naemorhedus goral	S
BOVIDAE	Naemorhedus sumatraensis	S
BOVIDAE	Pseudois nayaur	S
CANIDAE	Canis lupus	V
CANIDAE	Cuon alpinus	V
CANIDAE	Vulpes vulpes	S
CERVIDAE	Muntiacus muntjak	
FELIDAE	Felis lynx	E
FELIDAE	Panthera pardus	S
FELIDAE	Panthera uncia	E
MOSCHIDAE	Moschus chrysogaster	E
MURIDAE	Niviventer niviventer	
MURIDAE	Rattus turkestanicus	
SORICIDAE	Sorex minutus	
SUIDAE	Sus scrofa	
URSIDAE	Ursus thibetanus	V



**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Bird Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> DHORPATAN HUNTING RESERVE  
**Number of Species** : 137  
**NRDB status** : 15  
**Pages** : 4

Family	Scientific Name	NRDB
ACCIPITRIDAE	Accipiter nisus	
ACCIPITRIDAE	Buteo buteo	S
ACCIPITRIDAE	Circus cyaneus	
ACCIPITRIDAE	Circus macrourus	S
ACCIPITRIDAE	Gypaetus barbatus	S
ACCIPITRIDAE	Gyps himalayensis	
ACCIPITRIDAE	Milvus migrans	
ACCIPITRIDAE	Neophron percnopterus	S
ACCIPITRIDAE	Spilornis cheela	S
ALAUDIDAE	Alauda gulula	
ALCEDINIDAE	Alcedo atthis	
ALCEDINIDAE	Ceryle lugubris	
APODIDAE	Apus melba	
CAMPEPHAGIDAE	Pericrocotus ethologus	
CAPITONIDAE	Megalaima virens	
CAPRIMULGIDAE	Caprimulgus indicus	
CERTHIIDAE	Certhia familiaris	
CERTHIIDAE	Certhia himalayana	
CERTHIIDAE	Certhia nipalensis	
CHARADRIIDAE	Scolopax rusticola	
CICONIIDAE	Ciconia episcopus	S
CICONIIDAE	Ciconia nigra	E (HMG/P)
CINCLIDAE	Cinclus pallasii	
COLUMBIDAE	Columba hodgsonii	
COLUMBIDAE	Columba leuconota	
COLUMBIDAE	Streptopelia chinensis	
COLUMBIDAE	Streptopelia orientalis	
CORVIDAE	Corvus macrorhynchos	
CORVIDAE	Garrulus lanceolatus	
CORVIDAE	Nucifraga caryocatactes	
CORVIDAE	Pyrrhocorax pyrrhocorax	
CORVIDAE	Urocissa flavirostris	
CUCULIDAE	Cuculus canorus	

Family	Scientific Name	NRDB
CUCULIDAE	Cuculus saturatus	
CUCULIDAE	Hierococcyx sparverioides	
DICAEIDAE	Dicaeum ignipectus	
DICRURIDAE	Dicrurus leucophaeus	
EMBERIZIDAE	Emberiza cia	
EMBERIZIDAE	Emberiza fucata	
EMBERIZIDAE	Emberiza pusilla	
EMBERIZIDAE	Melophus lathami	
FALCONIDAE	Falco tinnunculus	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus nipalensis	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus rhodopeplus	
FRINGILLIDAE	Mycerobas affinis	
FRINGILLIDAE	Mycerobas carnipes	
FRINGILLIDAE	Pyrrhula erythrocephala	
HIRUNDINIDAE	Delichon nipalensis	
IBIDORHYNCHIDAE	Ibidorhyncha struthersii	
LANIIDAE	Lanius schach	
LANIIDAE	Lanius tephronotus	
MOTACILLIDAE	Anthus hodgsoni	
MOTACILLIDAE	Anthus sylvanus	
MOTACILLIDAE	Motacilla cinerea	
MOTACILLIDAE	Motacilla alba	
MUSCICAPIDAE	Cettia brunnifrons	
MUSCICAPIDAE	Cettia fortipes	
MUSCICAPIDAE	Phylloscopus inornatus	
MUSCICAPIDAE	Phylloscopus maculipennis	
MUSCICAPIDAE	Phylloscopus magnirostris	
MUSCICAPIDAE	Phylloscopus occipitalis	
MUSCICAPIDAE	Phylloscopus pulcher	
MUSCICAPIDAE	Phylloscopus reguloides	
MUSCICAPIDAE	Prinia criniger	
MUSCICAPIDAE	Regulus regulus	
MUSCICAPIDAE	Seicercus burkii	
MUSCICAPIDAE	Seicercus xanthoschistos	
MUSCICAPIDAE	Alcippe vinipectus	
MUSCICAPIDAE	Garrulax affinis	
MUSCICAPIDAE	Garrulax albogularis	
MUSCICAPIDAE	Garrulax lineatus	
MUSCICAPIDAE	Garrulax ocellatus	
MUSCICAPIDAE	Garrulax striatus	
MUSCICAPIDAE	Garrulax variegatus	
MUSCICAPIDAE	Heterophasia capistrata	
MUSCICAPIDAE	Minla strigula	
MUSCICAPIDAE	Yuhina gularis	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Chaimarrornis leucocephalus	
MUSCICAPIDAE	Enicurus scouleri	
MUSCICAPIDAE	Hodgsonius phoenicuroides	
MUSCICAPIDAE	Luscinia brunnea	
MUSCICAPIDAE	Phoenicurus ochruros	
MUSCICAPIDAE	Rhyacornis fuliginosus	
MUSCICAPIDAE	Saxicola ferrea	
MUSCICAPIDAE	Saxicola torquata	
MUSCICAPIDAE	Turdus albocinctus	
MUSCICAPIDAE	Turdus boulboul	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Turdus viscivorus	
MUSCICAPIDAE	Zoothera wardii	S
MUSCICAPIDAE	Zoothera citrina	
MUSCICAPIDAE	Monticola cinclorhyncha	
MUSCICAPIDAE	Myiophoneus caeruleus	
MUSCICAPIDAE	Phoenicurus frontalis	
MUSCICAPIDAE	Culicicapa ceylonensis	
MUSCICAPIDAE	Ficedula parva	
MUSCICAPIDAE	Ficedula strophiate	
MUSCICAPIDAE	Ficedula supercilialis	
MUSCICAPIDAE	Ficedula tricolor	
MUSCICAPIDAE	Ficedula westermanni	S
MUSCICAPIDAE	Muscicapa sibirica	
MUSCICAPIDAE	Muscicapa thalassina	
MUSCICAPIDAE	Rhipidura hypoxantha	
MUSCICAPIDAE	Tarsiger chrysaeus	
MUSCICAPIDAE	Tarsiger cyanurus	
NECTARINIIDAE	Aethopyga ignicauda	
NECTARINIIDAE	Aethopyga nipalensis	
PARIDAE	Aegithalos concinnus	
PARIDAE	Cephalopyrus flammiceps	
PARIDAE	Parus dichrous	
PARIDAE	Parus melanolophus	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PARIDAE	Parus xanthogenys	
PHASIANIDAE	Alectoris chukar	
PHASIANIDAE	Catreus wallichii	E (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Pucrasia macrolopha	S
PHASIANIDAE	Tragopan satyra	E (HMG/P)
PICIDAE	Dendrocopos auriceps	S
PICIDAE	Dendrocopos himalayensis	
PICIDAE	Dendrocopos hyperythrus	

Family	Scientific Name	NRDB
PICIDAE	Picus squamatus	
PLOCEIDAE	Lonchura punctulata	
PLOCEIDAE	Passer domesticus	
PLOCEIDAE	Passer montanus	
PLOCEIDAE	Passer rutilans	
PYCNONOTIDAE	Hypsipetes leucocephalus	
SITTIDAE	Sitta himalayensis	
STRIGIDAE	Glaucidium cuculoides	
STRIGIDAE	Otus spilocephalus	S
STRIGIDAE	Strix aluco	
STURNIDAE	Acridotheres tristis	
UPUPIDAE	Upupa epops	
ZOSTEROPIDAE	Zosterops palpebrosus	

**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Reptile Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> DHORPATAN HUNTING RESERVE  
**Number of Species** : 1  
**NRDB status** : 0  
**Pages** : 1

---

Family	Scientific Name	NRDB
VIPERIDAE	Agkistrodon himalayanus	

---





**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Amphibian Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> DHORPATAN  
**Number of Species** : 1  
**NRDB status** : 1  
**Pages** : 1

---

<b>Family</b>	<b>Scientific Name</b>	<b>NRDB</b>
PELOBATIDAE	Scutiger nepalensis	S

---



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Fish Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> DHORPATAN HUNTING RESERVE  
**Number of Species** : 0  
**NRDB status** : 0  
**Pages** : 1

---

<b>Family</b>	<b>Scientific Name</b>	<b>NRDB</b>
---------------	------------------------	-------------

---



**LIST OF VERTEBRATES RECORDED FOR  
ANNAPURNA CONSERVATION AREA PROJECT**



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Mammal Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> ANNAPURNA CONSERVATION AREA  
**Number of Species** : 92  
**NRDB status** : 33  
**Pages** : 3

Family	Scientific Name	NRDB
AILURIDAE	Ailurus fulgens	E
BOVIDAE	Bos grunniens	C
BOVIDAE	Hemitragus jemlahicus	S
BOVIDAE	Naemorhedus goral	S
BOVIDAE	Naemorhedus sumatraensis	S
BOVIDAE	Ovis ammon	C
BOVIDAE	Pantholops hodgsoni	C
BOVIDAE	Pseudois nayaur	S
CALLOSCIURINAE	Callosciurus pygerythrus	
CALLOSCIURINAE	Dremomys lokriah	
CANIDAE	Canis aureus	
CANIDAE	Canis lupus	V
CANIDAE	Cuon alpinus	V
CANIDAE	Vulpes bengalensis	S
CANIDAE	Vulpes ferrilata	S
CANIDAE	Vulpes vulpes	S
CERCOPITHECIDAE	Macaca assamensis	V
CERCOPITHECIDAE	Macaca mulatta	S
CERCOPITHECIDAE	Semnopithecus entellus	S
CERVIDAE	Muntiacus muntjak	
FELIDAE	Catopuma temminckii	V
FELIDAE	Felis chaus	S
FELIDAE	Felis lynx	E
FELIDAE	Panthera pardus	S
FELIDAE	Panthera uncia	E
FELIDAE	Pardofelis marmorata	V
FELIDAE	Pardofelis nebulosa	V
FELIDAE	Prionailurus bengalensis	V
HERPESTIDAE	Herpestes nyula	
HERPESTIDAE	Herpestes urva	S
HIPPOSIDERIDAE	Hipposideros armiger	
HIPPOSIDERIDAE	Hipposideros cineraceus	
LEPORIDAE	Lepus nigricollis	
LEPORIDAE	Lepus oiostolus	
LUTRANAE	Lutra lutra	S



Family	Scientific Name	NRDB
LUTRANAE	Lutrogale perspicillata	S
MANIDAE	Manis pendatactyla	S
MOSCHIDAE	Moschus chrysogaster	E
MURIDAE	Apodemus sylvaticus	
MURIDAE	Bandicota bengalensis	
MURIDAE	Bandicota indica	
MURIDAE	Millardia meltada	
MURIDAE	Mus cervicolor	
MURIDAE	Nesiokia indica	
MURIDAE	Niviventer niviventer	
MURIDAE	Rattus nitidus	
MURIDAE	Rattus rattus	
MURIDAE	Rattus turkestanicus	
MUSTELIDAE	Martes flavigula	
MUSTELIDAE	Mustela altaica	
MUSTELIDAE	Mustela erminae	
MUSTELIDAE	Mustela kathiah	
MUSTELIDAE	Mustela sibirica	
MUSTELIDAE	Mustela strigidorsa	V
OCHOTONIDAE	Ochotona curzoniae	
OCHOTONIDAE	Ochotona daurica	
OCHOTONIDAE	Ochotona lama	
PTEROMYIDAE	Hylopetes alboniger	
PTEROMYIDAE	Petaurista elegans	
PTEROMYIDAE	Petaurista magnificus	
PTEROMYIDAE	Petaurista nobilis	
PTEROPODIDAE	Pteropus giganteus	
PTEROPODIDAE	Rousettus leschenaulti	
RHINOLOPHIDAE	Rhinolophus affinis	
RHINOLOPHIDAE	Rhinolophus ferrumequinum	
RHIZOMYINAE	Pitymys leucurus	
SCIURIDAE	Marmota himalaya	
SORICIDAE	Chimarrogale himalayica	
SORICIDAE	Nectogale elegans	
SORICIDAE	Soriculus baileyi	
SORICIDAE	Soriculus caudatus	
SORICIDAE	Soriculus leucops	
SORICIDAE	Soriculus nigrescens	
SORICIDAE	Suncus murinus	
SUIDAE	Sus scrofa	
URSIDAE	Ursus arctos	V
URSIDAE	Ursus thibetanus	V
VESPERTILIONIDAE	Barbastella leucomelas	
VESPERTILIONIDAE	Myotis formosus	
VESPERTILIONIDAE	Myotis minopteres	
VESPERTILIONIDAE	Myotis muricola	

Family	Scientific Name	NRDB
VESPERTILIONIDAE	Myotis mystacinus	
VESPERTILIONIDAE	Myotis sicarius	
VESPERTILIONIDAE	Myotis siligorensis	
VESPERTILIONIDAE	Nyctalus montanus	
VESPERTILIONIDAE	Pipistrellus coromandra	
VESPERTILIONIDAE	Pipistrellus javanicus	
VIVERRIDAE	Paguma larvata	
VIVERRIDAE	Paradoxurus hermaphroditus	V
VIVERRIDAE	Prionodon pardicolor	
VIVERRIDAE	Viverra zibetha	
VIVERRIDAE	Viverricula indica	



**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Bird Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> ANNAPURNA CONSERVATION AREA  
**Number of Species** : 474  
**NRDB status** : 90  
**Pages** : 11

Family	Scientific Name	NRDB
ACCIPITRIDAE	Accipiter badius	S
ACCIPITRIDAE	Accipiter gentilis	
ACCIPITRIDAE	Accipiter nisus	
ACCIPITRIDAE	Accipiter trivirgatus	S
ACCIPITRIDAE	Accipiter virgatus	S
ACCIPITRIDAE	Aegypius monachus	V
ACCIPITRIDAE	Aquila chrysaetos	S
ACCIPITRIDAE	Aquila clanga	V
ACCIPITRIDAE	Aquila heliaca	V
ACCIPITRIDAE	Aquila nipalensis	S
ACCIPITRIDAE	Buteo buteo	S
ACCIPITRIDAE	Buteo hemilasius	S
ACCIPITRIDAE	Buteo rufinus	S
ACCIPITRIDAE	Circus aeruginosus	
ACCIPITRIDAE	Circus cyaneus	
ACCIPITRIDAE	Circus macrourus	S
ACCIPITRIDAE	Circus melanoleucus	S
ACCIPITRIDAE	Circus pygargus	
ACCIPITRIDAE	Gypaetus barbatus	S
ACCIPITRIDAE	Gyps bengalensis	
ACCIPITRIDAE	Gyps fulvus	
ACCIPITRIDAE	Gyps himalayensis	
ACCIPITRIDAE	Gyps indicus	S
ACCIPITRIDAE	Haliaeetus leucoryphus	E
ACCIPITRIDAE	Hieraaetus fasciatus	
ACCIPITRIDAE	Hieraaetus pennatus	
ACCIPITRIDAE	Ichthyophaga humilis	
ACCIPITRIDAE	Ictinaetus malayensis	
ACCIPITRIDAE	Milvus migrans	VG
ACCIPITRIDAE	Neophron percnopterus	S
ACCIPITRIDAE	Pandion haliaetus	S
ACCIPITRIDAE	Pernis ptilorhynchus	
ACCIPITRIDAE	Sarcogyps calvus	S

Family	Scientific Name	NRDB
ACCIPITRIDAE	Spilornis cheela	S
ACCIPITRIDAE	Spizaetus nipalensis	S
ALAUDIDAE	Alauda gulgula	
ALAUDIDAE	Calandrella acutirostris	
ALAUDIDAE	Calandrella brachydactyla	
ALAUDIDAE	Eremophila alpestris	
ALCEDINIDAE	Alcedo atthis	
ALCEDINIDAE	Ceryle lugubris	
ALCEDINIDAE	Ceryle rudis	
ALCEDINIDAE	Halcyon smyrnensis	
ANATIDAE	Anas acuta	
ANATIDAE	Anas clypeata	
ANATIDAE	Anas crecca	
ANATIDAE	Anas formosa	VG
ANATIDAE	Anas penelope	S
ANATIDAE	Anas platyrhynchos	
ANATIDAE	Anas querquedula	
ANATIDAE	Anas strepera	
ANATIDAE	Anser indicus	S
ANATIDAE	Aythya ferina	
ANATIDAE	Aythya fuligula	
ANATIDAE	Aythya nyroca	S
ANATIDAE	Mergus merganser	
ANATIDAE	Tadorna ferruginea	
APODIDAE	Apus affinis	
APODIDAE	Apus apus	
APODIDAE	Apus melba	
APODIDAE	Apus pacificus	
APODIDAE	Collocalia brevirostris	
APODIDAE	Hirundapus caudacutus	
ARDEIDAE	Ardeola grayii	
ARDEIDAE	Bubulcus ibis	
ARTAMIDAE	Artamus fuscus	
CAMPEPHAGIDAE	Coracina macei	
CAMPEPHAGIDAE	Hemipus picatus	
CAMPEPHAGIDAE	Pericrocotus brevirostris	S
CAMPEPHAGIDAE	Pericrocotus ethologus	
CAMPEPHAGIDAE	Pericrocotus flammeus	
CAMPEPHAGIDAE	Pericrocotus solaris	
CAPITONIDAE	Megalaima asiatica	
CAPITONIDAE	Megalaima franklinii	
CAPITONIDAE	Megalaima virens	
CAPRIMULGIDAE	Caprimulgus indicus	
CERTHIIDAE	Certhia discolor	
CERTHIIDAE	Certhia familiaris	

Family	Scientific Name	NRDB
CERTHIIDAE	<i>Certhia himalayana</i>	
CERTHIIDAE	<i>Certhia nipalensis</i>	
CHARADRIIDAE	<i>Actitis hypoleucos</i>	
CHARADRIIDAE	<i>Arenaria interpres</i>	
CHARADRIIDAE	<i>Calidris temminckii</i>	
CHARADRIIDAE	<i>Charadrius dubius</i>	
CHARADRIIDAE	<i>Gallinago nemoricola</i>	V
CHARADRIIDAE	<i>Gallinago solitaria</i>	
CHARADRIIDAE	<i>Hoplopterus indicus</i>	
CHARADRIIDAE	<i>Pluvialis fulva</i>	
CHARADRIIDAE	<i>Scolopax rusticola</i>	
CHARADRIIDAE	<i>Tringa glareola</i>	
CHARADRIIDAE	<i>Tringa nebularia</i>	
CHARADRIIDAE	<i>Tringa ochropus</i>	
CHARADRIIDAE	<i>Vanellus vanellus</i>	
CINCLIDAE	<i>Cinclus cinclus</i>	
CINCLIDAE	<i>Cinclus pallasii</i>	
COLUMBIDAE	<i>Columba hodgsonii</i>	
COLUMBIDAE	<i>Columba leuconota</i>	
COLUMBIDAE	<i>Columba livia</i>	
COLUMBIDAE	<i>Columba palumbus</i>	
COLUMBIDAE	<i>Columba pulchricollis</i>	
COLUMBIDAE	<i>Columba rupestris</i>	
COLUMBIDAE	<i>Macropygia unchall</i>	V
COLUMBIDAE	<i>Streptopelia chinensis</i>	
COLUMBIDAE	<i>Streptopelia orientalis</i>	
COLUMBIDAE	<i>Streptopelia senegalensis</i>	
COLUMBIDAE	<i>Treron sphenura</i>	
CORACIIDAE	<i>Coracias benghalensis</i>	
CORVIDAE	<i>Cissa chinensis</i>	
CORVIDAE	<i>Corvus corax</i>	
CORVIDAE	<i>Corvus macrorhynchos</i>	
CORVIDAE	<i>Corvus splendens</i>	
CORVIDAE	<i>Dendrocitta formosae</i>	
CORVIDAE	<i>Garrulus glandarius</i>	
CORVIDAE	<i>Garrulus lanceolatus</i>	
CORVIDAE	<i>Nucifraga caryocatactes</i>	
CORVIDAE	<i>Pseudopodoces humilis</i>	
CORVIDAE	<i>Pyrrhocorax graculus</i>	
CORVIDAE	<i>Pyrrhocorax pyrrhocorax</i>	
CORVIDAE	<i>Urocissa erythrorhyncha</i>	
CORVIDAE	<i>Urocissa flavirostris</i>	
CUCULIDAE	<i>Cacomantis merulinus</i>	
CUCULIDAE	<i>Cuculus canorus</i>	
CUCULIDAE	<i>Cuculus micropterus</i>	

Family	Scientific Name	NRDB
CUCULIDAE	Cuculus poliocephalus	
CUCULIDAE	Cuculus saturatus	
CUCULIDAE	Eudynamys scolopacea	
CUCULIDAE	Hierococcyx sparverioides	
CUCULIDAE	Hierococcyx varius	
CUCULIDAE	Phaenicophaeus tristis	
DICAEIDAE	Dicaeum ignipectus	
DICAEIDAE	Dicaeum melanoxanthum	S
DICRURIDAE	Dicrurus aeneus	
DICRURIDAE	Dicrurus hottentottus	
DICRURIDAE	Dicrurus leucophaeus	
DICRURIDAE	Dicrurus macrocercus	
DICRURIDAE	Dicrurus remifer	
EMBERIZIDAE	Emberiza cia	
EMBERIZIDAE	Emberiza citrinella	UR
EMBERIZIDAE	Emberiza fucata	
EMBERIZIDAE	Emberiza leucocephalos	
EMBERIZIDAE	Emberiza pusilla	
EMBERIZIDAE	Emberiza rustica	UR
EMBERIZIDAE	Melophus lathamii	
FALCONIDAE	Falco amurensis	S
FALCONIDAE	Falco cherrug	S
FALCONIDAE	Falco columbarius	
FALCONIDAE	Falco jugger	
FALCONIDAE	Falco naumanni	V
FALCONIDAE	Falco pelegrinoides	E
FALCONIDAE	Falco peregrinus	E
FALCONIDAE	Falco severus	E
FALCONIDAE	Falco subbuteo	
FALCONIDAE	Falco tinnunculus	
FALCONIDAE	Microhierax caerulescens	
FRINGILLIDAE	Bucanetes mongolicus	
FRINGILLIDAE	Callacanthus burtoni	
FRINGILLIDAE	Carduelis carduelis	
FRINGILLIDAE	Carduelis flavirostris	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus edwardsii	
FRINGILLIDAE	Carpodacus erythrinus	
FRINGILLIDAE	Carpodacus nipalensis	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus puniceus	
FRINGILLIDAE	Carpodacus rhodochrous	
FRINGILLIDAE	Carpodacus rhodopeplus	
FRINGILLIDAE	Carpodacus rubescens	
FRINGILLIDAE	Carpodacus rubicilla	

Family	Scientific Name	NRDB
CERTHIIDAE	<i>Certhia himalayana</i>	
CERTHIIDAE	<i>Certhia nipalensis</i>	
CHARADRIIDAE	<i>Actitis hypoleucos</i>	
CHARADRIIDAE	<i>Arenaria interpres</i>	
CHARADRIIDAE	<i>Calidris temminckii</i>	
CHARADRIIDAE	<i>Charadrius dubius</i>	
CHARADRIIDAE	<i>Gallinago nemoricola</i>	V
CHARADRIIDAE	<i>Gallinago solitaria</i>	
CHARADRIIDAE	<i>Hoplopterus indicus</i>	
CHARADRIIDAE	<i>Pluvialis fulva</i>	
CHARADRIIDAE	<i>Scolopax rusticola</i>	
CHARADRIIDAE	<i>Tringa glareola</i>	
CHARADRIIDAE	<i>Tringa nebularia</i>	
CHARADRIIDAE	<i>Tringa ochropus</i>	
CHARADRIIDAE	<i>Vanellus vanellus</i>	
CINCLIDAE	<i>Cinclus cinclus</i>	
CINCLIDAE	<i>Cinclus pallasii</i>	
COLUMBIDAE	<i>Columba hodgsonii</i>	
COLUMBIDAE	<i>Columba leuconota</i>	
COLUMBIDAE	<i>Columba livia</i>	
COLUMBIDAE	<i>Columba palumbus</i>	
COLUMBIDAE	<i>Columba pulchricollis</i>	
COLUMBIDAE	<i>Columba rupestris</i>	
COLUMBIDAE	<i>Macropygia unchall</i>	V
COLUMBIDAE	<i>Streptopelia chinensis</i>	
COLUMBIDAE	<i>Streptopelia orientalis</i>	
COLUMBIDAE	<i>Streptopelia senegalensis</i>	
COLUMBIDAE	<i>Treron sphenura</i>	
CORACIIDAE	<i>Coracias benghalensis</i>	
CORVIDAE	<i>Cissa chinensis</i>	
CORVIDAE	<i>Corvus corax</i>	
CORVIDAE	<i>Corvus macrorhynchos</i>	
CORVIDAE	<i>Corvus splendens</i>	
CORVIDAE	<i>Dendrocitta formosae</i>	
CORVIDAE	<i>Garrulus glandarius</i>	
CORVIDAE	<i>Garrulus lanceolatus</i>	
CORVIDAE	<i>Nucifraga caryocatactes</i>	
CORVIDAE	<i>Pseudopodoces humilis</i>	
CORVIDAE	<i>Pyrrhocorax graculus</i>	
CORVIDAE	<i>Pyrrhocorax pyrrhocorax</i>	
CORVIDAE	<i>Urocissa erythrorhyncha</i>	
CORVIDAE	<i>Urocissa flavirostris</i>	
CUCULIDAE	<i>Cacomantis merulinus</i>	
CUCULIDAE	<i>Cuculus canorus</i>	
CUCULIDAE	<i>Cuculus micropterus</i>	



Family	Scientific Name	NRDB
CUCULIDAE	Cuculus poliocephalus	
CUCULIDAE	Cuculus saturatus	
CUCULIDAE	Eudynamys scolopacea	
CUCULIDAE	Hierococcyx sparveroides	
CUCULIDAE	Hierococcyx varius	
CUCULIDAE	Phaenicophaeus tristis	
DICAEIDAE	Dicaeum ignipectus	
DICAEIDAE	Dicaeum melanoxanthum	S
DICRURIDAE	Dicrurus aeneus	
DICRURIDAE	Dicrurus hottentottus	
DICRURIDAE	Dicrurus leucophaeus	
DICRURIDAE	Dicrurus macrocercus	
DICRURIDAE	Dicrurus remifer	
EMBERIZIDAE	Emberiza cia	
EMBERIZIDAE	Emberiza citrinella	UR
EMBERIZIDAE	Emberiza fucata	
EMBERIZIDAE	Emberiza leucocephalos	
EMBERIZIDAE	Emberiza pusilla	
EMBERIZIDAE	Emberiza rustica	UR
EMBERIZIDAE	Melophus lathamii	
FALCONIDAE	Falco amurensis	S
FALCONIDAE	Falco cherrug	S
FALCONIDAE	Falco columbarius	
FALCONIDAE	Falco jugger	
FALCONIDAE	Falco naumanni	V
FALCONIDAE	Falco pelegrinoides	E
FALCONIDAE	Falco peregrinus	E
FALCONIDAE	Falco severus	E
FALCONIDAE	Falco subbuteo	
FALCONIDAE	Falco tinnunculus	
FALCONIDAE	Microhierax caerulescens	
FRINGILLIDAE	Bucanetes mongolicus	
FRINGILLIDAE	Callacanthus burtoni	
FRINGILLIDAE	Carduelis carduelis	
FRINGILLIDAE	Carduelis flavirostris	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus edwardsii	
FRINGILLIDAE	Carpodacus erythrinus	
FRINGILLIDAE	Carpodacus nipalensis	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus puniceus	
FRINGILLIDAE	Carpodacus rhodochrous	
FRINGILLIDAE	Carpodacus rhodopeplus	
FRINGILLIDAE	Carpodacus rubescens	
FRINGILLIDAE	Carpodacus rubicilla	

Family	Scientific Name	NRDB
FRINGILLIDAE	Carpodacus rubicilloides	
FRINGILLIDAE	Carpodacus thura	
FRINGILLIDAE	Carpodacus vinaceus	UR
FRINGILLIDAE	Fringilla coelebs	
FRINGILLIDAE	Fringilla montifringilla	
FRINGILLIDAE	Haematospiza sipahi	UR
FRINGILLIDAE	Leucosticte brandti	
FRINGILLIDAE	Leucosticte nemoricola	
FRINGILLIDAE	Loxia curvirostra	
FRINGILLIDAE	Mycerobas affinis	
FRINGILLIDAE	Mycerobas carnipes	
FRINGILLIDAE	Mycerobas melanozanthos	
FRINGILLIDAE	Propyrrhula subhimachala	
FRINGILLIDAE	Pyrrhoptes epauletta	
FRINGILLIDAE	Pyrrhula erythrocephala	
FRINGILLIDAE	Pyrrhula nipalensis	
FRINGILLIDAE	Serinus pusillus	
FRINGILLIDAE	Serinus thibetanus	
GRUIDAE	Anthropoides virgo	S
GRUIDAE	Grus grus	E (HMG/P)
HIRUNDINIDAE	Delichon dasypus	
HIRUNDINIDAE	Delichon nipalensis	
HIRUNDINIDAE	Delichon urbica	
HIRUNDINIDAE	Hirundo daurica	
HIRUNDINIDAE	Hirundo rustica	
HIRUNDINIDAE	Ptyonoprogne rupestris	
HIRUNDINIDAE	Riparia paludicola	
HIRUNDINIDAE	Riparia riparia	
INDICATORIDAE	Indicator xanthonotus	
IRENIDAE	Chloropsis hardwickii	
LANIIDAE	Lanius cristatus	
LANIIDAE	Lanius isabellinus	UR
LANIIDAE	Lanius schach	
LANIIDAE	Lanius tephronotus	
LANIIDAE	Lanius vittatus	
LARIDAE	Larus brunnicephalus	
MEROPIDAE	Merops orientalis	S
MOTACILIIDAE	Anthus novaeseelandiae	
MOTACILLIDAE	Anthus cervinus	
MOTACILLIDAE	Anthus hodgsoni	
MOTACILLIDAE	Anthus roseatus	
MOTACILLIDAE	Anthus spinoletta	
MOTACILLIDAE	Anthus sylvanus	
MOTACILLIDAE	Anthus trivialis	
MOTACILLIDAE	Motacilla alba	

Family	Scientific Name	NRDB
MOTACILLIDAE	Motacilla cinerea	
MOTACILLIDAE	Motacilla citreola	
MOTACILLIDAE	Motacilla flava	
MOTACILLIDAE	Motacilla maderaspatensis	
MUSCICAPIDAE	Abroscopus schisticeps	
MUSCICAPIDAE	Acrocephalus dumetorum	
MUSCICAPIDAE	Actinodura nipalensis	
MUSCICAPIDAE	Alcippe castaniceps	
MUSCICAPIDAE	Alcippe chrysotis	V
MUSCICAPIDAE	Alcippe nipalensis	
MUSCICAPIDAE	Alcippe vinipectus	
MUSCICAPIDAE	Brachypterys montana	S
MUSCICAPIDAE	Brachypteryx stellata	V
MUSCICAPIDAE	Bradypterus thoracicus	
MUSCICAPIDAE	Cettia acanthizoides	S
MUSCICAPIDAE	Cettia brunnifrons	
MUSCICAPIDAE	Cettia flavolivacea	
MUSCICAPIDAE	Cettia major	
MUSCICAPIDAE	Chaimarrornis leucocephalus	
MUSCICAPIDAE	Cinclidium leucurum	S
MUSCICAPIDAE	Conostoma aemodium	V
MUSCICAPIDAE	Copsychus saularis	
MUSCICAPIDAE	Culicicapa ceylonensis	
MUSCICAPIDAE	Cutia nipalensis	E
MUSCICAPIDAE	Cyornis banyumas	V
MUSCICAPIDAE	Enicurus immaculatus	
MUSCICAPIDAE	Enicurus maculatus	
MUSCICAPIDAE	Enicurus schistaceus	
MUSCICAPIDAE	Enicurus scouleri	
MUSCICAPIDAE	Ficedula hodgsonii	
MUSCICAPIDAE	Ficedula hyperythra	
MUSCICAPIDAE	Ficedula monileger	V
MUSCICAPIDAE	Ficedula parva	
MUSCICAPIDAE	Ficedula strophata	
MUSCICAPIDAE	Ficedula superciliaris	
MUSCICAPIDAE	Ficedula tricolor	
MUSCICAPIDAE	Ficedula westermanni	S
MUSCICAPIDAE	Garrulax affinis	
MUSCICAPIDAE	Garrulax albogularis	
MUSCICAPIDAE	Garrulax caerulatus	E
MUSCICAPIDAE	Garrulax erythrocephalus	
MUSCICAPIDAE	Garrulax leucolophus	
MUSCICAPIDAE	Garrulax lineatus	
MUSCICAPIDAE	Garrulax ocellatus	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Garrulax ruficollis	
MUSCICAPIDAE	Garrulax squamatus	V
MUSCICAPIDAE	Garrulax striatus	
MUSCICAPIDAE	Garrulax subunicolor	S
MUSCICAPIDAE	Garrulax variegatus	
MUSCICAPIDAE	Grandala coelicolor	
MUSCICAPIDAE	Heterophasia capistrata	
MUSCICAPIDAE	Hippolais caligata	
MUSCICAPIDAE	Hodgsonius phoenicuroides	
MUSCICAPIDAE	Leiothrix lutea	
MUSCICAPIDAE	Leptopoeile sophiae	
MUSCICAPIDAE	Luscinia brunnea	
MUSCICAPIDAE	Luscinia pectoralis	
MUSCICAPIDAE	Luscinia svecica	
MUSCICAPIDAE	Minla cyanouroptera	
MUSCICAPIDAE	Minla ignotincta	
MUSCICAPIDAE	Minla strigula	
MUSCICAPIDAE	Monticola cinclorhyncha	
MUSCICAPIDAE	Monticola rufiventris	
MUSCICAPIDAE	Monticola solitarius	
MUSCICAPIDAE	Muscicapa ferruginea	S
MUSCICAPIDAE	Muscicapa latirostris	
MUSCICAPIDAE	Muscicapa ruficauda	
MUSCICAPIDAE	Muscicapa sibirica	
MUSCICAPIDAE	Muscicapa thalassina	
MUSCICAPIDAE	Muscicapella hodgsoni	S
MUSCICAPIDAE	Myiophoneus caeruleus	
MUSCICAPIDAE	Myzornis pyrrhous	S
MUSCICAPIDAE	Niltava grandis	S
MUSCICAPIDAE	Niltava macgrigoriae	
MUSCICAPIDAE	Niltava sundara	
MUSCICAPIDAE	Oenanthe deserti	
MUSCICAPIDAE	Oenanthe isabellina	UR
MUSCICAPIDAE	Orthotomus sutorius	
MUSCICAPIDAE	Paradoxornis fulvifrons	V
MUSCICAPIDAE	Paradoxornis nipalensis	S
MUSCICAPIDAE	Paradoxornis unicolor	V
MUSCICAPIDAE	Phoenicurus caeruleocephalus	
MUSCICAPIDAE	Phoenicurus erythrogaster	
MUSCICAPIDAE	Phoenicurus erythronotus	
MUSCICAPIDAE	Phoenicurus frontalis	
MUSCICAPIDAE	Phoenicurus hodgsoni	
MUSCICAPIDAE	Phoenicurus ochruros	
MUSCICAPIDAE	Phoenicurus schisticeps	
MUSCICAPIDAE	Phylloscopus affinis	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Phylloscopus cantator	
MUSCICAPIDAE	Phylloscopus collybita	
MUSCICAPIDAE	Phylloscopus fuligiventer	S
MUSCICAPIDAE	Phylloscopus inornatus	
MUSCICAPIDAE	Phylloscopus maculipennis	
MUSCICAPIDAE	Phylloscopus magnirostris	
MUSCICAPIDAE	Phylloscopus occipitalis	
MUSCICAPIDAE	Phylloscopus proregulus	
MUSCICAPIDAE	Phylloscopus pulcher	
MUSCICAPIDAE	Phylloscopus reguloides	
MUSCICAPIDAE	Phylloscopus trochiloides	
MUSCICAPIDAE	Pnoepyga albiventer	
MUSCICAPIDAE	Pnoepyga immaculata	Endemic
MUSCICAPIDAE	Pnoepyga pusilla	
MUSCICAPIDAE	Pomatorhinus ruficollis	
MUSCICAPIDAE	Pomatorhinus schisticeps	
MUSCICAPIDAE	Pomatorhinus erythrogastrus	
MUSCICAPIDAE	Prinia criniger	
MUSCICAPIDAE	Pteruthius flaviscapis	
MUSCICAPIDAE	Pteruthius melanotis	
MUSCICAPIDAE	Pteruthius rufiventer	V
MUSCICAPIDAE	Pteruthius xanthochloris	
MUSCICAPIDAE	Regulus regulus	
MUSCICAPIDAE	Rhipidura albicollis	
MUSCICAPIDAE	Rhipidura hypoxantha	
MUSCICAPIDAE	Rhyacornis fuliginosus	
MUSCICAPIDAE	Saxicola caprata	
MUSCICAPIDAE	Saxicola ferrea	
MUSCICAPIDAE	Saxicola torquata	
MUSCICAPIDAE	Seicercus burkii	
MUSCICAPIDAE	Seicercus castaniceps	
MUSCICAPIDAE	Seicercus poliogenys	S
MUSCICAPIDAE	Seicercus xanthoschistos	
MUSCICAPIDAE	Stachyris chrysaea	V
MUSCICAPIDAE	Stachyris nigricaps	
MUSCICAPIDAE	Stachyris pyrrhops	
MUSCICAPIDAE	Stachyris ruficeps	
MUSCICAPIDAE	Sylvia curruca	
MUSCICAPIDAE	Tarsiger chrysaeus	
MUSCICAPIDAE	Tarsiger cyanurus	
MUSCICAPIDAE	Tarsiger hyperythrus	S
MUSCICAPIDAE	Tarsiger indicus	
MUSCICAPIDAE	Terpsiphone paradisi	
MUSCICAPIDAE	Tesia castaneocoronata	
MUSCICAPIDAE	Tesia cyaniventer	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Turdoides nipalensis	Endemic
MUSCICAPIDAE	Turdus albocinctus	
MUSCICAPIDAE	Turdus boulboul	
MUSCICAPIDAE	Turdus merula	
MUSCICAPIDAE	Turdus naumanni	UR
MUSCICAPIDAE	Turdus rubrocanus	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Turdus unicolor	
MUSCICAPIDAE	Turdus viscivorus	
MUSCICAPIDAE	Xiphirhynchus superciliaris	V
MUSCICAPIDAE	Yuhina flavicollis	
MUSCICAPIDAE	Yuhina gularis	
MUSCICAPIDAE	Yuhina occipitalis	
MUSCICAPIDAE	Yuhina zantholeuca	
MUSCICAPIDAE	Zoothera citrina	
MUSCICAPIDAE	Zoothera dauma	
MUSCICAPIDAE	Zoothera dixonii	
MUSCICAPIDAE	Zoothera mollissima	
MUSCICAPIDAE	Zoothera monticola	V
MUSCICAPIDAE	Zoothera wardii	S
NECTARINIIDAE	Aethopyga gouldiae	
NECTARINIIDAE	Aethopyga ignicauda	
NECTARINIIDAE	Aethopyga nipalensis	
NECTARINIIDAE	Aethopyga saturata	
NECTARINIIDAE	Aethopyga siparaja	
NECTARINIIDAE	Nectarinia asiatica	
ORIOLOIDAE	Oriolus oriolus	
ORIOLOIDAE	Oriolus traillii	
PARIDAE	Aegithalos concinnus	
PARIDAE	Aegithalos iouschistos	
PARIDAE	Aegithalos niveogularis	
PARIDAE	Cephalopyrus flammiceps	
PARIDAE	Parus ater	
PARIDAE	Parus dichrous	
PARIDAE	Parus major	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PARIDAE	Parus rufonuchalis	
PARIDAE	Parus spilonotus	
PARIDAE	Parus xanthogenys	
PARIDAE	Sylviparus modestus	
PHALACROCORACIDAE	Phalacrocorax carbo	
PHASIANIDAE	Alectoris chukar	
PHASIANIDAE	Arborophila rufogularis	E
PHASIANIDAE	Arborophila torqueola	

Family	Scientific Name	NRDB
PHASIANIDAE	Catreus wallichii	E (HMG/P)
PHASIANIDAE	Francolinus francolinus	
PHASIANIDAE	Gallus gallus	
PHASIANIDAE	Ithaginis cruentus	S
PHASIANIDAE	Lerwa lerwa	
PHASIANIDAE	Lophophorus impejanus	S (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Perdix hodgsoniae	
PHASIANIDAE	Pucrasia macrolopha	
PHASIANIDAE	Tetraogallus himalayensis	S
PHASIANIDAE	Tetraogallus tibetanus	
PHASIANIDAE	Tragopan satyra	E (HMG/P)
PICIDAE	Blythipicus pyrrhotis	S
PICIDAE	Celeus brachyurus	S
PICIDAE	Chrysocolaptes lucidus	
PICIDAE	Dendrocopos auriceps	S
PICIDAE	Dendrocopos cathpharius	
PICIDAE	Dendrocopos darjellensis	
PICIDAE	Dendrocopos himalayensis	
PICIDAE	Dendrocopos hyperythrus	
PICIDAE	Dendrocopos macei	
PICIDAE	Jynx torquilla	
PICIDAE	Picumnus innominatus	S
PICIDAE	Picus canus	
PICIDAE	Picus chlorolophus	
PICIDAE	Picus flavinucha	
PICIDAE	Picus squamatus	
PLOCEIDAE	Lonchura malacca	
PLOCEIDAE	Lonchura punctulata	
PLOCEIDAE	Lonchura striata	
PLOCEIDAE	Montifringilla adamsi	
PLOCEIDAE	Montifringilla ruficollis	UR
PLOCEIDAE	Passer domesticus	
PLOCEIDAE	Passer montanus	
PLOCEIDAE	Passer rutilans	
PLOCEIDAE	Petronia xanthocollis	
PLOCEIDAE	Ploceus philippinus	
PODICIPEDIDAE	Podiceps cristatus	S
PODICIPEDIDAE	Podiceps nigricollis	
PRUNELLIDAE	Prunella atrogularis	
PRUNELLIDAE	Prunella collaris	
PRUNELLIDAE	Prunella fulvescens	
PRUNELLIDAE	Prunella himalayana	
PRUNELLIDAE	Prunella immaculata	
PRUNELLIDAE	Prunella rubeculoides	

Family	Scientific Name	NRDB
PRUNELLIDAE	Prunella strophiatea	
PSITTACIDAE	Psittacula eupatria	
PSITTACIDAE	Psittacula himalayana	S
PYCNONOTIDAE	Hypsipetes flavalus	
PYCNONOTIDAE	Hypsipetes leucocephalus	
PYCNONOTIDAE	Hypsipetes mcclllandii	
PYCNONOTIDAE	Pycnonotus cafer	
PYCNONOTIDAE	Pycnonotus leucogenys	
PYCNONOTIDAE	Pycnonotus striatus	
RALLIEDAE	Fulica atra	
RALLIEDAE	Gallinula chloropus	
RECURVIROSTRIDAE	Himantopus himantopus	VG
SITTIDAE	Sitta castanea	
SITTIDAE	Sitta frontalis	
SITTIDAE	Sitta himalayensis	
SITTIDAE	Tichodroma muraria	
STRIGIDAE	Asio flammeus	S
STRIGIDAE	Athene brama	S
STRIGIDAE	Athene noctua	S
STRIGIDAE	Bubo bubo	V
STRIGIDAE	Bubo nipalensis	S
STRIGIDAE	Glaucidium brodiei	
STRIGIDAE	Glaucidium cuculoides	
STRIGIDAE	Glaucidium radiatum	
STRIGIDAE	Otus spilocephalus	S
STRIGIDAE	Otus sunia	V
STRIGIDAE	Strix aluco	
STRIGIDAE	Tyto alba	S
STURNIDAE	Acridotheres fuscus	
STURNIDAE	Acridotheres tristis	
STURNIDAE	Sturnus vulgaris	
TROGLODYTIDAE	Troglodytes troglodytes	
TROGONIDAE	Harpactes erythrocephalus	V
TURDIDAE	Rhyacornis fuliginosus	
UPUPIDAE	Upupa epops	
ZOSTEROPIDAE	Zosterops palpebrosus	





**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Reptile Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> ANNAPURNA CONSERVATION AREA  
**Number of Species** : 34  
**NRDB status** : 4  
**Pages** : 1

Family	Scientific Name	NRDB
AGAMIDAE	Calotes versicolor	
AGAMIDAE	Japalura major	
AGAMIDAE	Japalura tricarinata	
AGAMIDAE	Laudakia tuberculata	
AGAMIDAE	Phrynocephalus theobaldi	
COLUBRIDAE	Amphiesma platyceps	
COLUBRIDAE	Amphiesma stolata	
COLUBRIDAE	Boiga trigonata	
COLUBRIDAE	Elaphe helena	
COLUBRIDAE	Elaphe hodgsoni	
COLUBRIDAE	Elaphe porhyracea	
COLUBRIDAE	Elaphe radiata	
COLUBRIDAE	Lycodon aulicus	
COLUBRIDAE	Pseudoxenodon macrops	
COLUBRIDAE	Ptyas mucosus	S
COLUBRIDAE	Rhabdophis himalayana	
COLUBRIDAE	Sibynophis collaris	
COLUBRIDAE	Trachischium fuscum	
COLUBRIDAE	Xenochrophis piscator	
COLUBRIDAE	Xenochrophis sanctijohannis	
ELAPIDAE	Calliophis maclellandii	
ELAPIDAE	Ophiophagus hannah	V
GEKKONIDAE	Hemidactylus brookii	
GEKKONIDAE	Hemidactylus flaviviridis	
GEKKONIDAE	Hemidactylus garnotii	
SCINCIDAE	Scincella capitanea	S
SCINCIDAE	Scincella himalayana	
SCINCIDAE	Scincella sikkimensis	
SCINCIDAE	Sphenomorphus maculatus	
VARANIDAE	Varanus flavescens	S
VIPERIDAE	Agkistrodon himalayanus	
VIPERIDAE	Ovophis monticola	
VIPERIDAE	Trimeresurus erythrurus	
VIPERIDAE	Trimeresurus septentrionalis	



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Amphibian Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> ANNAPURNA  
**Number of Species** : 22  
**NRDB status** : 3  
**Pages** : 1

Family	Scientific Name	NRDB
BUFONIDAE	Bufo himalayanus	
BUFONIDAE	Bufo melanostictus	
BUFONIDAE	Bufo microtypanum	
BUFONIDAE	Bufo stomaticus	
MICROHYLIDAE	Microhyla ornata	
PELOBATIDAE	Megophrys parva	
PELOBATIDAE	Scutiger alticola	
PELOBATIDAE	Scutiger nepalensis	S
PELOBATIDAE	Scutiger sikimmensis	
RANIDAE	Amolops afghanus	
RANIDAE	Amolops formosus	
RANIDAE	Rana cyanophlyctis	
RANIDAE	Rana liebigii	
RANIDAE	Rana limnocharis	
RANIDAE	Rana parkeri	
RANIDAE	Rana polunini	
RANIDAE	Rana rara	S
RANIDAE	Rana rostandi	S
RANIDAE	Rana syhadrensis	
RANIDAE	Rana tigerina	
RHACOPHORIDAE	Polypedates maculatus	
RHACOPHORIDAE	Rhacophorus maximus	



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Fish Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> ANNAPURNA CONSERVATION AREA  
**Number of Species** : 2  
**NRDB status** : 2  
**Pages** : 1

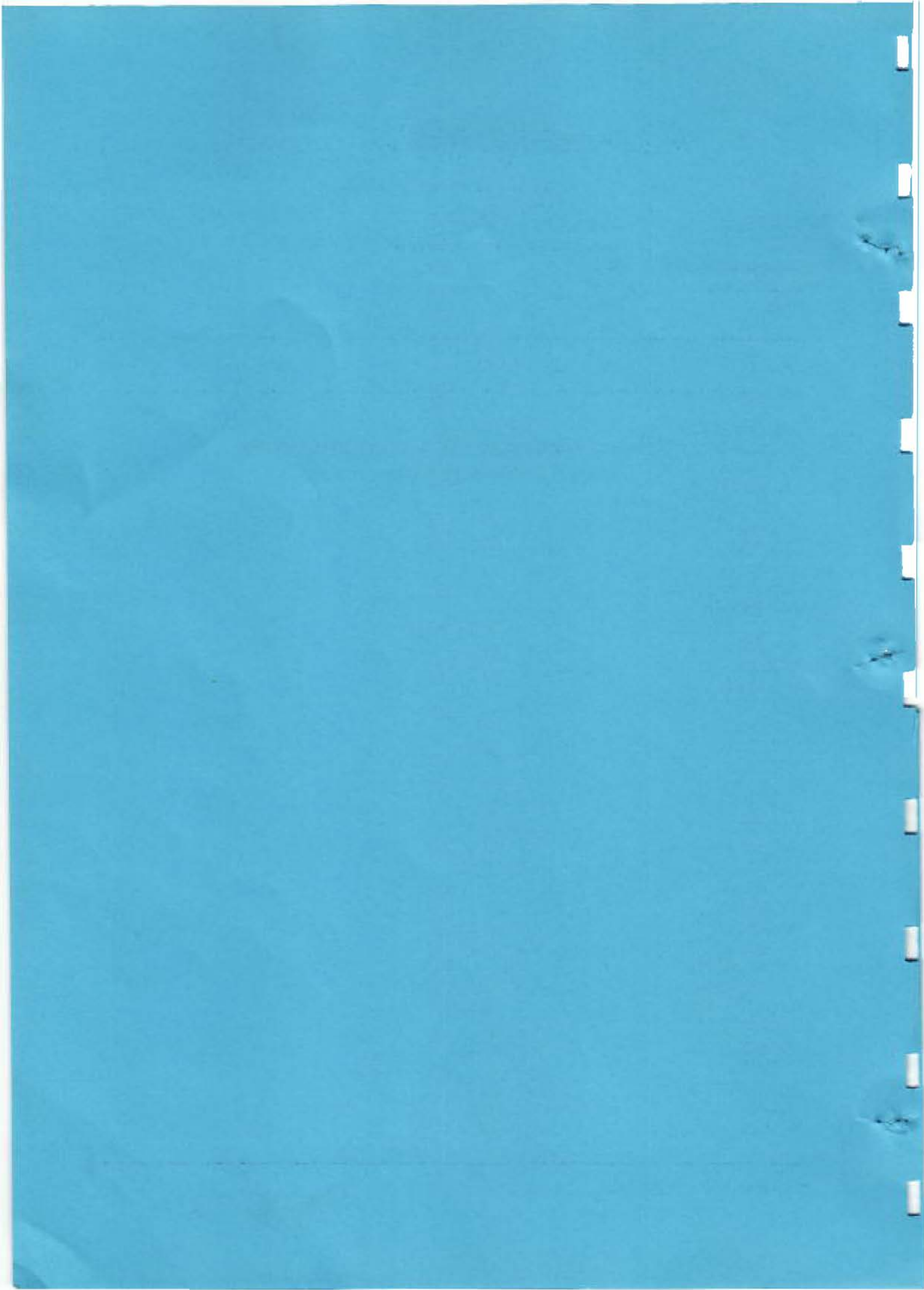
---

<b>Family</b>	<b>Scientific Name</b>	<b>NRDB</b>
CYPRINIDAE	Schizothorax plagiostomus	V
CYPRINIDAE	Schizothorax richardsonii	V



**LIST OF VERTEBRATES RECORDED FOR  
LANGTANG NATIONAL PARK**





**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Mammal Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> LANGTANG NATIONAL PARK  
**Number of Species** : 45  
**NRDB status** : 14  
**Pages** : 2

Family	Scientific Name	NRDB
AILURIDAE	Ailurus fulgens	E
BOVIDAE	Hemitragus jemlahicus	S
BOVIDAE	Naemorhedus goral	S
BOVIDAE	Naemorhedus sumatraensis	S
CALLOSCIURINAE	Dremomys lokriah	
CANIDAE	Canis aureus	
CANIDAE	Cuon alpinus	V
CANIDAE	Vulpes vulpes	S
CERCOPITHECIDAE	Macaca assamensis	V
CERCOPITHECIDAE	Macaca mulatta	S
CERCOPITHECIDAE	Semnopithecus entellus	S
CERVIDAE	Muntiacus muntjak	
FELIDAE	Panthera pardus	S
FELIDAE	Prionailurus bengalensis	V
HERPESTIDAE	Herpestes edwardsii	
HERPESTIDAE	Herpestes javanicus	
HYSTRICIDAE	Hystrix indica	
LUTRANAE	Lutra lutra	S
MOSCHIDAE	Moschus chrysogaster	E
MURIDAE	Mus musculus	
MURIDAE	Niviventer eha	
MURIDAE	Niviventer fulvescens	
MURIDAE	Niviventer niviventer	
MURIDAE	Rattus nitidus	
MURIDAE	Rattus rattus	
MURIDAE	Rattus turkestanicus	
MUSTELIDAE	Martes flavigula	
MUSTELIDAE	Martes foina	
MUSTELIDAE	Mustela altaica	
OCHOTONIDAE	Ochotona macrotis	
OCHOTONIDAE	Ochotona roylei	
PTEROMYIDAE	Petaurista caniceps	
PTEROMYIDAE	Petaurista petaurista	
RHIZOMYINAE	Alticola roylei	
RHIZOMYINAE	Pitymys sikimensis	
SORICIDAE	Sorex cylindricauda	

Family	Scientific Name	NRDB
SORICIDAE	Soriculus baileyi	
SORICIDAE	Soriculus caudatus	
SORICIDAE	Soriculus gruberi	
SORICIDAE	Soriculus leucops	
SORICIDAE	Soriculus nigrescens	
SORICIDAE	Suncus etruscus	
SORICIDAE	Suncus murinus	
SUIDAE	Sus scrofa	
URSIDAE	Ursus thibetanus	E

**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Bird Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> LANGTANG NATIONAL PARK  
**Number of Species** : 289  
**NRDB status** : 47  
**Pages** : 7

Family	Scientific Name	NRDB
ACCIPITRIDAE	Accipiter badius	S
ACCIPITRIDAE	Accipiter gentilis	
ACCIPITRIDAE	Accipiter nisus	
ACCIPITRIDAE	Accipiter trivirgatus	S
ACCIPITRIDAE	Accipiter virgatus	S
ACCIPITRIDAE	Aquila chrysaetos	
ACCIPITRIDAE	Aquila clanga	
ACCIPITRIDAE	Aquila heliaca	V
ACCIPITRIDAE	Aquila nipalensis	S
ACCIPITRIDAE	Buteo buteo	S
ACCIPITRIDAE	Buteo hemilasius	S
ACCIPITRIDAE	Buteo rufinus	S
ACCIPITRIDAE	Circus cyaneus	
ACCIPITRIDAE	Circus macrourus	S
ACCIPITRIDAE	Gypaetus barbatus	S
ACCIPITRIDAE	Gyps himalayensis	
ACCIPITRIDAE	Hieraaetus fasciatus	
ACCIPITRIDAE	Ictinaetus malayensis	
ACCIPITRIDAE	Milvus migrans	
ACCIPITRIDAE	Pernis ptilorhynchus	
ACCIPITRIDAE	Sarcogyps calvus	S
ACCIPITRIDAE	Spilornis cheela	S
ACCIPITRIDAE	Spizaetus nipalensis	
ANATIDAE	Anas crecca	
ANATIDAE	Anser indicus	S
ANATIDAE	Aythya fuligula	
ANATIDAE	Tadorna ferruginea	
APODIDAE	Apus affinis	
APODIDAE	Apus melba	
APODIDAE	Apus pacificus	
APODIDAE	Collocalia brevirostris	
APODIDAE	Hirundapus caudacutus	
BOMBYCILLIDAE	Bombycilla garrulus	
CAMPEPHAGIDAE	Coracina macei	

Family	Scientific Name	NRDB
CAMPEPHAGIDAE	Coracina melaschistos	
CAMPEPHAGIDAE	Pericrocotus brevirostris	S
CAMPEPHAGIDAE	Pericrocotus ethologus	
CAMPEPHAGIDAE	Pericrocotus flammeus	
CAPITONIDAE	Megalaima asiatica	
CAPITONIDAE	Megalaima franklinii	
CAPITONIDAE	Megalaima virens	
CAPRIMULGIDAE	Caprimulgus indicus	
CERTHIIDAE	Certhia familiaris	
CERTHIIDAE	Certhia nipalensis	
CHARADRIIDAE	Numenius arquata	
CHARADRIIDAE	Scolopax rusticola	
CINCLIDAE	Cinclus cinclus	
CINCLIDAE	Cinclus pallasii	
COLUMBIDAE	Columba hodgsonii	
COLUMBIDAE	Columba leuconota	
COLUMBIDAE	Columba livia	
COLUMBIDAE	Columba pulchricollis	
COLUMBIDAE	Streptopelia chinensis	
COLUMBIDAE	Streptopelia orientalis	
COLUMBIDAE	Treron sphenura	
CORVIDAE	Corvus corax	
CORVIDAE	Corvus macrorhynchos	
CORVIDAE	Dendrocitta formosae	
CORVIDAE	Garrulus glandarius	
CORVIDAE	Garrulus lanceolatus	
CORVIDAE	Nucifraga caryocatactes	
CORVIDAE	Pyrrhocorax graculus	
CORVIDAE	Pyrrhocorax pyrrhocorax	
CORVIDAE	Urocissa flavirostris	
CUCULIDAE	Cacomantis passerinus	
CUCULIDAE	Cuculus canorus	
CUCULIDAE	Cuculus micropterus	
CUCULIDAE	Cuculus poliocephalus	
CUCULIDAE	Cuculus saturatus	
CUCULIDAE	Eudynamys scolopacea	
CUCULIDAE	Hierococcyx sparveriioides	
DICAEIDAE	Dicaeum agile	
DICAEIDAE	Dicaeum ignipectus	
DICAEIDAE	Dicaeum melanoxanthum	S
DICRURIDAE	Dicrurus aeneus	
DICRURIDAE	Dicrurus leucophaeus	
DICRURIDAE	Dicrurus macrocercus	
EMBERIZIDAE	Emberiza pusilla	
EMBERIZIDAE	Melophus lathami	
FALCONIDAE	Falco amurensis	S

Family	Scientific Name	NRDB
FALCONIDAE	Falco peregrinus	E
FALCONIDAE	Falco severus	E
FALCONIDAE	Falco tinnunculus	
FRINGILLIDAE	Carduelis carduelis	
FRINGILLIDAE	Carduelis flavirostris	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus edwardsii	UR
FRINGILLIDAE	Carpodacus erythrinus	
FRINGILLIDAE	Carpodacus nipalensis	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus puniceus	
FRINGILLIDAE	Carpodacus rhodochrous	
FRINGILLIDAE	Carpodacus rhodopeplus	
FRINGILLIDAE	Carpodacus rubescens	
FRINGILLIDAE	Carpodacus thura	
FRINGILLIDAE	Carpodacus vinaceus	UR
FRINGILLIDAE	Fringilla coelebs	
FRINGILLIDAE	Haematospiza sipahi	UR
FRINGILLIDAE	Leucosticte nemoricola	
FRINGILLIDAE	Loxia curvirostra	
FRINGILLIDAE	Mycerobas affinis	
FRINGILLIDAE	Mycerobas carnipes	
FRINGILLIDAE	Mycerobas melanozanthos	
FRINGILLIDAE	Propyrrhula subhimachala	
FRINGILLIDAE	Pyrhoplectes epauletta	
FRINGILLIDAE	Pyrhula erythrocephala	
FRINGILLIDAE	Pyrhula nipalensis	
FRINGILLIDAE	Serinus thibetanus	
HIRUNDINIDAE	Delichon dasypus	
HIRUNDINIDAE	Delichon nipalensis	
HIRUNDINIDAE	Hirundo daurica	
HIRUNDINIDAE	Hirundo rustica	
HIRUNDINIDAE	Ptyonoprogne rupestris	
IBIDORHYNCHIDAE	Ibidorhyncha struthersii	S
INDICATORIDAE	Indicator xanthonotus	
IRENIDAE	Chloropsis hardwickii	
LANIIDAE	Lanius schach	
LANIIDAE	Lanius tephronotus	
MOTACILLIDAE	Anthus godlewskii	
MOTACILLIDAE	Anthus cervinus	
MOTACILLIDAE	Anthus hodgsoni	
MOTACILLIDAE	Anthus roseatus	
MOTACILLIDAE	Anthus spinoletta	
MOTACILLIDAE	Anthus sylvanus	
MOTACILLIDAE	Motacilla alba	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Garrulax striatus	
MUSCICAPIDAE	Garrulax subunicolor	S
MUSCICAPIDAE	Garrulax variegatus	
MUSCICAPIDAE	Heterophasia capistrata	
MUSCICAPIDAE	Minla strigula	
MUSCICAPIDAE	Myzornis pyrrhous	S
MUSCICAPIDAE	Paradoxornis fulvifrons	V
MUSCICAPIDAE	Paradoxornis nipalensis	S
MUSCICAPIDAE	Pomatorhinus erythrogenys	
MUSCICAPIDAE	Pomatorhinus ruficollis	
MUSCICAPIDAE	Pteruthius flaviscapis	
MUSCICAPIDAE	Pteruthius xanthochloris	
MUSCICAPIDAE	Stachyris pyrrhops	
MUSCICAPIDAE	Yuhina flavicollis	
MUSCICAPIDAE	Yuhina gularis	
MUSCICAPIDAE	Brachypteryx montana	S
MUSCICAPIDAE	Brachypteryx stellata	V
MUSCICAPIDAE	Pnoepyga alviventris	
MUSCICAPIDAE	Pnoepyga immaculata	Endemic
MUSCICAPIDAE	Pnoepyga pusilla	
MUSCICAPIDAE	Chaimarrornis leucocephalus	
MUSCICAPIDAE	Cinclidium leucurum	S
MUSCICAPIDAE	Enicurus maculatus	
MUSCICAPIDAE	Enicurus scouleri	
MUSCICAPIDAE	Grandala coelicolor	
MUSCICAPIDAE	Hodgsonius phoenicuroides	
MUSCICAPIDAE	Luscinia brunnea	
MUSCICAPIDAE	Luscinia pectoralis	
MUSCICAPIDAE	Monticola cinclorhyncha	
MUSCICAPIDAE	Monticola rufiventris	
MUSCICAPIDAE	Myiophoneus caeruleus	
MUSCICAPIDAE	Phoenicurus caeruleocephalus	
MUSCICAPIDAE	Phoenicurus erythrogaster	
MUSCICAPIDAE	Phoenicurus frontalis	
MUSCICAPIDAE	Phoenicurus hodgsoni	
MUSCICAPIDAE	Phoenicurus ochruros	
MUSCICAPIDAE	Phoenicurus schisticeps	
MUSCICAPIDAE	Rhyacornis fuliginosus	
MUSCICAPIDAE	Saxicola caprata	
MUSCICAPIDAE	Saxicola ferrea	
MUSCICAPIDAE	Saxicola torquata	
MUSCICAPIDAE	Tarsiger chrysaeus	
MUSCICAPIDAE	Tarsiger cyanurus	
MUSCICAPIDAE	Tarsiger hyperythrus	S
MUSCICAPIDAE	Tarsiger indicus	
MUSCICAPIDAE	Turdus albocinctus	

Family	Scientific Name	NRDB
MOTACILLIDAE	Motacilla cinerea	
MUSCICAPIDAE	Abroscopus schisticeps	
MUSCICAPIDAE	Cettia brunnifrons	
MUSCICAPIDAE	Cettia flavolivacea	
MUSCICAPIDAE	Phylloscopus affinis	
MUSCICAPIDAE	Phylloscopus fulgiventor	S
MUSCICAPIDAE	Phylloscopus inornatus	
MUSCICAPIDAE	Phylloscopus maculipennis	
MUSCICAPIDAE	Phylloscopus magnirostris	
MUSCICAPIDAE	Phylloscopus proregulus	
MUSCICAPIDAE	Phylloscopus pulcher	
MUSCICAPIDAE	Phylloscopus reguloides	
MUSCICAPIDAE	Phylloscopus trochiloides	
MUSCICAPIDAE	Prinia criniger	
MUSCICAPIDAE	Culicicapa ceylonensis	
MUSCICAPIDAE	Ficedula hyperythra	
MUSCICAPIDAE	Ficedula parva	
MUSCICAPIDAE	Ficedula strophliata	
MUSCICAPIDAE	Ficedula superciliaris	
MUSCICAPIDAE	Ficedula tricolor	
MUSCICAPIDAE	Ficedula westermanni	S
MUSCICAPIDAE	Muscicapa ferruginea	S
MUSCICAPIDAE	Muscicapa latirostris	
MUSCICAPIDAE	Muscicapa ruficauda	
MUSCICAPIDAE	Muscicapa sibirica	
MUSCICAPIDAE	Muscicapa thalassina	
MUSCICAPIDAE	Niltava grandis	S
MUSCICAPIDAE	Niltava macgrigoriae	
MUSCICAPIDAE	Niltava sundara	
MUSCICAPIDAE	Rhipidura albicollis	
MUSCICAPIDAE	Regulus regulus	
MUSCICAPIDAE	Seicercus burkii	
MUSCICAPIDAE	Seicercus castaneiceps	
MUSCICAPIDAE	Seicercus xanthoschistos	
MUSCICAPIDAE	Tesia castaneocoronata	
MUSCICAPIDAE	Tesia cyaniventer	
MUSCICAPIDAE	Actinodura nipalensis	
MUSCICAPIDAE	Alcippe castaneiceps	
MUSCICAPIDAE	Alcippe vinipectus	
MUSCICAPIDAE	Conostoma aemodium	V
MUSCICAPIDAE	Garrulax affinis	
MUSCICAPIDAE	Garrulax albogularis	
MUSCICAPIDAE	Garrulax erythrocephalus	
MUSCICAPIDAE	Garrulax lineatus	
MUSCICAPIDAE	Garrulax ocellatus	



Family	Scientific Name	NRDB
MUSCICAPIDAE	Turdus albocinctus	
MUSCICAPIDAE	Troglodytes troglodytes	
MUSCICAPIDAE	Turdus boulboul	
MUSCICAPIDAE	Turdus merula	
MUSCICAPIDAE	Turdus obscurus	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Turdus unicolor	
MUSCICAPIDAE	Zoothera dauma	
MUSCICAPIDAE	Zoothera dixonii	
MUSCICAPIDAE	Zoothera mollissima	
MUSCICAPIDAE	Zoothera monticola	V
MUSCICAPIDAE	Zoothera wardii	S
MUSCICAPIDAE	Yuhina occipitalis	
MUSCICAPIDAE	Rhipidura hypoxantha	
NECTARINIIDAE	Aethopyga gouldiae	
NECTARINIIDAE	Aethopyga ignicauda	
NECTARINIIDAE	Aethopyga nipalensis	
ORIOOLIDAE	Oriolus oriolus	
ORIOOLIDAE	Oriolus traillii	
PARIDAE	Aegithalos concinnus	
PARIDAE	Aegithalos iouschistos	
PARIDAE	Aegithalos niveogularis	
PARIDAE	Cephalopyrus flammiceps	
PARIDAE	Parus ater	
PARIDAE	Parus dichrous	
PARIDAE	Parus major	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PARIDAE	Parus xanthogenys	
PARIDAE	Sylviparus modestus	
PHASIANIDAE	Alectoris chukar	
PHASIANIDAE	Arborophila torqueola	
PHASIANIDAE	Coturnix coturnix	
PHASIANIDAE	Francolinus francolinus	
PHASIANIDAE	Ithaginis cruentus	S
PHASIANIDAE	Lerwa lerwa	
PHASIANIDAE	Lophophorus impejanus	S (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Tetraogallus himalayensis	
PHASIANIDAE	Tetraogallus tibetanus	S
PHASIANIDAE	Tragopan satyra	E (HMG/P)
PICIDAE	Blythipicus pyrrhotis	S
PICIDAE	Dendrocopos auriceps	S
PICIDAE	Dendrocopos cathpharius	
PICIDAE	Dendrocopos darjellensis	
PICIDAE	Dendrocopos hyperythrus	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Troglodytes troglodytes	
MUSCICAPIDAE	Turdus boulboul	
MUSCICAPIDAE	Turdus merula	
MUSCICAPIDAE	Turdus obscurus	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Turdus unicolor	
MUSCICAPIDAE	Zoothera dauma	
MUSCICAPIDAE	Zoothera dixonii	
MUSCICAPIDAE	Zoothera mollissima	
MUSCICAPIDAE	Zoothera monticola	V
MUSCICAPIDAE	Zoothera wardii	S
MUSCICAPIDAE	Yuhina occipitalis	
MUSCICAPIDAE	Rhipidura hypoxantha	
NECTARINIIDAE	Aethopyga gouldiae	
NECTARINIIDAE	Aethopyga ignicauda	
NECTARINIIDAE	Aethopyga nipalensis	
ORIOLOIDAE	Oriolus oriolus	
ORIOLOIDAE	Oriolus traillii	
PARIDAE	Aegithalos concinnus	
PARIDAE	Aegithalos iouschistos	
PARIDAE	Aegithalos niveogularis	
PARIDAE	Cephalopyrus flammiceps	
PARIDAE	Parus ater	
PARIDAE	Parus dichrous	
PARIDAE	Parus major	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PARIDAE	Parus xanthogenys	
PARIDAE	Sylviparus modestus	
PHASIANIDAE	Alectoris chukar	
PHASIANIDAE	Arborophila torqueola	
PHASIANIDAE	Coturnix coturnix	
PHASIANIDAE	Francolinus francolinus	
PHASIANIDAE	Ithaginis cruentus	S
PHASIANIDAE	Lerwa lerwa	
PHASIANIDAE	Lophophorus impejanus	S (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Tetraogallus himalayensis	
PHASIANIDAE	Tetraogallus tibetanus	S
PHASIANIDAE	Tragopan satyra	E (HMG/P)
PICIDAE	Blythipicus pyrrhotis	S
PICIDAE	Dendrocopos auriceps	S
PICIDAE	Dendrocopos cathpharius	
PICIDAE	Dendrocopos darjellensis	
PICIDAE	Dendrocopos hyperythrus	

Family	Scientific Name	NRDB
PICIDAE	Dendrocopos macei	
PICIDAE	Picumnus innominatus	S
PICIDAE	Picus canus	
PICIDAE	Picus squamatus	
PLOCEIDAE	Montifringilla adamsi	
PLOCEIDAE	Passer domesticus	
PLOCEIDAE	Passer montanus	
PRUNELLIDAE	Prunella collaris	
PRUNELLIDAE	Prunella fulvescens	
PRUNELLIDAE	Prunella himalayana	
PRUNELLIDAE	Prunella immaculata	
PRUNELLIDAE	Prunella rubeculoides	
PRUNELLIDAE	Prunella strophata	
PYCNONOTIDAE	Hypsipetes leucocephalus	
PYCNONOTIDAE	Hypsipetes maclellandii	
PYCNONOTIDAE	Pycnonotus leucogenys	
PYCNONOTIDAE	Pycnonotus striatus	
SITTIDAE	Sitta himalayensis	
SITTIDAE	Tichodroma muraria	
STRIGIDAE	Asio flammeus	S
STRIGIDAE	Athene bama	S
STRIGIDAE	Bubo bubo	V
STRIGIDAE	Glaucidium brodiei	
STRIGIDAE	Otus spilocephalus	S
STRIGIDAE	Strix aluco	
STURNIDAE	Acridotheres tristis	
UPUPIDAE	Upupa epops	
ZOSTEROPIDAE	Zosterops palpebrosus	

**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Reptile Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> LANGTANG NATIONAL PARK  
**Number of Species** : 2  
**NRDB status** : 0  
**Pages** : 1

---

Family	Scientific Name	NRDB
AGAMIDAE	Japalura tricarinata	
CROTALIDAE	Trimeresurus stejnegeri	

---



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Amphibian Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> LANGTANG  
**Number of Species** : 2  
**NRDB status** : 1  
**Pages** : 1

---

Family	Scientific Name	NRDB
BUFONIDAE	Bufo himalayanus	
PELOBATIDAE	Scutiger nepalensis	S

---



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Fish Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> LANGTANG NATIONAL PARK  
**Number of Species** : 2  
**NRDB status** : 1  
**Pages** : 1

---

Family	Scientific Name	NRDB
CYPRINIDAE	Schizothorax plagiostomus	V
CYPRINIDAE	Schizothoraichthys esocinus	





**LIST OF VERTEBRATES RECORDED FOR  
SAGARMATHA NATIONAL PARK**



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Mammal Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SAGARMATHA NATIONAL PARK  
**Number of Species** : 34  
**NRDB status** : 14  
**Pages** : 1

Family	Scientific Name	NRDB
AILURIDAE	Ailurus fulgens	E
BOVIDAE	Bos mutus	C
BOVIDAE	Hemitragus jemlahicus	S
BOVIDAE	Naemorhedus goral	S
BOVIDAE	Naemorhedus sumatraensis	S
CANIDAE	Canis aureus	
CANIDAE	Canis lupus	V
CANIDAE	Cuon alpinus	V
CANIDAE	Vulpes vulpes	S
CERCOPITHECIDAE	Macaca mulatta	S
CERCOPITHECIDAE	Semnopithecus entellus	S
CERVIDAE	Muntiacus muntjak	
FELIDAE	Panthera pardus	S
FELIDAE	Panthera uncia	E
LEPORIDAE	Lepus oiostolus	
MOSCHIDAE	Moschus chrysogaster	E
MOSCHIDAE	Moschus fuscus	E
MURIDAE	Mus musculus	
MURIDAE	Niviventer eha	
MURIDAE	Rattus rattus	
MURIDAE	Rattus turkestanicus	
MUSTELIDAE	Martes flavigula	
MUSTELIDAE	Mustela kathiah	
MUSTELIDAE	Mustela sibirica	
OCHOTONIDAE	Ochotona macrotis	
OCHOTONIDAE	Ochotona roylei	
RHIZOMYINAE	Alticola microtinal	
RHIZOMYINAE	Alticola stoliczkanus	
SCIURIDAE	Marmota himalaya	
SORICIDAE	Chimarrogale himalayica	
SORICIDAE	Nectogale elegans	
TALPIDAE	Talpa micrura	
URSIDAE	Ursus thibetanus	V
VIVERRIDAE	Paguma larvata	



**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Bird Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SAGARMATHA NATIONAL PARK  
**Number of Species** : 199  
**NRDB status** : 33  
**Pages** : 5

Family	Scientific Name	NRDB
ACCIPITRIDAE	Accipiter badius	S
ACCIPITRIDAE	Accipiter gentilis	
ACCIPITRIDAE	Accipiter nisus	
ACCIPITRIDAE	Accipiter trivirgatus	S
ACCIPITRIDAE	Accipiter virgatus	S
ACCIPITRIDAE	Aegypius monachus	V
ACCIPITRIDAE	Aquila chrysaetos	S
ACCIPITRIDAE	Aquila heliaca	V
ACCIPITRIDAE	Aquila nipalensis	S
ACCIPITRIDAE	Buteo buteo	S
ACCIPITRIDAE	Buteo hemilasius	S
ACCIPITRIDAE	Buteo rufinus	S
ACCIPITRIDAE	Circus cyaneus	
ACCIPITRIDAE	Gypaetus barbatus	S
ACCIPITRIDAE	Gyps himalayensis	
ACCIPITRIDAE	Hieraaetus pennatus	
ACCIPITRIDAE	Ichthyophaga humilis	E
ACCIPITRIDAE	Milvus migrans	
ACCIPITRIDAE	Pandion haliaetus	S
ACCIPITRIDAE	Sarcogyps calvus	S
ACCIPITRIDAE	Spilornis cheela	S
ACCIPITRIDAE	Spizaetus nipalensis	S
ALAUDIDAE	Alauda gulgula	
ALAUDIDAE	Calandrella acutirostris	
ALAUDIDAE	Calandrella brachydactyla	
ALAUDIDAE	Eremophila alpestris	
ANATIDAE	Anas acuta	
ANATIDAE	Anas clypeata	
ANATIDAE	Anas crecca	
ANATIDAE	Anas penelope	S
ANATIDAE	Anas querquedula	
ANATIDAE	Anas strepera	
ANATIDAE	Anser indicus	S

Family	Scientific Name	NRDB
ANATIDAE	Aythya ferina	
ANATIDAE	Aythya fuligula	
ANATIDAE	Aythya nyroca	S
ANATIDAE	Bucephala clangula	VG
ANATIDAE	Tadorna ferruginea	
APODIDAE	Apus pacificus	
APODIDAE	Collocalia brevirostris	
CAMPEPHAGIDAE	Pericrocotus ethologus	
CERTHIIDAE	Certhia familiaris	
CERTHIIDAE	Certhia nipalensis	
CHARADRIIDAE	Actitis hypoleucos	
CHARADRIIDAE	Calidris temminckii	
CHARADRIIDAE	Gallinago gallinago	
CHARADRIIDAE	Gallinago solitaria	
CHARADRIIDAE	Scolopax rusticola	
CHARADRIIDAE	Tringa nebularia	
CHARADRIIDAE	Tringa ochropus	
CHARADRIIDAE	Tringa totanus	
CHARADRIIDAE	Xenus cinereus	
CINCLIDAE	Cinclus cinclus	
CINCLIDAE	Cinclus pallasii	
COLUMBIDAE	Columba hodgsonii	
COLUMBIDAE	Columba leuconota	
COLUMBIDAE	Columba rupestris	
COLUMBIDAE	Streptopelia orientalis	
COLUMBIDAE	Treron sphenura	
CORVIDAE	Corvus corax	
CORVIDAE	Corvus macrorhynchos	
CORVIDAE	Nucifraga caryocatactes	
CORVIDAE	Pyrrhocorax graculus	
CORVIDAE	Pyrrhocorax pyrrhocorax	
CUCULIDAE	Clamator jacobinus	
CUCULIDAE	Cuculus canorus	
CUCULIDAE	Cuculus poliocephalus	
CUCULIDAE	Cuculus saturatus	
CUCULIDAE	Hierococcyx sparveroides	
DICRURIDAE	Dicrurus leucophaeus	
EMBERIZIDAE	Emberiza fucata	
EMBERIZIDAE	Emberiza pusilla	
FALCONIDAE	Falco amurensis	S
FALCONIDAE	Falco columbarius	
FALCONIDAE	Falco naumanni	V
FALCONIDAE	Falco pelegrinoides	E
FALCONIDAE	Falco peregrinus	E

Family	Scientific Name	NRDB
FALCONIDAE	Falco tinnunculus	
FRINGILLIDAE	Carduelis flavirostris	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus erythrinus	
FRINGILLIDAE	Carpodacus nipalensis	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus puniceus	
FRINGILLIDAE	Carpodacus rhodochrous	
FRINGILLIDAE	Carpodacus rubicilla	
FRINGILLIDAE	Carpodacus rubicilloides	
FRINGILLIDAE	Carpodacus thura	
FRINGILLIDAE	Leucosticte brandti	
FRINGILLIDAE	Leucosticte nemoricola	
FRINGILLIDAE	Loxia curvirostra	
FRINGILLIDAE	Mycerobas affinis	
FRINGILLIDAE	Mycerobas carnipes	
FRINGILLIDAE	Propyrrhula subhimachala	
FRINGILLIDAE	Pyrrhula erythrocephala	
GRUIDAE	Anthropoides virgo	S
HIRUNDINIDAE	Delichon dasypus	
HIRUNDINIDAE	Delichon nipalensis	
HIRUNDINIDAE	Hirundo rustica	
HIRUNDINIDAE	Ptyonoprogne rupestris	
IBIDORHYNCHIDAE	Ibidorhyncha struthersii	
LANIIDAE	Lanius tephronotus	
LARIDAE	Larus brunnicephalus	
LARIDAE	Larus fuscus	
LARIDAE	Larus ridibundus	
LARIDAE	Sterna aurantia	
LARIDAE	Sterna hirundo	
MOTACILLIDAE	Anthus roseatus	
MOTACILLIDAE	Motacilla alba	
MOTACILLIDAE	Motacilla cinerea	
MOTACILLIDAE	Motacilla citreola	
MUSCICAPIDAE	Anthus godlewskii	
MUSCICAPIDAE	Anthus hodgsoni	
MUSCICAPIDAE	Ficedula strophliata	
MUSCICAPIDAE	Ficedula superciliaris	
MUSCICAPIDAE	Ficedula tricolor	
MUSCICAPIDAE	Muscicapa thalassina	
MUSCICAPIDAE	Cettia brunnifrons	
MUSCICAPIDAE	Phylloscopus affinis	
MUSCICAPIDAE	Phylloscopus fulgiventis	S
MUSCICAPIDAE	Phylloscopus inornatus	
MUSCICAPIDAE	Phylloscopus maculipennis	
MUSCICAPIDAE	Phylloscopus magnirostris	



Family	Scientific Name	NRDB
MUSCICAPIDAE	Phylloscopus proregulus	
MUSCICAPIDAE	Phylloscopus pulcher	
MUSCICAPIDAE	Phylloscopus reguloides	
MUSCICAPIDAE	Phylloscopus trochiloides	
MUSCICAPIDAE	Regulus regulus	
MUSCICAPIDAE	Seicercus burkii	
MUSCICAPIDAE	Alcippe vinipectus	
MUSCICAPIDAE	Garrulax affinis	
MUSCICAPIDAE	Garrulax erythrocephalus	
MUSCICAPIDAE	Garrulax lineatus	
MUSCICAPIDAE	Garrulax ocellatus	
MUSCICAPIDAE	Heterophasia capistrata	
MUSCICAPIDAE	Minla strigula	
MUSCICAPIDAE	Paradoxornis fulvifrons	V
MUSCICAPIDAE	Pnoepyga albiventer	
MUSCICAPIDAE	Yuhina gularis	
MUSCICAPIDAE	Yuhina occipitalis	
MUSCICAPIDAE	Chaimarrornis leucocephalus	
MUSCICAPIDAE	Enicurus scouleri	
MUSCICAPIDAE	Grandala coelicolor	
MUSCICAPIDAE	Hodgsonius phoenicuroides	
MUSCICAPIDAE	Luscinia brunnea	
MUSCICAPIDAE	Luscinia pectoralis	
MUSCICAPIDAE	Luscinia svecica	
MUSCICAPIDAE	Monticola rufiventris	
MUSCICAPIDAE	Myiophoneus caeruleus	
MUSCICAPIDAE	Phoenicurus erythrogaster	
MUSCICAPIDAE	Phoenicurus frontalis	
MUSCICAPIDAE	Phoenicurus hodgsoni	
MUSCICAPIDAE	Phoenicurus ochruros	
MUSCICAPIDAE	Phoenicurus schisticeps	
MUSCICAPIDAE	Rhyacornis fuliginosus	
MUSCICAPIDAE	Saxicola ferrea	
MUSCICAPIDAE	Saxicola torquata	
MUSCICAPIDAE	Tarsiger chrysaeus	
MUSCICAPIDAE	Tarsiger cyanurus	
MUSCICAPIDAE	Tarsiger indicus	
MUSCICAPIDAE	Turdus albocinctus	
MUSCICAPIDAE	Turdus kessleri	UR
MUSCICAPIDAE	Turdus merula	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Zoothera dixonii	
MUSCICAPIDAE	Zoothera mollissima	
MUSCICAPIDAE	Niltava sundara	
MUSCICAPIDAE	Rhipidura hypoxantha	

Family	Scientific Name	NRDB
NECTARINIIDAE	Aethopyga gouldiae	
NECTARINIIDAE	Aethopyga ignicauda	
PARIDAE	Aegithalos iouschistos	
PARIDAE	Parus ater	
PARIDAE	Parus dichrous	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PHASIANIDAE	Ithaginis cruentus	S
PHASIANIDAE	Lerwa lerwa	
PHASIANIDAE	Lophophorus impejanus	S (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Tetraogallus tibetanus	S
PHASIANIDAE	Tragopan satyra	E (HMG/P)
PICIDAE	Dendrocopos darjellensis	
PLOCEIDAE	Montifringilla adamsi	
PLOCEIDAE	Montifringilla ruficollis	
PLOCEIDAE	Passer domesticus	
PLOCEIDAE	Passer montanus	
PLOCEIDAE	Passer rutilans	
PRUNELLIDAE	Prunella collaris	
PRUNELLIDAE	Prunella fulvescens	
PRUNELLIDAE	Prunella himalayana	
PRUNELLIDAE	Prunella rubeculoides	
PRUNELLIDAE	Prunella strophiatea	
RALLIDAE	Fulica atra	
SITTIDAE	Tichodroma muraria	
STRIGIDAE	Bubo bubo	V
STRIGIDAE	Orus spilocephalus	S
STRIGIDAE	Strix aluco	
TROGLODYTIDAE	Troglodytes troglodytes	
UPUPIDAE	Upupa epops	



**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Reptile Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> SAGARMATHA NATIONAL PARK  
**Number of Species** : 5  
**NRDB status** :  
**Pages** : 1

---

Family	Scientific Name	NRDB
AGAMIDAE	Calotes versicolor	
COLUBRIDAE	Elaphe hodgsoni	
COLUBRIDAE	Oligodon erythrogaster	
COLUBRIDAE	Pseudoxenodon macrops	
ELAPIDAE	Naja kaouthia	



**LIST OF VERTEBRATES RECORDED FOR  
MAKALU BARUN NATIONAL PARK**



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Mammal Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> MAKALU BARUN NATIONAL PARK  
**Number of Species** : 81  
**NRDB status** : 26  
**Pages** : 2

Family	Scientific Name	NRDB
AILURIDAE	Ailurus fulgens	E
BOVIDAE	Hemitragus jemlahicus	S
BOVIDAE	Naemorhedus goral	S
BOVIDAE	Naemorhedus sumatraensis	S
BOVIDAE	Ovis ammon	C
CALLOSCIURINAE	Callosciurus pygerythrus	
CALLOSCIURINAE	Dremomys lokriah	
CALLOSCIURINAE	Tamias maclellandi	
CANIDAE	Canis aureus	
CANIDAE	Canis lupus	V
CANIDAE	Cuon alpinus	V
CANIDAE	Vulpes vulpes	S
CERCOPITHECIDAE	Macaca assamensis	V
CERCOPITHECIDAE	Macaca mulatta	S
CERCOPITHECIDAE	Semnopithecus entellus	S
CERVIDAE	Muntiacus muntjak	
FELIDAE	Catopuma temminckii	V
FELIDAE	Felis chaus	S
FELIDAE	Panthera pardus	S
FELIDAE	Panthera uncia	E
FELIDAE	Pardofelis nebulosa	V
FELIDAE	Prionailurus bengalensis	V
HERPESTIDAE	Herpestes edwardsii	
HERPESTIDAE	Herpestes urva	S
HIPPOSIDERIDAE	Hipposideros armiger	
HYSTRICIDAE	Hystrix indica	
LEPORIDAE	Lepus nigricollis	
LEPORIDAE	Lepus oiostolus	
LUTRANAE	Aonyx cinerea	S
LUTRANAE	Lutra lutra	S
LUTRANAE	Lutrogale perspicillata	S
MANIDAE	Manis pentadactyla	S
MOSCHIDAE	Moschus chrysogaster	E
MURIDAE	Apodemus sylvaticus	
MURIDAE	Bandicota bengalensis	
MURIDAE	Niviventer niviventer	



Family	Scientific Name	NRDB
MURIDAE	Rattus rattus	
MUSTELIDAE	Martes flavigula	
MUSTELIDAE	Martes foina	
MUSTELIDAE	Mustela altaica	
MUSTELIDAE	Mustela kathiah	
MUSTELIDAE	Mustela sibirica	
MUSTELIDAE	Mustela strigidorsa	V
OCHOTONIDAE	Ochotona macrotis	
OCHOTONIDAE	Ochotona roylei	
PTEROMYIDAE	Hylopetes alboniger	
PTEROMYIDAE	Petaurista elegans	
PTEROMYIDAE	Petaurista magnificus	
PTEROMYIDAE	Petaurista petaurista	
PTEROPODIDAE	Cynopterus sphinx	
PTEROPODIDAE	Pteropus giganteus	
PTEROPODIDAE	Rousettus leschenaulti	
RHIZOMYINAE	Alticola stoliczkanus	
RHIZOMYINAE	Cannomys badius	
SCIURIDAE	Marmota bobak	
SCIURIDAE	Ratufa bicolor	S
SORICIDAE	Chimarrogale himalayica	
SORICIDAE	Nectogale elegans	
SORICIDAE	Soriculus baileyi	
SORICIDAE	Soriculus caudatus	
SORICIDAE	Soriculus leucops	
SORICIDAE	Soriculus nigrescens	
SORICIDAE	Suncus murinus	
SORICIDAE	Suncus stoliczkanus	
SUIDAE	Sus scrofa	
TALPIDAE	Talpa micrura	
TUPAIINAE	Tupaia glis	
URSIDAE	Ursus thibetanus	V
VESPERTILIONIDAE	Barbastella leucomelas	
VESPERTILIONIDAE	Eptesicus nilssoni	
VESPERTILIONIDAE	Eptesicus serotinus	
VESPERTILIONIDAE	Myotis mystacinus	
VESPERTILIONIDAE	Myotis siligorensis	
VESPERTILIONIDAE	Nyctalus montanus	
VESPERTILIONIDAE	Pipistrellus coromandra	
VESPERTILIONIDAE	Pipistrellus javanicus	
VESPERTILIONIDAE	Plecotus auritus	
VIVERRIDAE	Paguma larvata	
VIVERRIDAE	Paradoxurus hermaphroditus	
VIVERRIDAE	Viverra zibetha	
VIVERRIDAE	Viverricula indica	

**APPLIED DATABASE for  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Bird Report (Qualitative)**

Taxonomy : All species  
Area : Protected Area-> MAKALU BARUN NATIONAL PARK  
Number of Species : 400  
NRDB status : 83  
Pages : 9

Family	Scientific Name	NRDB
ACCIPITRIDAE	Accipiter badius	S
ACCIPITRIDAE	Accipiter gentilis	
ACCIPITRIDAE	Accipiter nisus	
ACCIPITRIDAE	Accipiter trivirgatus	S
ACCIPITRIDAE	Accipiter virgatus	S
ACCIPITRIDAE	Aegypius monachus	V
ACCIPITRIDAE	Aquila chrysaetos	S
ACCIPITRIDAE	Aquila nipalensis	S
ACCIPITRIDAE	Butastur teesa	S
ACCIPITRIDAE	Buteo buteo	S
ACCIPITRIDAE	Buteo hemilasius	S
ACCIPITRIDAE	Buteo rufinus	S
ACCIPITRIDAE	Circus aeruginosus	
ACCIPITRIDAE	Circus cyaneus	
ACCIPITRIDAE	Elanus caeruleus	S
ACCIPITRIDAE	Gypaetus barbatus	S
ACCIPITRIDAE	Gyps bengalensis	
ACCIPITRIDAE	Gyps himalayensis	
ACCIPITRIDAE	Gyps indicus	S
ACCIPITRIDAE	Haliastur indus	
ACCIPITRIDAE	Hieraaetus fasciatus	
ACCIPITRIDAE	Ictinaetus malayensis	
ACCIPITRIDAE	Milvus migrans	
ACCIPITRIDAE	Pandion haliaetus	S
ACCIPITRIDAE	Pernis ptilorhynchus	
ACCIPITRIDAE	Sarcogyps calvus	S
ACCIPITRIDAE	Spilornis cheela	S
ACCIPITRIDAE	Spizaetus cirrhatus	S
ACCIPITRIDAE	Spizaetus nipalensis	S
ALAUDIDAE	Eremophila alpestris	
ALCEDINIDAE	Alcedo atthis	
ALCEDINIDAE	Ceryle lugubris	
ALCEDINIDAE	Halcyon smyrnensis	
ANATIDAE	Anser indicus	S
ANATIDAE	Mergus merganser	

Family	Scientific Name	NRDB
ANATIDAE	Tadorna ferruginea	
APODIDAE	Apus affinis	
APODIDAE	Apus apus	
APODIDAE	Apus melba	
APODIDAE	Apus pacificus	
APODIDAE	Collocalia brevirostris	
APODIDAE	Hirundapus caudacutus	
APODIDAE	Zoonavena sylvatica	
ARDEIDAE	Bubulcus ibis	
ARDEIDAE	Butorides striatus	
ARDEIDAE	Egretta garzetta	
BURHINIDAE	Burhinus oedicnemus	
BURHINIDAE	Esacus recurvirostris`	C
CAMPEPHAGIDAE	Coracina macei	
CAMPEPHAGIDAE	Coracina melaschistos	
CAMPEPHAGIDAE	Hemipus picatus	
CAMPEPHAGIDAE	Pericrocotus brevirostris	S
CAMPEPHAGIDAE	Pericrocotus ethologus	
CAMPEPHAGIDAE	Pericrocotus flammeus	
CAMPEPHAGIDAE	Pericrocotus solaris	V
CAMPEPHAGIDAE	Tephrodornis gularis	
CAPITONIDAE	Megalaima asiatica	
CAPITONIDAE	Megalaima franklinii	
CAPITONIDAE	Megalaima haemacephala	
CAPITONIDAE	Megalaima lineata	
CAPITONIDAE	Megalaima virens	
CAPRIMULGIDAE	Caprimulgus indicus	
CAPRIMULGIDAE	Caprimulgus macrurus	
CERTHIIDAE	Certhia discolor	
CERTHIIDAE	Certhia familiaris	
CERTHIIDAE	Certhia nipalensis	
CHARADRIIDAE	Actitis hypoleucos	
CHARADRIIDAE	Charadrius dubius	
CHARADRIIDAE	Gallinago nemoricola	V
CHARADRIIDAE	Gallinago solitaria	
CHARADRIIDAE	Gallinago stenura	
CHARADRIIDAE	Hoplopterus cinereus	V
CHARADRIIDAE	Hoplopterus duvaucelii	
CHARADRIIDAE	Hoplopterus indicus	
CHARADRIIDAE	Pluvialis fulva	
CHARADRIIDAE	Scolopax rusticola	
CHARADRIIDAE	Tringa nebularia	
CHARADRIIDAE	Tringa ochropus	
CHARADRIIDAE	Tringa totanus	
CICONIIDAE	Ciconia episcopus	S

Family	Scientific Name	NRDB
CINCLIDAE	<i>Cinclus pallasii</i>	
COLUMBIDAE	<i>Chalcophaps indica</i>	
COLUMBIDAE	<i>Columba hodgsonii</i>	
COLUMBIDAE	<i>Columba leuconota</i>	
COLUMBIDAE	<i>Columba livia</i>	
COLUMBIDAE	<i>Macropygia unchall</i>	V
COLUMBIDAE	<i>Streptopelia chinensis</i>	
COLUMBIDAE	<i>Streptopelia orientalis</i>	
COLUMBIDAE	<i>Streptopelia tranquebarica</i>	
COLUMBIDAE	<i>Treron phoenicoptera</i>	S
COLUMBIDAE	<i>Treron sphenura</i>	
CORACIIDAE	<i>Coracias benghalensis</i>	
CORVIDAE	<i>Cissa chinensis</i>	
CORVIDAE	<i>Corvus corax</i>	
CORVIDAE	<i>Corvus macrorhynchos</i>	
CORVIDAE	<i>Corvus splendens</i>	
CORVIDAE	<i>Dendrocitta formosae</i>	
CORVIDAE	<i>Nucifraga caryocatactes</i>	
CORVIDAE	<i>Pyrrhocorax pyrrhocorax</i>	
CORVIDAE	<i>Urocissa erythrorhyncha</i>	
CORVIDAE	<i>Urocissa flavirostris</i>	
CUCULIDAE	<i>Cacomantis merulinus</i>	
CUCULIDAE	<i>Cacomantis passerinus</i>	
CUCULIDAE	<i>Cacomantis sonneratii</i>	V
CUCULIDAE	<i>Clamator jacobinus</i>	
CUCULIDAE	<i>Cuculus canorus</i>	
CUCULIDAE	<i>Cuculus micropterus</i>	
CUCULIDAE	<i>Cuculus poliocephalus</i>	
CUCULIDAE	<i>Cuculus saturatus</i>	
CUCULIDAE	<i>Eudynamys scolopacea</i>	
CUCULIDAE	<i>Hierococcyx sparveriioides</i>	
CUCULIDAE	<i>Phaenicophaeus leschenaultii</i>	
CUCULIDAE	<i>Phaenicophaeus tristis</i>	
DICAEIDAE	<i>Dicaeum agile</i>	
DICAEIDAE	<i>Dicaeum concolor</i>	
DICAEIDAE	<i>Dicaeum ignipectus</i>	
DICAEIDAE	<i>Dicaeum melanoxanthum</i>	S
DICRURIDAE	<i>Dicrurus aeneus</i>	
DICRURIDAE	<i>Dicrurus hottentottus</i>	
DICRURIDAE	<i>Dicrurus leucophaeus</i>	
DICRURIDAE	<i>Dicrurus macrocerus</i>	
DICRURIDAE	<i>Dicrurus paradiseus</i>	
DICRURIDAE	<i>Dicrurus remifer</i>	
EMBERIZIDAE	<i>Emberiza cia</i>	
EMBERIZIDAE	<i>Emberiza pusilla</i>	
EMBERIZIDAE	<i>Emberiza spodocephala</i>	

Family	Scientific Name	NRDB
FALCONIDAE	Falco amurensis	S
FALCONIDAE	Falco chicquera	E
FALCONIDAE	Falco jugger	E
FALCONIDAE	Falco naumanni	V
FALCONIDAE	Falco peregrinus	E
FALCONIDAE	Falco severus	E
FALCONIDAE	Falco subbuteo	
FALCONIDAE	Falco tinnunculus	
FALCONIDAE	Microhierax caerulescens	
FRINGILLIDAE	Carduelis spinoides	
FRINGILLIDAE	Carpodacus edwardsii	UR
FRINGILLIDAE	Carpodacus erythrinus	
FRINGILLIDAE	Carpodacus nipalensis	
FRINGILLIDAE	Carpodacus pulcherrimus	
FRINGILLIDAE	Carpodacus puniceus	
FRINGILLIDAE	Carpodacus rhodochrous	
FRINGILLIDAE	Carpodacus rhodopeplus	
FRINGILLIDAE	Carpodacus rubicilloides	
FRINGILLIDAE	Carpodacus thura	
FRINGILLIDAE	Haematospiza sipahi	UR
FRINGILLIDAE	Leucosticte brandti	
FRINGILLIDAE	Leucosticte nemoricola	
FRINGILLIDAE	Mycerobas affinis	
FRINGILLIDAE	Mycerobas carnipes	
FRINGILLIDAE	Mycerobas melanozanthos	
FRINGILLIDAE	Propyrrhula subhimachala	
FRINGILLIDAE	Pyrrhoptes epauletta	
FRINGILLIDAE	Pyrrhula erythrocephala	
FRINGILLIDAE	Pyrrhula nipalensis	
GLAREOLIDAE	Glareola lactea	
GLAREOLIDAE	Glareola maldivarum	
HIRUNDINIDAE	Delichon nipalensis	
HIRUNDINIDAE	Delichon urbica	
HIRUNDINIDAE	Hirundo daurica	
HIRUNDINIDAE	Hirundo rustica	
HIRUNDINIDAE	Ptyonoprogne rupestris	
HIRUNDINIDAE	Riparia paludicola	
HIRUNDINIDAE	Riparia riparia	
IBIDORHYNCHIDAE	Ibidorhyncha struthersii	S
INDICATORIDAE	Indicator xanthonotus	V
IRENIDAE	Aegithina tiphia	
IRENIDAE	Chloropsis aurifrons	
IRENIDAE	Chloropsis hardwickii	
LANIIDAE	Lanius schach	
LANIIDAE	Lanius tephronotus	
LARIDAE	Larus ichthyaetus	
LARIDAE	Larus ridibundus	

Family	Scientific Name	NRDB
MEROPIDAE	Merops leschenaulti	
MEROPIDAE	Merops orientalis	S
MOTACILIIDAE	Anthus novaeseelandiae	
MOTACILLIDAE	Anthus hodgsoni	
MOTACILLIDAE	Anthus roseatus	
MOTACILLIDAE	Motacilla alba	
MOTACILLIDAE	Motacilla cinerea	
MOTACILLIDAE	Motacilla citreola	
MOTACILLIDAE	Motacilla maderaspatensis	
MUSCICAPIDAE	Abroscopus schisticeps	
MUSCICAPIDAE	Abroscopus superciliaris	
MUSCICAPIDAE	Actinodura egertoni	E
MUSCICAPIDAE	Actinodura nipalensis	
MUSCICAPIDAE	Alcippe castaniceps	
MUSCICAPIDAE	Alcippe cinerea	
MUSCICAPIDAE	Alcippe nipalensis	
MUSCICAPIDAE	Alcippe vinipectus	
MUSCICAPIDAE	Brachypteryx montana	S
MUSCICAPIDAE	Cettia brunnifrons	
MUSCICAPIDAE	Cettia flavolivacea	
MUSCICAPIDAE	Cettia fortipes	
MUSCICAPIDAE	Cettia pallidipes	S
MUSCICAPIDAE	Chaimarrornis leucocephalus	
MUSCICAPIDAE	Cochoa viridis	
MUSCICAPIDAE	Conostoma aemodium	V
MUSCICAPIDAE	Copsychus saularis	
MUSCICAPIDAE	Culicicapa ceylonensis	
MUSCICAPIDAE	Cyornis banyumas	V
MUSCICAPIDAE	Cyornis poliogenys	
MUSCICAPIDAE	Cyornis unicolor	E
MUSCICAPIDAE	Enicurus maculatus	
MUSCICAPIDAE	Enicurus schistaceus	
MUSCICAPIDAE	Enicurus scouleri	
MUSCICAPIDAE	Ficedula hodgsonii	
MUSCICAPIDAE	Ficedula hyperythra	
MUSCICAPIDAE	Ficedula monileger	V
MUSCICAPIDAE	Ficedula strophciata	
MUSCICAPIDAE	Ficedula subrubra	E
MUSCICAPIDAE	Ficedula superciliaris	
MUSCICAPIDAE	Ficedula tricolor	
MUSCICAPIDAE	Ficedula westermanni	S
MUSCICAPIDAE	Garrulax affinis	
MUSCICAPIDAE	Garrulax albogularis	
MUSCICAPIDAE	Garrulax caerulatus	E
MUSCICAPIDAE	Garrulax erythrocephalus	
MUSCICAPIDAE	Garrulax leucolophus	

Family	Scientific Name	NRDB
MUSCICAPIDAE	Garrulax ocellatus	
MUSCICAPIDAE	Garrulax pectoralis	S
MUSCICAPIDAE	Garrulax rufogularis	
MUSCICAPIDAE	Garrulax squamatus	V
MUSCICAPIDAE	Garrulax striatus	
MUSCICAPIDAE	Garrulax subunicolor	S
MUSCICAPIDAE	Grandala coelicolor	
MUSCICAPIDAE	Heterophasia capistrata	
MUSCICAPIDAE	Leiothrix argentauris	V
MUSCICAPIDAE	Leiothrix lutea	
MUSCICAPIDAE	Luscinia brunnea	
MUSCICAPIDAE	Luscinia pectoralis	
MUSCICAPIDAE	Luscinia svecica	
MUSCICAPIDAE	Minla cyanouroptera	
MUSCICAPIDAE	Minla ignotincta	
MUSCICAPIDAE	Minla strigula	
MUSCICAPIDAE	Monticola cinclorhyncha	
MUSCICAPIDAE	Monticola rufiventris	
MUSCICAPIDAE	Muscicapa ferruginea	S
MUSCICAPIDAE	Muscicapa sibirica	
MUSCICAPIDAE	Muscicapa thalassina	
MUSCICAPIDAE	Muscicapella hodgsoni	S
MUSCICAPIDAE	Myiophoneus caeruleus	
MUSCICAPIDAE	Myzornis pyrrhura	S
MUSCICAPIDAE	Niltava grandis	S
MUSCICAPIDAE	Niltava sundara	
MUSCICAPIDAE	Orthotomus sutorius	
MUSCICAPIDAE	Paradoxornis fulvifrons	V
MUSCICAPIDAE	Paradoxornis nipalensis	S
MUSCICAPIDAE	Pellorneum ruficeps	
MUSCICAPIDAE	Phoenicurus frontalis	
MUSCICAPIDAE	Phoenicurus hodgsoni	
MUSCICAPIDAE	Phoenicurus ochruros	
MUSCICAPIDAE	Phylloscopus affinis	
MUSCICAPIDAE	Phylloscopus collybita	
MUSCICAPIDAE	Phylloscopus fulgiventis	S
MUSCICAPIDAE	Phylloscopus inornatus	
MUSCICAPIDAE	Phylloscopus maculipennis	
MUSCICAPIDAE	Phylloscopus magnirostris	
MUSCICAPIDAE	Phylloscopus proregulus	
MUSCICAPIDAE	Phylloscopus pulcher	
MUSCICAPIDAE	Phylloscopus reguloides	
MUSCICAPIDAE	Phylloscopus trochiloides	
MUSCICAPIDAE	Pnoepyga albiventer	
MUSCICAPIDAE	Pnoepyga pusilla	
MUSCICAPIDAE	Pomatorhinus ferruginosus	E

Family	Scientific Name	NRDB
MUSCICAPIDAE	Pomatorhinus ruficollis	
MUSCICAPIDAE	Pomatorhinus schisticeps	
MUSCICAPIDAE	Pomatorhinus erythrogenys	
MUSCICAPIDAE	Prinia cinereocapilla	S
MUSCICAPIDAE	Prinia criniger	
MUSCICAPIDAE	Prinia hodgsonii	
MUSCICAPIDAE	Pteruthius flaviscapis	
MUSCICAPIDAE	Pteruthius melanotis	
MUSCICAPIDAE	Pteruthius rufiventer	V
MUSCICAPIDAE	Pteruthius xanthocloris	
MUSCICAPIDAE	Regulus regulus	
MUSCICAPIDAE	Rhipidura albicollis	
MUSCICAPIDAE	Rhipidura hypoxantha	
MUSCICAPIDAE	Ryacornis fuliginosus	
MUSCICAPIDAE	Saxicola caprata	
MUSCICAPIDAE	Saxicola ferrea	
MUSCICAPIDAE	Saxicola torquata	
MUSCICAPIDAE	Seicercus burkii	
MUSCICAPIDAE	Seicercus castaniceps	
MUSCICAPIDAE	Seicercus xanthoschistos	
MUSCICAPIDAE	Spelaeornis caudatus	
MUSCICAPIDAE	Spelaeornis formosus	V
MUSCICAPIDAE	Stachyris chrysaea	V
MUSCICAPIDAE	Stachyris nigriceps	
MUSCICAPIDAE	Stachyris pyrrhops	
MUSCICAPIDAE	Stachyris ruficeps	
MUSCICAPIDAE	Terpsiphone paradisi	
MUSCICAPIDAE	Tesia castaneocoronata	
MUSCICAPIDAE	Tesia olivea	V
MUSCICAPIDAE	Tickellia hodgsoni	V
MUSCICAPIDAE	Turdoides nipalensis	
MUSCICAPIDAE	Turdoides striatus	
MUSCICAPIDAE	Turdus albocinctus	
MUSCICAPIDAE	Turdus merula	
MUSCICAPIDAE	Tarsiger chrysaeus	
MUSCICAPIDAE	Tarsiger cyanurus	
MUSCICAPIDAE	Tarsiger hyperythrus	S
MUSCICAPIDAE	Tarsiger indicus	
MUSCICAPIDAE	Turdus rubrocanus	
MUSCICAPIDAE	Turdus ruficollis	
MUSCICAPIDAE	Turdus unicolor	
MUSCICAPIDAE	Xiphirhynchus superciliaris	V
MUSCICAPIDAE	Yuhina flavicollis	
MUSCICAPIDAE	Yuhina gularis	
MUSCICAPIDAE	Yuhina zantholeuca	
MUSCICAPIDAE	Zoothera citrina	



Family	Scientific Name	NRDB
MUSCICAPIDAE	Zoothera dauma	
MUSCICAPIDAE	Zoothera dixonii	
MUSCICAPIDAE	Zoothera marginata	E
MUSCICAPIDAE	Zoothera mollissima	
MUSCICAPIDAE	Zoothera monticola	V
MUSCICAPIDAE	Zoothera wardii	S
NECTARINIIDAE	Aethopyga ignicauda	
NECTARINIIDAE	Aethopyga nipalensis	
NECTARINIIDAE	Aethopyga saturata	
NECTARINIIDAE	Aethopyga siparaja	
NECTARINIIDAE	Arachnothera magna	
NECTARINIIDAE	Nectarinia asiatica	
ORIOLOIDAE	Oriolus tenuirostris	
ORIOLOIDAE	Oriolus traillii	
PARIDAE	Aegithalos concinnus	
PARIDAE	Aegithalos iouschistos	
PARIDAE	Parus ater	
PARIDAE	Parus dichrous	
PARIDAE	Parus major	
PARIDAE	Parus monticolus	
PARIDAE	Parus rubidiventris	
PARIDAE	Parus spilonotus	
PARIDAE	Parus xanthogenys	
PARIDAE	Sylviparus modestus	
PHALACROCORACIDAE	Phalacrocorax carbo	
PHASIANIDAE	Arborophila torqueola	
PHASIANIDAE	Ithaginis cruentus	S
PHASIANIDAE	Lerwa lerwa	
PHASIANIDAE	Lophophorus impejanus	S (HMG/P)
PHASIANIDAE	Lophura leucomelana	S
PHASIANIDAE	Tetraogallus himalayensis	
PHASIANIDAE	Tetraogallus tibetanus	
PHASIANIDAE	Tragopan satyra	E (HMG/P)
PICIDAE	Chrysocolaptes lucidus	
PICIDAE	Dendrocopos auriceps	S
PICIDAE	Dendrocopos cathpharius	
PICIDAE	Dendrocopos darjellensis	
PICIDAE	Dendrocopos himalayensis	
PICIDAE	Dendrocopos hyperythrus	
PICIDAE	Dendrocopos macei	
PICIDAE	Picus canus	
PICIDAE	Picus chlorolophus	
PICIDAE	Picus flavinucha	
PICIDAE	Sasia ochracea	
PLOCEIDAE	Lonchura punctulata	
PLOCEIDAE	Lonchura striata	
PLOCEIDAE	Passer domesticus	

Family	Scientific Name	NRDB
PLOCEIDAE	Passer montanus	
PRUNELLIDAE	Prunella collaris	
PRUNELLIDAE	Prunella himalayana	
PRUNELLIDAE	Prunella immaculata	
PRUNELLIDAE	Prunella rubeculoides	
PRUNELLIDAE	Prunella strophiatea	
PSITTACIDAE	Psittacula cyanocephala	S
PSITTACIDAE	Psittacula himalayana	S
PYCNONOTIDAE	Hypsipetes flavalus	
PYCNONOTIDAE	Hypsipetes leucocephalus	
PYCNONOTIDAE	Hypsipetes mcclllandii	
PYCNONOTIDAE	Pycnonotus cafer	
PYCNONOTIDAE	Pycnonotus leucogenys	
PYCNONOTIDAE	Pycnonotus melanicterus	
PYCNONOTIDAE	Pycnonotus striatus	
ROSTRATULIDAE	Rostratula benghalensis	
SITTIDAE	Sitta castanea	
SITTIDAE	Sitta himalayensis	
SITTIDAE	Tichodroma muraria	
STRIGIDAE	Asio flammeus	S
STRIGIDAE	Bubo nipalensis	S
STRIGIDAE	Glaucidium brodiei	
STRIGIDAE	Glaucidium cuculoides	
STRIGIDAE	Glaucidium radiatum	
STRIGIDAE	Ninox scutulata	S
STRIGIDAE	Otus bakkamoena	S
STRIGIDAE	Otus spilocephalus	S
STRIGIDAE	Otus sunia	V
STRIGIDAE	Strix aluco	
STRIGIDAE	Strix leptogrammica	V
STURNIDAE	Acridotheres fuscus	
STURNIDAE	Acridotheres tristis	
STURNIDAE	Gracula religiosa	V
STURNIDAE	Saroglossa spiloptera	S
STURNIDAE	Sturnus malabaricus	
STURNIDAE	Sturnus pagodarum	
TROGLODYTIDAE	Troglodytes troglodytes	
TROGONIDAE	Harpactes erythrocephalus	V
TURDIDAE	Rhyacornis fuliginosus	
UPUPIDAE	Upupa epops	
ZOSTEROPIDAE	Zosterops palpebrosus	



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Reptile Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> MAKALU BARUN NATIONAL PARK  
**Number of Species** : 12  
**NRDB status** : 1  
**Pages** : 1

---

Family	Scientific Name	NRDB
AGAMIDAE	Japalura variegata	
BOIDAE	Python molurus	V
COLUBRIDAE	Atretium schistosum	
COLUBRIDAE	Dendrelaphis tristis	
COLUBRIDAE	Elaphe radiata	
GEKKONIDAE	Cosymbotus platyurus	
SCINCIDAE	Mabuya carinata	
SCINCIDAE	Scincella modestum	
SCINCIDAE	Scincella reevesi	
SCINCIDAE	Sphenomorphus indicum	
SCINCIDAE	Sphenomorphus maculatus	
VIPERIDAE	Ovophis monticola	

---



APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL

Amphibian Report (Qualitative)

Taxonomy : All species  
Area : Protected Area-> MAKALU BARUN NATIONAL PARK  
Number of Species : 2  
NRDB status : 0  
Pages : 1

---

Family	Scientific Name	NRDB
<hr/>		
MICROHYLIDAE	Microhyla ornata	
RANIDAE	Rana blanfordii	



**APPLIED DATABASE FOR  
INTEGRATED BIODIVERSITY CONSERVATION IN NEPAL**

**Fish Report (Qualitative)**

**Taxonomy** : All species  
**Area** : Protected Area-> MAKALU BARUN NATIONAL PARK  
**Number of Species** : 13  
**NRDB status** : 5  
**Pages** : 1

---

Family	Scientific Name	NRDB
CYPRINIDAE	Acrossocheilus hexagonolepis	V
CYPRINIDAE	Barilius barna	
CYPRINIDAE	Crossocheilus latius	
CYPRINIDAE	Garra annandalei	
CYPRINIDAE	Garra gotyla	
CYPRINIDAE	Schizothorax richardsonii	V
CYPRINIDAE	Schizothoraichthys progastus	V
PSILORHYNCHIDAE	Psilorhynchus pseudecheneis	V
COBITIDAE	Lepidocephalichthys guntea	
COBITIDAE	Noemacheilus rupecola	
SISORIDAE	Glyptothorax pectinopterus	
SISORIDAE	Pseudecheneis sulcatus	
ANGUILLIDAE	Anguilla bengalensis	V

---





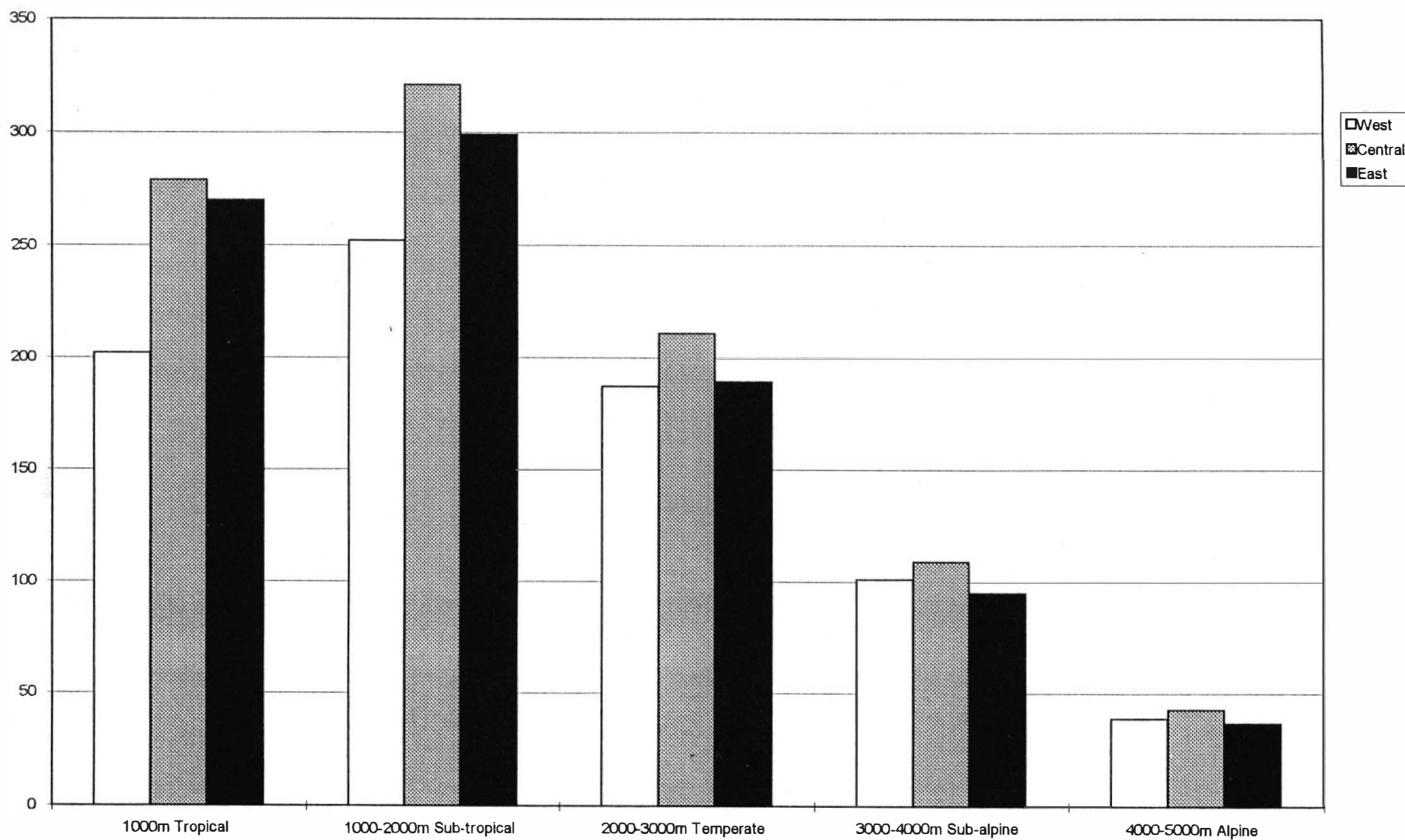
## **Appendix 7-1**

---

### **Distribution of medicinal plants in Nepal by altitudinal zone and sub-region**



APPENDIX 7-1 DISTRIBUTION OF MEDICINAL PLANTS IN NEPAL  
BY ALTITUDINAL ZONE AND SUB-REGION





## **Appendix 7-2**

---

**Common non-timber forest  
products in trade**

## 2. Introduction

The first part of the paper discusses the importance of the study and the objectives of the research. The second part describes the methodology used in the study. The third part presents the results of the study. The fourth part discusses the conclusions and the implications of the study.

## APPENDIX 7-2 COMMON NON-TIMBER FOREST PRODUCTS IN TRADE

Scientific Name	Local Name	Family	Parts Used/Collected	Physiographic Zone	Remarks
<i>Abies spectabilis</i>	Talis patra	Pinaceae	Leaves	Middle to High Mountain	
<i>Acacia catechu</i>	Khayer	Mimosaceae	Bark	Terai	
<i>Acacia concinna</i>	Sikakai, Rasula	Mimosaceae	Seed and fruit	Terai	
<i>Aconitum heterophyllum</i>	Atis	Ranunculaceae	Root	Middle to High Mountain	
<i>Aconitum palmatum</i>	Bikhma	Ranunculaceae	Root and bulb	High Mountain	
<i>Aconitum spicatum</i>	Bikh	Ranunculaceae	Tuber	Middle to High Mountain	
<i>Acorus calamus*</i>	Bojho	Araceae	Rhizome	Terai to High Mountain	
<i>Aegle marmelos</i>	Bcl	Rutaceae	Fruit	Terai to Middle Mountain	
<i>Allium wallichii</i>	Banlusun	Liliaceae	Bulb	Middle to High Mountain	
<i>Arundinaria intermedia</i>	Nigalo	Gramineae	Stem	Middle Mountain	
<i>Asparagus officinalis</i>	Kurilo	Liliaceae	Whole plant	Middle to High Mountain	
<i>Asparagus racemosus*</i>	Satabari	Liliaceae	Tuber	Middle Mountain	
<i>Berberis aristata</i>	Chutro	Berberidaceae	Bark, root	Middle Mountain	
<i>Berberis nepalensis</i>	Daru	Berberidaceae	Bark, root	Middle to High Mountain	
<i>Bergenia ligulata*</i>	Pakhanbed	Saxifragaceae	Rhizome	Middle Mountain	
<i>Bauhinia vahlii</i>	Bhorla	Leguminosae	Leaves	Terai/Siwaliks	
<i>Betula utilis</i>	Bhojpatra	Betulaceae	Peel of bark	High Mountain	
<i>Boehraavia diffusa*</i>	Punarnava		Stem, leaves	Terai to Middle Mountain	
<i>Bombax malabaricum</i>	Simal	Bombaceae	Fruit, flower, resin	Terai	
<i>Bruchycorythis obcordata*</i>	Gamdol		Tuber, root	Middle Mountain	
<i>Calamus tenuis</i>	Bet	Palmae	Rhizome, stem	Siwaliks	



<i>Cassia fistula</i>	Rajbrikshya	Leguminosae	Fruit	Terai/Siwaliks	
<i>Choerospondias axillaris</i>	Lapsi	Anacardaceae	Fruit	Middle Mountain	
<i>Cinnamomum glaucescens</i>	Sugandha kokila	Lauraceae	Fruit	Terai/Siwaliks	
<i>Cinnamomum zeylanicum</i>	Dalchini	Lauraceae	Bark	Middle Mountain	
<i>Cinnamomum tamala*</i>	Tejpat	Lauraceae	Leaf	Middle Mountain	
<i>Citrullus colocynthis</i>	Indreni	Cucurbitaceae	Fruit, root	Middle Mountain	
<i>Curculigo orchoides</i>	Musali	Amaryllidaceae	Rhizome	Terai/Siwaliks	
<i>Curcuma zedoaria</i>	Kachur		Rhizome	Terai	
<i>Cyperus sp.</i>	Kachur	Cyperaceae	Rhizome	Terai to Middle Mountain	
<i>Daphne bholua</i>	Lokta	Thymelaeaceae	Bark	Middle Mountain	
<i>Delphinium dendudatum</i>	Nirnasi	Ranunculaceae	Root, tubers	Middle Mountain	
<i>Dendrobium macraei</i>	Jibanti	Orchidaceae	Pseudobulb	Terai/Siwaliks	
<i>Dendrocalamus hamiltonii</i>	Tama bans	Gramineae	Rhizome, stem	Siwaliks to Middle Mountain	
<i>Didymocarpus leucocalyx</i>	Kumkum	Gesneriaceae	Plant, leaf	Terai to Middle Mountain	
<i>Dioscorea sp.</i>	Kukur tarul	Dioscoreaceae	Rhizome	Middle Mountain	
<i>Dioscorea deltoidea</i>	Vyakur	Dioscoreaceae	Rhizome	Middle Mountain	
<i>Diospyros melanoxylon</i>	Tendu ko pat	Ebenaceae	Leaves	Terai	
<i>Elaeocarpus sphaericus</i>	Rudrakshya	Elaeocarpaceae	Fruit	Middle Mountain	
<i>Entada scandens</i>	Pangra	Leguminosae	Fruit, seed	Terai to Middle Mountain	
<i>Ephedra gerardiana</i>	Somlata	Gnetaceae	Berries	Middle to High Mountain	More in MM
<i>Eulaliopsis binata</i>	Babiyo, sabai	Gramineae	Plant, leaves	Siwaliks	
<i>Juglans regia</i>	Okhar	Juglandaceae	Fruit	Middle Mountain	
<i>Juniperus sp.</i>	Dhupi	Cupressaceae	Berry, leaf	Middle to High Mountain	More in HM
Lichens*	Jhyau		Plant	Terai to High Mountain	

<i>Lindera neesiana</i>	Siltunur	Lauraceae	Fruit	Middle Mountain	
<i>Lycopodium clavatum</i>	Nagbeli	Lycopodiaceae	Inflorescens	Middle Mountain	
<i>Maesa chisia</i>	Bilaune	Myrsinaceae	Barks	Terai/Siwaliks	
<i>Mentha arvensis</i>	Pudina	Labiatae	Leaves	Terai to Middle Mountain	
Mushroom	Chyau		Plant	Terai to High Mountain	
<i>Myrica esculenta</i>	Kaphal	Myricaceae	Fruit, bark	Middle Mountain	
<i>Nardostachys jatamansi</i> *	Jatamansi, Bhutle	Valerianaceae	Root	Middle to High Mountain	More in HM
<i>Orchis sp.</i>	Gamdol, Salepmisri	Orchidaceae	Tubers	High Mountain	
<i>Orchis latifolia</i>	Panch aunle	Orchidaceae	Tubers	Middle to High Mountain	Mostly in MM
<i>Osyris wightiana</i>	Nundhiki	Santalaceae	Leaves, stem	Terai to Middle Mountain	
<i>Paris polyphylla</i>	Satuwa	Liliaceae	Rhizome	Middle Mountain	
<i>Parnassia nubicola</i>	Mamira	Saxifragaceae	Rhizome	Middle to High Mountain	Lower part-HM
<i>Phoenix humilis</i>	Thakal	Compositae	Leaves	Terai	
<i>Phragmites maxima</i>	Narkat	Gramineae	Stem	Terai	
<i>Phyllanthus emblica</i>	Amala	Euphorbiaceae	Fruit	Terai/Siwaliks	
<i>Picrorhiza kurroa</i> *	Kutki	Scrophulariaceae	Root	Middle to High Mountain	
<i>Pinus roxburghii</i>	Khote salla	Pinaceae	Resin	Siwalik to Middle Mountain	
<i>Piper chaba</i>	Chabo	Piperaceae	Fruit	Terai/Siwalik	
<i>Piper longum</i>	Pipla	Piperaceae	Fruit	Terai	
<i>Podophyllum hexandrum</i>	Laghupatra	Berberidaceae	Rhizome	Middle Mountain	
<i>Polygonatum sp</i>	Khiraula		Fruit	Middle Mountain	
<i>Polypodium vulgare</i>	Bisfez	Polypodiaceae	Plant	Middle Mountain	
<i>Rauwolfia serpentina</i>	Sarpagandha	Apocynaceae	Root	Middle Mountain	

<i>Rheum australe</i>	Padamchal, Amalbed, Setakchini	Polygonaceae	Rhizome, petiole	Middle to High Mountain	3300-3600 m altitude
<i>Rhododendron anthopogon</i>	Sunpati	Ericaceae	Leaves	Middle to High Mountain	3300-4000 m
<i>Rubia cordifolia*</i>	Majitho	Rubiaceae	Root, stem	Terai to Middle Mountain	
<i>Saccharum spontaneum</i>	Khar ghans	Gramineae	Stem, leaf	Terai	
<i>Sapindus mukorossi</i>	Ritha	Sapindaceae	Fruit	Middle Mountain	Upto 1200 m
<i>Saussurea lappa</i>	Kuth	Compositae	Plant	Terai	Imported
<i>Selinum tenuifolium</i>	Bhutkesh	Umbelliferae	Plant	Middle to High Mountain	
<i>Semecarpus anacardium</i>	Bhalayo	Anacardiaceae	Fruit	Terai/Siwaliks	
<i>Sida spinosa</i>	Balu	Malvaceae	Fruit	Terai/Siwaliks	
<i>Shorea robusta</i>	Sal	Dipterocarpaceae	Seed/Leaf	Terai/Siwaliks	
<i>Swertia chirayita</i>	Chiraito	Gentianaceae	Plant	Middle Mountain	
<i>Taraxacum officinale</i>	Tukiphool	Compositae	Root	Middle Mountain	
<i>Taxus wallichiana</i>	Lauth salla	Taxaceae	Leaves	Middle Mountain	
<i>Thysanolaena maxima</i>	Amriso	Gramineae	Inflorescens	Siwaliks to Middle Mountain	
<i>Tinospora sinensis</i>	Gurjo	Menispermaceae	Bulbs, leaves	Terai/Siwaliks	
<i>Trichosanthes wallichiana</i>	Indrayani	Cucurbitaceae	Fruit	Siwaliks to Middle Mountain	
<i>Valeriana wallichii</i>	Sugandawal	Valerianaceae	Plant, root	Middle Mountain	
<i>Vetivera zizanioides</i>	Khas khas	Gramineae	Root	Terai	
<i>Woodfordia fruticosa</i>	Dhainyaro	Lythraceae	Fruit	Siwaliks	
<i>Zanthoxylum armatum</i>	Timur	Rutaceae	Fruit	Middle Mountain	
<i>Zanthoxylum oxyphyllum</i>	Boke timur	Rutaceae	Fruit	Middle Mountain	
	Banmula				
	Bisjara				

	Bodhani		Seed	Terai/Siwaliks	
	Chulthe			Middle to High Mountain	
	Consifear		Bark	Terai	
	Gokul dhup		Resin		
	Kakarsinghe			Middle to High Mountain	
	Lohan			Siwaliks to Middle Mountain	
	Majisetha				
	Nagkeshar			Middle Mountain	
	Rishimark		Plant	Terai	
	Salmisri		Rhizome	Terai to Middle Mountain	
	Samayo			Middle to High Mountain	
	Suganda patta		Leaves	Terai/Siwaliks	
	Tayari			Siwaliks	
	Tigedi		Seeds	Terai	
	Titekando			Middle to High Mountain	
	Others				

Note: \* Recommended for special monitoring



## **Appendix 7-3**

---

**Main royalty paid non-timber  
forest products collected FY  
1993/94 by weight (Kg)**





# APPENDIX 7-3 MAIN ROYALTY PAID NON-TIMBER FOREST PRODUCTS COLLECTED FY 1993/94 BY WEIGHT (Kg)

Scientific Name	Physiographic Zones			
	Terai/Siwaliks	Mid-Hills	High Mountain/ High Himal	Total
<i>Acacia concinna</i>	82812		6250	89062
<i>Aconitum heterophyllum</i>	37		2678	2715
<i>Acorus calamus</i>	837	2472	898	4207
<i>Allium wallichii</i>	1276	1494		2770
<i>Asparagus officinalis</i>	39270	5663	500	45433
<i>Asparagus racemosus</i>	51316	2770	5370	59456
<i>Bauhinia vahlii</i>	17150			17150
<i>Berberis aristata</i>	200		98	298
<i>Berberis nepalensis</i>			12400	12400
<i>Bergenia ligulata</i>	15650	80630	92030	188310
<i>Bombax malabaricum</i>	2782			2782
<i>Calamus tenuis</i>	5000			5000
<i>Choerospondias axillaris</i>		50		50
<i>Cinnamomum tamala</i>	194895	35708	28728	259331
<i>Cinnamomum zeylanicum</i>	244578	62665	22527	329770
<i>Citrullus colocynthis</i>	1495	48	346	1889
<i>Curculigo orchoides</i>	64		250	314
<i>Curcuma zedoaria</i>	3200	8557	6473	18230
<i>Dendrobium denudatum</i>			144	144
<i>Dendrobium macraei</i>	22476	1500		23976
<i>Dendrocalamus hamiltonii</i>	150			150
<i>Didymocarpus leucocalyx</i>	1905		165	2070
<i>Dioscorea deltoidea</i>	60	539	3692	4291
<i>Dioscorea sp.</i>	5393	11765	500	17658
<i>Diospyros melanoxylon</i>	47079			47079
<i>Elaeocarpus sphaericus</i>	18976	192	2010	21178
<i>Entada scandens</i>	751	497		1248
<i>Ephedra gerardiana</i>	3100	4225	4073	11398
<i>Juglans regia</i>	3750	20171	1950	25871
<i>Juniperus sp.</i>		12459	184485	196944
<i>Lichens</i>	22615	9905	501	33021
<i>Lycopodium clavatum</i>	365	679	1361	2405
<i>Maesia chisia</i>	1500	19366		20866
<i>Mushroom spp.</i>	16516		5808	22324
<i>Myrica esculenta</i>			10161	10161
<i>Nardosiachys jatamansi</i>		4083	255928	260011
<i>Orchis spp.</i>		100		100
<i>Paris polyphylla</i>	1015	671	535	2221
<i>Phyllanthus emblica</i>	1200			1200
<i>Picrorhiza kurroa</i>	1763	1618	19454	22835
<i>Pinus roxburghii</i>	300408	432000		732408
<i>Piper chaba</i>	2844	93	1954	4891
<i>Piper longum</i>	1570	19714		21284
<i>Rheum emodi</i>	13635	3343	33002	49980



# APPENDIX 7-3 MAIN ROYALTY PAID NON-TIMBER FOREST PRODUCTS COLLECTED FY 1993/94 BY WEIGHT (Kg)

Scientific Name	Physiographic Zones			Total
	Terai/Siwaliks	Mid-Hills	High Mountain/ High Himal	
<i>Rhododendron anthopogon</i>		250	405	655
<i>Rubia cordifolia</i>	18466	26796	6023	51285
<i>Sapindus mukorossi</i>	98570	191816	18300	308686
<i>Selinum tenuifolium</i>		1350	7137	8487
<i>Semecarpus anarcadium</i>	425			425
<i>Shorea robusta</i> (seed)	8019188			8019188
<i>Shorea robusta</i> (leaf)	60	1050		1110
Silajit		56	46933	46989
<i>Swertia chirayita</i>	102163	48672	154321	305156
<i>Taraxacum officinale</i>	1244			1244
<i>Taxus baccata</i>		2181		2181
<i>Thysanolaena maxima</i>	9650			9650
<i>Tinospora sinensis</i>	4925	20		4945
<i>Valeriana wallichii</i>	19523	2781	12710	35014
<i>Vetivera zizanioides</i>		230	300	530
<i>Zanthoxylum armatum</i>	38840	219982	1490	260312
Others *	42379	15616	2468	60463
Total (in Kg)	9482808	1256426	970420	11709654
Total Revenue (NRs)	10907164	2534335	2279328	15720827

Note :

\* Others include lohan, consifear, bisjara, bisfez, belauni, algae, thale ban, gokuldhup, dalhaldi etc

Source :

HMG (1995) Annual Report of the Department of Forests.  
DOF, Kathmandu

## **Appendix 7-4**

---

**Main royalty paid non-timber  
forest products collected in the  
Highlands and amount of  
royalty paid to HMGN**



# APPENDIX 7-4 MAIN ROYALTY PAID NON-TIMBER FOREST PRODUCTS COLLECTED IN THE HIGHLANDS AND AMOUNT OF ROYALTY PAID TO HMGN

(Vol. in Kg)

(F.Y. 1993/94)

Physiographic Zones							Total for all
	High Mountain/High Himal						Physiographic Zones
Scientific Name	EDR	CDR	WDR	MWDR	FWDR	Sub-total	
<i>Acacia concinna</i>		6000			250	6250	89062
<i>Aconitum heterophyllum</i>				2678		2678	2715
<i>Acorus calamus</i>	400	490	8			898	4204
<i>Allium wallichii</i>						0	2770
<i>Asparagus officinalis</i>		500				500	45433
<i>Asparagus racemosus</i>				5370		5370	59456
<i>Bauhinia vahlii</i>						0	17150
<i>Berberis aristata</i>		98				98	298
<i>Berberis nepalensis</i>		12400				12400	12400
<i>Bergenia ligulata</i>		2150			89880	92030	188310
<i>Bombax malabaricum</i>						0	2782
<i>Calamus tenuis (bundle)</i>						0	5000
<i>Choerospondias axillaris</i>						0	50
<i>Cinnamomum tamala</i>					28728	28728	259331
<i>Cinnamomum zeylanicum</i>			850	13556	8121	22527	329770
<i>Citrullus colocynthis</i>		346				346	1889
<i>Curculigo orchoides</i>		250				250	314
<i>Curcuma zedoaria</i>					6473	6473	18230
<i>Dendrobium denudatum</i>			144			144	144
<i>Dendrobium macraei</i>						0	23976
<i>Dendrocalamus hamiltonii</i>						0	150
<i>Didymocarpus leucocalyx</i>					165	165	2070
<i>Dioscorea deltoidea</i>					3692	3692	4291
<i>Dioscorea sp.</i>			500			500	17658
<i>Diospyros melanoxylon</i>						0	47079
<i>Elaeocarpus sphaericus</i>	2010					2010	21178
<i>Entada scandens</i>						0	1248
<i>Ephedra gerardiana</i>			108	3965		4073	11398
<i>Juglans regia (bark)</i>				1500	450	1950	25871
<i>Juniperus sp.</i>	200	485		100	183700	184485	196944
<i>Lichens</i>		501				501	33021
<i>Lycopodium clavatum</i>		1361				1361	2405

# **APPENDIX 7-4 MAIN ROYALTY PAID NON-TIMBER FOREST PRODUCTS COLLECTED IN THE HIGHLANDS AND AMOUNT OF ROYALTY PAID TO HMGN**

Physiographic Zones							
Scientific Name	High Mountains					Sub-total	Total for all Physiographic Zones
	EDR	CDR	WDR	MWDR	FWDR		
<i>Maesia chisia</i>						0	20866
<i>Mushroom</i>	500			5006	302	5808	22324
<i>Myrica esculenta (bark)</i>					10161	10161	10161
<i>Nardostachys jatamansi</i>		50	2830	253048		255928	260011
<i>Orchis sp.</i>						0	100
<i>Paris polyphylla</i>		3	112	110	310	535	2221
<i>Phyllanthus emblica</i>						0	1200
<i>Picrorhiza kurroa</i>	1148		358	17372	576	19454	22835
<i>Pinus roxburghii (resin)</i>						0	732408
<i>Piper chaba</i>	1954					1954	4891
<i>Piper longum</i>						0	21284
<i>Rheum emodi</i>	500		27178	2068	3256	33002	49980
<i>Rhododendron anthopogon</i>		365		40		405	655
<i>Rubia cordifolia</i>		6023				6023	51285
<i>Sapindus mukorossi</i>	180				18120	18300	308686
<i>Selinum tenuifolium</i>				3337	3800	7137	8487
<i>Semecarpus anarcadium</i>						0	425
<i>Shorea robusta (seed)</i>						0	8019188
<i>Shorea robusta (leaf)</i>						0	1110
<i>Silajit</i>			313	46620		46933	46989
<i>Swertia chirayita</i>	90467	47103	3716	5023	8012	154321	305156
<i>Taraxacum officinale</i>						0	1244
<i>Taxus baccata</i>						0	2181
<i>Thysanolaena maxima</i>						0	9650
<i>Tinospora sinensis</i>						0	4945
<i>Valeriana wallichii</i>		1170	1528	9022	990	12710	35014
<i>Vetivera zizanioides</i>					300	300	530
<i>Zanthoxylum armatum</i>			450		1040	1490	260312
Others *		810	401	1257		2468	60463
Sub-total (in Kg)	93089	80485	34752	285912	384028	970420	11709654
Total Revenue (NRs)	204337	171279	92587	808300	558719	2279328	15720827

Source: HMG (1995) Annual Reports of the Department of Forests. DOF, Kathmandu

## **Appendix 7-5**

---

**Revenues generated for  
HMGN from royalty payments  
on non-timber forest products  
collection by physiographic  
zone and development region**





# APPENDIX 7-5 REVENUE GENERATED FOR HMGN FROM ROYALTY PAYMENTS ON NON-TIMBER FOREST PRODUCTS COLLECTION BY PHYSIOGRAPHIC ZONE AND DEVELOPMENT REGION

(F.Y. 1989/89 to 1993/94)

(Quantity in Kg and Revenue in NRs)

Physio-graphic	Dev.	Fiscal Years										Total	
		1989/90		1990/91		1991/92		1992/93		1993/94		1989/90 to 1993/94	
Zones	Reg	Quantity	Revenue	Quantity	Revenue	Quantity	Revenue	Quantity	Revenue	Quantity	Revenue	Quantity	Revenue
Terai /	EDR	219	356033	85	294280	901	564731	337260	479439	1507200	1292587	1845665	2987070
Siwaliks	CDR	513	465658	442	641222	315	569974	325818	686561	565144	869179	892232	3232594
	WDR	1323	485007	669	519520	244	537006	1235923	1139405	2708399	1589839	3946558	4270777
	MWDR	740	1414059	1696	2912154	971	2296900	681309	1689543	659983	1095086	1344699	9407742
	FWDR					94	152667	457012	753747	4042082	6060438	4499188	6966852
	<b>Sub-total</b>	2795	2720757	2892	4367176	2525	4121278	3037322	4748695	9482808	10907129	12528342	26865035
Middle	EDR	283	59232	286	12094	421	268576	257176	457690	67044	36687	325210	834279
Mountains	CDR	58	74807	48	40131		4455	166281	470910	67054	47966	233441	638269
	WDR	39	55235	492	429359	109	247484	61681	157858	51717	126269	114038	1016205
	MWDR	59	162269	577	1143997			1043831	2196500	477463	1273459	1521930	4776225
	FWDR			50	55440	5		636830	1182737	593148	1049953	1230033	2288130
	<b>Sub-total</b>	439	351543	1453	1681021	535	520515	2165799	4465695	1256426	2534334	3424652	9553108
High	EDR	61	139805	87	229006	87	199872	108971	249157	97359	213167	206565	1031007
Mountains/	CDR	8	10598			27	52357	46174	103338	80485	171279	126694	337572
High	WDR	32	75814	18	21778		17315	51869	287394	38485	92588	90404	494889
Himal	MWDR	39	135412	86	151656	71	273547	713195	1198408	370063	1243577	1083454	3002600
	FWDR	15	47524	1	3549	99	453615	120431	170169	384028	558719	504574	1233576
	<b>Sub-total</b>	155	409153	192	405989	284	996706	1040640	2008466	970420	2279330	2011691	6099644
	<b>Total</b>	3389	3481453	4537	6454186	3344	5638499	6243761	11222856	11709654	15720793	17964685	42517787

**Source :** Malla, S. B. et al. (1993) Minor Forest Products of Nepal : Current Status and Trade. FRIS Project # 4, Kathmandu 1995

HMG (1994) Annual Reports of the Department of Forests. DOF, Kathmandu

HMG (1995) Annual Reports of the Department of Forests. DOF, Kathmandu





## **Appendix 7-6**

---

**Non-timber forest products for  
which DFO license is required  
for collection**



**APPENDIX 7-6 NON-TIMBER FOREST PRODUCTS FOR WHICH DFO  
LICENSE IS REQUIRED FOR COLLECTION**

**NAME OF MEDICINAL PLANTS AND THEIR ROYALTY CHARGES**

S.No.	Nepali Name	Scientific Name	Price (P.kg.) NRs.
<b>I. SPECIES OF ROOTS</b>			
1.	Panchaule jara	<i>Orchis catifolia</i>	500
2.	Sarpagandha jara	<i>Rauwolfia serpentina</i>	50
3.	Marnira jara	<i>Parnassia noticola</i>	70
4.	Jatamansi jara	<i>Nardostachys jatamansi</i>	15
5.	Sugandhawala jara	<i>Valeriana wallichii</i>	15
6.	Kut jara	<i>Saussurea lappa</i>	15
7.	Bishma jara	<i>Aconitum palmatum</i>	10
8.	Pipla pipli jara	<i>Piper longum</i>	20
9.	Laghupatra jara	<i>Podophyllum hexandrum</i>	5
10.	Atish jara	<i>Aconitum heterophyllum</i>	10
11.	Vish jara	<i>Aconitum napellus</i>	7
12.	Pashan bed jara	<i>Bergenia ciliata</i>	5
13.	Kutki jara	<i>Picrorhiza serophulariaefolia</i>	10
14.	Vyakur jara	<i>Dioscorea deltoidea</i>	10
15.	Satawari jara	<i>Asparagus racemosus</i>	5
16.	Nirmasi jara	<i>Delphinium denudatum</i>	30
17.	Kamraj jara		6
18.	Satuwa jara	<i>Paris polyphylla</i>	5
19.	Tukiphul jara	<i>Taraxacum officinale</i>	7
20.	Khaskhas jara	<i>Vetiveria zizanioides</i>	10
21.	Asarephulko gano	<i>Lagerstromia parviflora</i>	10
22.	Kachur jara	<i>Curcuma zedoaria</i>	5
23.	Ban lasun jara	<i>Allium wallichii</i>	10
24.	Setkachini jara		5
25.	Kakoli jara	<i>Fritillaria cirrhosa</i>	5
26.	Gamadol jara		10
27.	Padamchal	<i>Rheum australe</i>	5
28.	Bojho jara	<i>Acorus calamus</i>	5
29.	Unyuko jara	<i>Dryopteris cochleata</i>	7
30.	Vishphejko jara	<i>Polypodium velgaris</i>	7
31.	Bajradantako jara	<i>Potentilla fulgens</i>	4
32.	Bhutkesh jara	<i>Cordia depressa</i>	4
33.	Sikakai jara	<i>Acacia concinna</i>	10
34.	Sisnu jara	<i>Artica dioca</i>	2
35.	Kuchilo	<i>Strychnos nuxyomica</i>	7
36.	Belauniko jara	<i>Maesa chisia</i>	10
37.	Musali	<i>Curculigo orchoides</i>	5

38.	Indreni phulko gatho	<i>Usbekia nepalensis</i>	5
39.	Nagarmathe	<i>Cyprus notundus</i>	5
40.	Akarkara	<i>Anacyeleis pyrethrum</i>	5
41.	Gujargan	<i>Tinospora cordifolia</i>	5
42.	Daru (daru haldi)	<i>Mahonia nepalensis</i>	2
43.	Kuriloko jara	<i>Asparagus officinalis</i>	2
<b>II. KATHKO BOKRA JATI (SPECIES OF TIMBER'S BARK)</b>			
1.	Okharko bokra	<i>Juglans regia</i>	100
2.	Kaphalko bokra	<i>Myrica esculenta</i>	100
3.	Paiyuko bokra	<i>Prunus cerasoides</i>	15
4.	Nepali dalchini	<i>Cinnamomum tamala</i>	20
5.	Beloni & belolniko jarabokra	<i>Maesa chisia</i>	10
6.	Dhupi kathko bokra	<i>Cupressus torulosa</i>	25
7.	Argeliko bokra	<i>Berberis aristata</i>	5
8.	Chutroko bokra	<i>Berberis aristata</i>	5
9.	Jiwantiko dathko bokra	<i>Desmotrichum fimbritum</i>	5
10.	Kanphiyarko bokra		25
11.	Pawanko bokra		5
12.	Jamani & Mandrako bokra	<i>Mahonia nepalensis</i>	5
13.	Punnarwako bokra	<i>Boehmeria diffusa</i>	8
14.	Bhojpatra	<i>Betula alnoides</i>	5
15.	Arjunko bokra	<i>Terminalia arjuna</i>	10
16.	Chatibanko bokra	<i>Alstonia scholaris</i>	5
17.	Totalako bokra	<i>Oroxylum indicum</i>	5
18.	Nimko bokra	<i>Azadirachta indica</i>	5
19.	Phalasko bokra	<i>Quercus lamellosa</i>	15
20.	Bhorlako bokra	<i>Bauhinia vahlii</i>	1
<b>III. PAT JATI (SPECIES OF LEAVES)</b>			
1.	Sikakaiko pat	<i>Acacia concinna</i>	3
2.	Tej pat	<i>Cinnamomum tamala</i>	10
3.	Nun dhikiko pat	<i>Osyris wightiana</i>	2
4.	Hinguwako pat	<i>Camellia kissi</i>	2
5.	Chimlaniko pat		2
6.	Sugandhako pat	<i>Valeriana wallichii</i>	1.50
7.	Kumkumko pat	<i>Didymocarpus leucocalyx</i>	4
8.	Lemon grassko pat	<i>Cymbopogon citratus</i>	0.50
9.	Asuroko pat	<i>Adhatoda vasica</i>	1
10.	Salko pat	<i>Shorea robusta</i>	50
11.	Bhorlako pat	<i>Bahunia vahlii</i>	50
12.	Sunpatiko pat	<i>Rhododendron anthopogon</i>	5
13.	Thingure sallako pat	<i>Tsuga dumosa</i>	2
14.	Dhupiko pat	<i>Juniperus communis</i>	2
15.	Jagarko pat		2
16.	Lauth salla	<i>Taxus baccata</i>	25
17.	Dhashingre pat	<i>Gaultheria fragrantissima</i>	1
18.	Titepati	<i>Artemisia vulgaris</i>	2

19.	Nagbelipat & Lahara	<i>Lycopodium spp.</i>	5
20.	Maltako pat		1
21.	Kharen, dudhelahara, bhalayo, taki, machur. silajinelako pat		1
22.	Balcheko lahara pat		1
23.	Unyuko pat	<i>Dryopteris cochleata</i>	1
24.	Masalako pat	<i>Eucalyptus spp.</i>	1
25.	Toklako pat		1
26.	Bhagalko pat		1
27.	Talispatrako pat	<i>Abies spectabilis</i>	3
28.	Piramid leaf (bakas)	<i>Justicia adhatoda</i>	5
29.	Bhrigarajko pat	<i>Eclipla prostrata</i>	1
30.	Jigarko pat		2
31.	Tenduko pat	<i>Diospyros melanoxylon</i>	2
<b>IV. PHUL &amp; BHUWA JATI (SPECIES OF FLOWERS &amp; ?)</b>			
1.	Palsko bhuwa	<i>Butea monosperma</i>	4
2.	Simalko bhuwa	<i>Bombax malabaricum</i>	4
3.	Aankako bhuwa	<i>Calostropis gigantea</i>	3
4.	Tuki phul	<i>Taraxacum officinale</i>	2
5.	Sughadh kokila phul	<i>Cinnamomum glandiferum</i>	3
6.	Padam pushkarko phul	<i>Iris decora</i>	3
7.	Simalko phul	<i>Bombax malabaricum</i>	3
8.	Gheyaroko phul	<i>Woodfordia fruticosa</i>	3
9.	Dhawako phul		1
10.	Gurasko phul	<i>Rhododendron arboreum</i>	2
11.	Asuroko phul	<i>Adhatoda vasica</i>	5
12.	Mauwako phul	<i>Madhuca latifolia</i>	5
13.	Nageswor phul	<i>Mesua ferrea</i>	5
14.	Sunpateko phul	<i>Rhododendron anthopogon</i>	4
15.	Kukre phul	<i>Anaphillis spp.</i>	2
16.	Makhmali phul		1
17.	Chimalko phul		2
18.	Buke phul		2
19.	Paiyu phul	<i>Prunus cerasoides</i>	2
20.	Rukh kamalko phul	<i>Magnolia grandiflora</i>	2
21.	Adusko phul	<i>Clerodendron</i>	2
22.	Dron puspi	<i>Leucas ciliata</i>	2
23.	Koiralako phul	<i>Bauhinia variegata</i>	1
24.	Anyu phul	other flowers	1
<b>V. PHAL &amp; BIJ JATI (SPECIES OF FRUIT &amp; SEEDS)</b>			
1.	Nagbeli	<i>Lycopodium</i>	15
2.	Nag keshar		5
3.	Pipala murjhang		5
4.	Pipla pipli	<i>Piper longum</i>	5
5.	Rohini	<i>Mallorus phillippinensis</i>	4

6.	Rudracha	<i>Elaeocarpus sphaericus</i>	3
7.	Bhadracha	<i>Elaeocarpus spp.</i>	8
8.	Okharphal	<i>Juglans regia</i>	3
9.	Katus	<i>Castanopsis spp.</i>	5
10.	Bokre timbu timber	<i>Zanthoxylum armatum</i>	3
11.	Pangro	<i>Eutada phaseoloides</i>	5
12.	Siltimbur	<i>Litsea cubeba</i>	3
13.	Ritha	<i>Sapindus mukorossi</i>	2
14.	Kuchila	<i>Strychnos nux-vomica</i>	5
15.	Lapsi	<i>Choerospondias axillaris</i>	2
16.	Ramphal	<i>Trewia nudiflora</i>	2
17.	Sitaphal		2
18.	Aamla	<i>Emblica officinalis</i>	2
19.	Tigedi		2
20.	Bel & belko dana	<i>Aegle marmelos</i>	2
21.	Dhatur	<i>Datura stramonium</i>	10
22.	Chiuri	<i>Madhuca butyracea</i>	5
23.	Budhani		2
24.	Adel	<i>Ricinus communis</i>	2
25.	Bhalayo	<i>Semicarpus anacardium</i>	2
26.	Jamun	<i>Syzygium cumini</i>	2
27.	Sikakai	<i>Acacia concinna</i>	3
28.	Mouwako biu	<i>Madhuca latifolia</i>	2
29.	Bayar	<i>Zizyphus jujuba</i>	2
30.	Satabari	<i>Asparagus officinalis</i>	2
31.	Bakaino	<i>Meia azedarach</i>	1
32.	Asna, simal, bodhiniko ghiu	<i>Terminalia tomentosa, Bombax ceiba, Grewia optiva</i>	2
33.	Palasko phal	<i>Butea monosperma</i>	3
34.	Machuwako phal	<i>Basia latifolia</i>	3
35.	Indrayaniko biya		8
36.	Kusumko biya	<i>Schleichera oleosa</i>	10
37.	Dhagrise biya	<i>Gaultheria fragrantissima</i>	2
38.	Sallako simta	<i>Pines spp.</i>	2
39.	Kakad sigi phal		2
40.	Ban karelako biya		1
41.	Kaiyoko phal	<i>Grevillea robusta</i>	1
42.	Pani amlako phal		1
43.	Sal	<i>Shorea robusta</i>	2
44.	Rati	<i>Abros precatorius</i>	2
45.	Chilauneko geda	<i>Schima wallichii</i>	2
46.	Khoto salla	<i>Pinus roxburghii</i>	400
47.	Dhupiko geda	<i>Juniperus indica</i>	15
48.	Utisko phal	<i>Alnus nepalensis</i>	2
49.	Ghearoko phal	<i>Woodfordia fruticosa</i>	2
50.	Paiyuko phal	<i>Prunus cerasoides</i>	2



51.	Rukh kamalko phal	<i>Magnolia grandiflora</i>	25
52.	Bet phal	<i>Calamus tenuis</i>	4
53.	Jungali jira	<i>Cuminum cyminum</i>	5
54.	Jungali jaiphal	<i>Cuminum jaiphal</i>	25
55.	Jungali jwanu	<i>Trachyspermum cecidodaphne</i>	5
56.		<i>Cinnamomum cecidodaphne</i>	5
57.	Rohiniko phal	<i>Malotos philinensis</i>	3
58.	Harro barro	<i>Jermanalia chebola, Terminalia bellirica</i>	2
59.	Bhragaraj	<i>Eclipta prostrata</i>	5
60.	Champawati (Chapko kosa & phal)	<i>Michelia champaca</i>	3
61.	Kantakari	<i>Solanum khasianum, Solanum xanthocarpum</i>	1.50
62.	Rajhracha	<i>Cassia fistula</i>	3
63.	Kachnar	<i>Bauhinia variegata</i>	5
64.	Kusum	<i>Schleichera triivga</i>	2
65.	Sajiwanko geda (diuli)	<i>Jatropha curcas [Origanum vulgane]</i>	2
<b>VI. BIRUWA JATI (SPECIES OF PLANTS)</b>			
1.	Yarsa gumba (prati gota)	<i>Cordyceps sinensis</i>	500
2.	Jyau	<i>Lichen Spp.</i>	10
3.	Majitha	<i>Rubia maniith</i>	2
4.	Chiraita	<i>Swertia angustifolia</i>	3
5.	Yakle hir	<i>Lobelia pyramidalis</i>	2
6.	Somalta	<i>Ephedra gerardiana</i>	2
7.	Jiwanti	<i>Desmotrichum fimbrium</i>	3
8.	Titepati	<i>Artemisia vulgaris</i>	1
9.	Gurjo lahara	<i>Tinospora cordifolia</i>	2
10.	Ghodtamre	<i>Centella asiatica</i>	1
11.	Pipal pat	<i>Ficus religiosa</i>	2
12.	Amalbed	<i>Rheum australe</i>	3
<b>VII. GAMAREJIN LOHAWAN JATI (SPECIES OF GUM, REGIN AND LAC)</b>			
1.	Rakta chandan	<i>Pterocarpus santalinus</i>	15
2.	Shreekhanda	<i>Santalum album</i>	25
3.	Silajit	Rock exudate	50
4.	Maha	Honey	10
5.	Khoto	<i>Pinus spp.</i>	3
6.	Mayen	Wax	5
7.	Laha	<i>Lacquer</i>	40
8.	Kapharsigi		2
9.	Gokul dhup	<i>Didymocarpus alibicalyx</i>	5
10.	Sal dhup	<i>Shorea robusta</i>	5
<b>VIII. ANYA JADIBUTI (OTHER HERBS)</b>			
1.	Kabela		15
2.	Chadamruwa	<i>Rauwolfia serpentina</i>	10
3.	Hihukhamar		6
4.	Bramhi	<i>Centello asiatica</i>	6



5.	Katuko		5
6.	Kala dana		5
7.	Chito	<i>Plumbago zeylanica</i>	5
8.	Durdiya mashi		5
9.	Pudina	<i>Mentha arvensis</i>	5
10.	Karaj chulthi		3
11.	Sinkauli	<i>Cinnamomum obtusifolium</i>	100
12.	Paha	<i>Boehmeria nivea</i>	25
13.	Chabo	<i>Piper chaba</i>	2
14.	Satyanasi		5
15.	Wasak	<i>Dichroa febrifuga</i>	2
16.	Anantamul	<i>Hemidesmus indicus</i>	5
17.	Lalgedi		2
18.	Mujaseth		1
19.	Rasulla	<i>Acacia concinna</i>	1
20.	Lohan	<i>Storax</i>	5
21.	Amphi	<i>Pyrularia edulis</i>	1
22.	Tapari		1
23.	Sakh durlabh	<i>Alhagi maurosum</i>	2
24.	Halik		2
25.	Rishimark		2
26.	Kijitalis		12
27.	Sadharan chau	<i>Agaricus campestris</i>	5
28.	Amalbed	<i>Rheum australe</i>	5
29.	Masali, mushali & kukur tarul		3

## **Appendix 8-1**

---

### **Main policy and programme highlights of HMG N Development Plans**



**APPENDIX 8-1 MAIN POLICY AND PROGRAM HIGHLIGHTS OF HMGN DEVELOPMENT PLAN(S)  
RELATED TO BIODIVERSITY CONSERVATION**

<b>Plan/Strategy</b>	<b>Objectives</b>	<b>Policies</b>	<b>Program Priorities</b>
First Plan (1956-'61)	<ul style="list-style-type: none"> <li>● Develop a clear cut forest policy and formulate legislation</li> </ul>	<ul style="list-style-type: none"> <li>● Develop policy for conservation and sustainable utilization of forest resources</li> </ul>	<ul style="list-style-type: none"> <li>● Develop a list of timber species and number/sq. mile</li> <li>● Manage forests and strengthen forestry services</li> </ul>
Second Plan (1962-'65)	<ul style="list-style-type: none"> <li>● Manage forestry resources scientifically</li> </ul>	<ul style="list-style-type: none"> <li>● Approach to long-term development of forestry resources</li> <li>● Allocate hill forests to Panchayats (local development unit) for their development</li> <li>● Develop forest industries</li> </ul>	<ul style="list-style-type: none"> <li>● Establish nursery and perform plantation by encouraging local people and soil conservation works</li> <li>● Collect and store exotic seeds</li> <li>● Establish national parks, game sanctuaries and deer Park and conserve rhinoceros</li> <li>● Establish laboratory for testing medicinal plants</li> <li>● Establish and expand botanical gardens and herbal farms</li> </ul>
Third Plan (1965-'70)	<ul style="list-style-type: none"> <li>● Establish a system for scientific management and utilization of forestry products</li> </ul>	<ul style="list-style-type: none"> <li>● Emphasize on wildlife conservation</li> <li>● Conduct survey for economically important plants</li> </ul>	<ul style="list-style-type: none"> <li>● Complete forest resources survey, started in the Second Plan</li> <li>● Establish two more wildlife conservation sites</li> <li>● Start soil conservation works in the selected areas</li> <li>● Initiate scientific examination of medicinal plants</li> <li>● Initiate plant exploration survey and strengthen royal botanical garden</li> <li>● Establish herbal farm(s)</li> </ul>
Fourth Plan (1970-'75)	<ul style="list-style-type: none"> <li>● Conserve and develop forests scientifically to maximize benefits</li> <li>● Develop herbs and medicinal plants for their production and processing</li> <li>● Emphasize on wildlife conservation</li> </ul>	<ul style="list-style-type: none"> <li>● Develop and manage forests scientifically following the Working Plan(s)</li> <li>● Strengthen wildlife conservation activities</li> <li>● Continue plant exploration activities</li> </ul>	<ul style="list-style-type: none"> <li>● Implement Working Plan in 6 divisions in Terai and Hills</li> <li>● Start silvicultural studies</li> <li>● Continue afforestation and forest protection works</li> <li>● Cultivate new herbs</li> <li>● Carry out country-wise intensive botanical survey and compile detailed account of flora of Nepal</li> <li>● Ensure wildlife conservation, and established national parks in Langtang and Chitwan</li> </ul>

Plan/Strategy	Objectives	Policies	Program Priorities
Fifth Plan (1975-'80)	<ul style="list-style-type: none"> <li>● Allocate minimum forest for ecological balance</li> <li>● Conserve forests and rare wildlife</li> <li>● Initiate herbal farming at commercial scale</li> </ul>	<ul style="list-style-type: none"> <li>● Implement forestry Working Plans in all Terai areas</li> <li>● Plant trees, considering natural growth of forests and its utilization</li> <li>● Establish a separate Department of Soil Conservation for soil conservation works at massive scale</li> <li>● Promote existing national parks and wildlife reserves and establish new National Parks after national survey</li> <li>● Initiate commercial farming of herbs and encourage NGOs for herbal farming</li> </ul>	<ul style="list-style-type: none"> <li>● Implement forest Working Plan</li> <li>● Initiate special forest development programs for Phulchoki, Nagarjun, Jiri</li> <li>● Carry out ecological survey in ten areas</li> <li>● Establish additional two conservation sites in Dolpa and Nawalpur, fix quota for hunting</li> <li>● Establish 6 hunting reserves in appropriate sites (4 in Terai and 2 in Hills)</li> </ul>
Sixth Plan (1980-'85)	<ul style="list-style-type: none"> <li>● Conserve natural resources and optimize benefits</li> </ul>	<ul style="list-style-type: none"> <li>● Increase community participation in forests management</li> <li>● Emphasize on herbs production and processing for increasing internal supply of herbal medicines</li> <li>● Emphasize wildlife conservation and establish of national parks, and introduce tourism for economic benefits</li> <li>● Formulate national environmental policy and give adequate attention on environmental aspect while implementing development activities</li> </ul>	<ul style="list-style-type: none"> <li>● Implement community forestry programs in 28 districts</li> <li>● Initiate Resource Conservation and Utilization and other similar projects in the pre-determined areas</li> <li>● Implement Shivapuri Watershed Project</li> <li>● Implement national parks and wildlife conservation projects and soil conservation and watershed projects</li> <li>● Carry out survey and demarcation of national parks and wildlife reserves</li> <li>● Establish Shey Phoksundo NP and Hunting Reserves in Bara, Trijuga and Dhorpatan</li> </ul>
Seventh Plan (1985-'90)	<ul style="list-style-type: none"> <li>● Give top priority in implementing forest development programs in most degraded forest areas</li> <li>● Maintain ecological balance</li> <li>● Derive maximum economic benefits from forest products</li> </ul>	<ul style="list-style-type: none"> <li>● Carry out afforestation works massively and ensure their protection by encouraging people's participation</li> <li>● Conserve water sources and watershed areas in hills with people's participation</li> <li>● Expand commercial farming of herbs</li> <li>● Consider ecological balance while implementing other development and construction works</li> <li>● Ensure people's participation in conserving natural resources</li> </ul>	<ul style="list-style-type: none"> <li>● Intensify afforestation works through people's participation</li> <li>● Continue programs for conserving rare wildlife and forests</li> <li>● Emphasize herbal farming at commercial scale and intensify the processing initiatives</li> <li>● Carry out botanical exploration and preservation and research of the medicinal plants</li> </ul>

Plan/Strategy	Objectives	Policies	Program Priorities
Eighth Plan (1992-'97)	<ul style="list-style-type: none"> <li>● Develop national parks, wildlife reserves and conservation areas for ensuring biodiversity conservation and promotion of natural sites</li> </ul>	<ul style="list-style-type: none"> <li>● Introduce fast growing trees, including fodder, grasses near the settlements</li> <li>● Involve individuals, communities and NGOs in forest development and management and formulate practical rules for the utilization of forest products</li> <li>● Mobilize Royal Nepal Army, only in very sensitive areas, for forest protection</li> <li>● Involve people's participation in the conservation and management of national parks, wildlife reserves, and conservation areas through sharing of benefits accrued from their conservation for local development and involvement of local people for the management of conservation site(s)</li> <li>● Establish a Trust Fund to share benefits accrued from the conservation of the National Parks and Wildlife Reserves and Conservation Areas</li> <li>● Strengthen forest survey, focus research on income and employment generating forestry activities</li> </ul>	<ul style="list-style-type: none"> <li>● Form 5000 Community User Groups and hand-over some 252,000 ha of forests to community groups</li> <li>● Provide national forests on long-term basis to small and marginal farmers and involve some 25,000 families in leasehold forestry development</li> <li>● Manage the national forests by the Department of Forests by developing 5-10 years Forest Working Plan and implement such plan in 628,000 ha of the 40 districts</li> <li>● Implement a special program for the conservation of soil, plant and natural resources by declaring a <u>special protected area</u> in Siwaliks.</li> <li>● Manage national parks, wildlife reserves, and conservation areas in 12 representative ecosystems, and ensure their conservation by sharing benefits for community development and protected area management in order to reduce park-people conflict</li> <li>● Carry out five studies, research and improvement program on natural environment conservation</li> <li>● Carry out infrastructure development activities in order to initiate farming of wildlife (deer, wildboar) and insects (butterfly and silkworm)</li> <li>● Make attractive the (wildlife) enclosure safe and clean in Central Zoo</li> </ul>
Master Plan for the Forestry Sector (1989-2011)	<ul style="list-style-type: none"> <li>● Conserve diverse ecosystems and genetic resources</li> <li>● Conserve flora and fauna diversity, and enhance rare and endangered species of plants and animals</li> </ul>	<ul style="list-style-type: none"> <li>● Manage and utilize land and forest resources on long-term basis, according to the ecological capability of the system</li> <li>● Conserve flora and fauna</li> <li>● Carry out environmental impact evaluation while implementing developing programs</li> </ul>	<ul style="list-style-type: none"> <li>● Manage diverse ecosystems represented in the protected areas</li> <li>● Priority identification for new protected areas or addition to existing ones</li> <li>● Genetic resources survey and studies such as of rare and endangered plant and animal</li> <li>● Continue in-situ, ex-situ, and in-vitro conservation of germplasm of endangered flora</li> <li>● Conserve rare and endangered species by animal breeding</li> <li>● Increase protection of flora, fauna and wetlands</li> </ul>
National Conservation Strategy, 1988	<ul style="list-style-type: none"> <li>● Preserve the biological diversity in order to maintain the variety of wild species, both plant and animals</li> </ul>	<ul style="list-style-type: none"> <li>● Strict protect siwaliks and <u>bhabar</u></li> <li>● Protect land containing habitat essential to terrestrial mammals, migratory birds, and freshwater fishes; genetic resources; enhancement of rare and endangered species</li> <li>● Carry out inventory of medicinal plants and minor forest products</li> </ul>	<ul style="list-style-type: none"> <li>● Collect and assess data on flora and fauna, including habitat and range of distribution, and identify endemic, rare and endangered species</li> <li>● Establish medicinal plant management program, conduct studies related to regeneration capability and optimal harvest times etc.</li> </ul>

<p>Environmental Policy and Action Plan, 1993</p>		<ul style="list-style-type: none"> <li>● Encourage community participation in forest management, and minimise adverse environmental impacts</li> <li>● Preserve endemic and endangered species and their habitats</li> <li>● Promote private and public institutions for biological resource inventory and conservation</li> </ul>	<ul style="list-style-type: none"> <li>● Continue community forestry in Hills</li> <li>● Identify and protect wetlands and water bodies significant to biodiversity conservation</li> <li>● Develop management plan to conserve biodiversity</li> <li>● Assess the status of biological diversity of endemic plants and animals, occurring outside the protected areas</li> <li>● Establish a national biodiversity database</li> </ul>
---	--	--	---



## **Appendix 8-2**

---

### **Chronology of biodiversity conservation and related legislation**





## APPENDIX 8-2 CHRONOLOGY OF BIODIVERSITY CONSERVATION AND RELATED LEGISLATION

- 01 Private Forest Nationalization Act, 1957
- 02 Wildlife Conservation Act, 1958 (repealed by National Parks and Wildlife Conservation Act, 1973)
- 03 Forest Act, 1961
- 04 Aquatic Animals Protection Act, 1961
- 05 Canal, Electricity and Water Resources Related Matters Act, 1967 (repealed by Water Resources Act, 1993)
- 06 Forest Conservation (Special Arrangement) Act, 1967 (repealed by Forest Act, 1993)
- 07 Forest Products Sales and Distribution Rules, 1971
- 08 Forest Conservation (Special Arrangement) Rules, 1971
- 09 Plant Protection Act, 1972
- 10 National Parks and Wildlife Conservation Act, 1973
- 11 Royal Chitwan National Parks Rules, 1974
- 12 National Parks and Wildlife Conservation Rules, 1974
- 13 National Parks and Wildlife Conservation Act, 1973 and its Rules, 1974 (amendment 1974)
- 14 Plant Protection Rules, 1974
- 15 Wildlife Reserve Rules, 1977
- 16 Panchayat Forest Rules, 1978
- 17 Panchayat Protected Forest Rules, 1978
- 18 Leasehold Forest Rules, 1978
- 19 National Parks and Wildlife Conservation Rules, 1974 (amendment in 1978)
- 20 Himalayan National Park Rules, 1979
- 21 Soil and Water Conservation Act, 1982
- 22 King Mahendra Trust for Nature Conservation Act, 1982
- 23 National Parks and Wildlife Conservation Act, 1973 (amendment 1982)
- 24 National Parks and Wildlife Conservation Act, 1973 (amendment in 1984)
- 25 National Parks and Wildlife Conservation Rules, 1974 (amendment 1985)
- 26 Private Forest Rules, 1984
- 27 King Mahendra Trust for Nature Conservation Rules, 1974
- 28 Khaptad National Parks Rules, 1987
- 29 Forest Act, 1993
- 30 National Parks and Wildlife Conservation Act, 1973 (amendment 1993)
- 31 Forestry Rules, 1995 (According to enforce Forest Act, 1993)
- 32 Draft Buffer Zone Management Rules, 1995



## **Appendix 8-3**

---

### **Protected areas of Nepal**



### APPENDIX 8-3 PROTECTED AREAS OF NEPAL

Management Category	Area (Kui <sup>2</sup> )	Year Gazetted	Physiographic Region	Altitude (m)	Climate	Biogeographic Realms *	IUCN Management Category	Remark
<b>National Parks</b>	<b>10144 (6.9 %)</b>							
Royal Chitwan	932	1973	Terai-Siwalik	150-815	Tropical monsoon	Indo-Malayan	II, X	World Heritage Site, 1984, rhino habitat
Royal Bardia	968	1988	Terai-Siwalik	152-1441	Tropical monsoon to Sub-tropical	Indo-Malayan	II	Estd.in 1976 as WR, Dense sal forest
Sagarmatha	1148	1976	High Mountain	2845-8848	Temperate to Alpine	Palaearctic	II, X	World Heritage Site, 1979 and highest mountain
Makalu-Barun	1500	1991	High Mountain - High Himalayas	435-8463	Sub-tropical to Alpine	Indo-Malayan to Palaearctic	II	Snow leopard
Langtang	1710	1976	High Mountain	720-7245	Sub-tropical to Alpine	Indo-Malayan to Palaearctic	II	High plant diversity within short aerial distance
Shey Phoksundo	3555	1984	High Mountain	2000-6883	Temperate to Alpine	Palaearctic	II	Highest waterfall in Nepal
Rara	106	1976	High Mountain	2800-4048	Temperate to Sub-alpine	Palaearctic	II	Rara - The largest lake
Khaptad	225	1984	High Mountain - High Himalayas	2800-3300	Temperate	Meeting Point	II	

Management Category	Area (Km <sup>2</sup> )	Year Gazetted	Physiographic Region	Altitude (m)	Climate Zone	Biogeographical Realms *	IUCN Management Category	Remarks
<b>Wildlife Reserves</b>	<b>1123</b> (0.8%)							
Koshi Tappu	175	1976	Terai	100-150	Tropical monsoon	Indo-Malayan	IV	Ramsar Wetland for waterfowl habitat, known for wild buffalo
Parsa	499	1984	Terai-Siwalik	100-150	Tropical monsoon	Indo-Malayan	IV	
Royal Suklaphanta	305	1976	Terai	90-270	Tropical monsoon	Indo-Malayan	IV	Largest herd of swamp deer, 150 km <sup>2</sup> area increased in 1994
Shivapuri (Watershed and WR)	144	1984	Middle Mountain	1366-2732	Sub-tropical to Temperate	Meeting Point	IV	
<b>Conservation Areas</b>	<b>7830</b> (5.32%)							
Makalu-Barun	830	1991	Middle to High Mountain	435-8463	Sub-tropical to Alpine	Indo-Malayan to Palearctic	II, VI	High biodiversity
Annapurna	7000	1992	Middle to High Mountain	1150-8091	Sub-tropical to Alpine	Indo-Malayan to Palearctic	VI	Presence of World's deepest gorges, the Kali Gandaki
<b>Hunting Reserve</b> Dhorpatan	<b>1325</b> (0.90)	1987	High Mountain	2850-5500	Temperate to Alpine	Meeting Point		Significant population of blue sheep
<b>Other Protected Areas</b>	<b>32</b> (0.02 %)							
Nagarjun Royal Forests	16		Middle Mountain	1323-2188	Sub-tropical to Temperate	Meeting Point		
Gokarna Safari Park	16		Middle Mountain	1300	Sub-tropical to Temperate	Meeting Point		
Nepal's Total Area	147181							
<b>Total Protected Area</b>	<b>20,422</b> (13.9 %)							

## **Appendix 8-4**

---

**Bio-conservation related treaties  
and conventions ratifies by  
Nepal**





## APPENDIX 8-4 BIODIVERSITY CONSERVATION RELATED TREATIES AND CONVENTIONS (RATIFICATION/ACCESSION/ACCEPTANCE BY NEPAL)

Convention/Agreement	Objectives	Summary of Provisions	Date of Adoption	Place of Adoption	Entry into Force	Date of Signature and Ratification	Dealing Institution
Plant Protection Agreement for the South-east Asia and Pacific Region (as amended)	Prevent the introduction into and spread within the regional of destructive plant diseases and pests	<ul style="list-style-type: none"> <li>• Establish a Plant Protection Commission</li> <li>• Regulate trade in plants and plant products by certification, prohibition, inspection, disinfection, quarantine, destruction etc. as necessary</li> </ul>	27.2.1956	Rome	2.7.1956	Ratification 12.8.1965	Ministry of Agriculture
Convention on Wetlands of International Importance Especially as Waterfowl Habitat	Stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value	<ul style="list-style-type: none"> <li>• Designate at least one national wetland for inclusion in the List of Wetlands of International Importance</li> <li>• Consider their international responsibilities for conservation, management and wise use of migratory stocks of wildfowl</li> <li>• Establish wetland nature reserves, cooperate in the exchange of information and train personnel for wetland management</li> <li>• Conferences on the conservation of wetlands and water-fowl to be convened as the need arises</li> </ul>	2.2.1971	Ramsar, Iran	21.12.1975 17.4.1988 in Nepal	Accession 17.12.1987	MFSC / Department of National Parks and Wildlife Conservation
Convention concerning the Protection of the World Cultural and Natural Heritage	Establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value, organized on a permanent basis and in accordance with modern scientific methods	<ul style="list-style-type: none"> <li>• Recognizes that the duty of identification, protection, conservation and transmission to future generations of the cultural and natural heritage belongs primarily to that State</li> <li>• Integrate the protection of their heritage into comprehensive planning programs, set up services and develop scientific and technical studies and take necessary legal, scientific, administrative and financial steps to protect their heritage</li> <li>• Submit an inventory of its national heritage and publish a World Heritage List and a List of World Heritage in Danger</li> <li>• Finance to a World Heritage Fund</li> </ul>	23.11.1972	Paris	17.12.1975	Acceptance 20.6.1978	Ministry of Education and Culture and Social Welfare
Convention on International Trade in Endangered Species of Wild Fauna and Flora	Protect certain endangered species from over-exploitation by means of a system of import/export permits	<ul style="list-style-type: none"> <li>• Includes animals and plants whether dead or alive, and any recognizable parts or derivatives thereof</li> <li>• Covers endangered species, trade to be tightly controlled, trade to be regulated</li> <li>• Permits required for species stating that export/import will not be detrimental to the survival of the species</li> </ul>	3.3.1973 (amendments in 22.6.1979 and 30.4.1983)	Washington	1.7.1975	Accession 18.6.1975	MFSC / DNFWC
International Tropical Timber Agreement	Provide an effective framework for cooperation and consultation and promote the expansion and diversification of international trade in tropical timber	<ul style="list-style-type: none"> <li>• Establishment of ITTO and ITTC (Council) to administer the provisions and supervise the operation of the Agreement</li> <li>• Make arrangement for consultation with relevant organization by the Council</li> <li>• Establish permanent Committees on Economic Information and Market Intelligence, Reforestation and Forest Management and Committee on Forest Industry</li> </ul>	18.11.1983	Geneva	1.4.1985	Accession 3.7.1990	MFSC Department of Forests

## APPENDIX 8-4 BIODIVERSITY CONSERVATION RELATED TREATIES AND CONVENTIONS (RATIFICATION/ACCESSION/ACCEPTANCE BY NEPAL)

Convention/Agreement	Objectives	Summary of Provisions	Date of Adoption	Place of Adoption	Entry into Force	Date of Signature and Ratification	Dealing Institution
Plant Protection Agreement for the South-east Asia and Pacific Region (as amended)	Prevent the introduction into and spread within the regional of destructive plant diseases and pests	<ul style="list-style-type: none"> <li>• Establish a Plant Protection Commission</li> <li>• Regulate trade in plants and plant products by certification, prohibition, inspection, disinfection, quarantine, destruction etc. as necessary</li> </ul>	27.2.1956	Rome	2.7.1956	Ratification 12.8. 1965	Ministry of Agriculture
Convention on Wetlands of International Importance Especially as Waterfowl Habitat	Stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value	<ul style="list-style-type: none"> <li>• Designate at least one national wetland for inclusion in the List of Wetlands of International Importance</li> <li>• Consider their international responsibilities for conservation, management and wise use of migratory stocks of wildfowl</li> <li>• Establish wetland nature reserves, cooperate in the exchange of information and train personnel for wetland management</li> <li>• Conferences on the conservation of wetlands and waterfowl to be convened as the need arises</li> </ul>	2.2.1971	Ramsar, Iran	21.12.1975 17.4.1988 in Nepal	Accession 17.12.1987	MFSC / Department of National Parks and Wildlife Conservation
Convention concerning the Protection of the World Cultural and Natural Heritage	Establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value, organized on a permanent basis and in accordance with modern scientific methods	<ul style="list-style-type: none"> <li>• Recognizes that the duty of identification, protection, conservation and transmission to future generations of the cultural and natural heritage belongs primarily to that State</li> <li>• Integrate the protection of their heritage into comprehensive planning programs, set up services and develop scientific and technical studies and take necessary legal, scientific, administrative and financial steps to protect their heritage</li> <li>• Submit an inventory of its national heritage and publish a World Heritage List and a List of World Heritage in Danger</li> <li>• Finance to a World Heritage Fund</li> </ul>	23.11.1972	Paris	17.12.1975	Acceptance 20.6. 1978	Ministry of Education and Culture and Social Welfare
Convention on International Trade in Endangered Species of Wild Fauna and Flora	Protect certain endangered species from over-exploitation by means of a system of import/export permits	<ul style="list-style-type: none"> <li>• Includes animals and plants whether dead or alive, and any recognizable parts or derivatives thereof</li> <li>• Covers endangered species, trade to be tightly controlled, trade to be regulated</li> <li>• Permits required for species stating that export/import will not be detrimental to the survival of the species</li> </ul>	3.3.1973 (amendments in 22.6.1979 and 30.4.1983)	Washington	1.7.1975	Accession 18.6.1975	MFSC / DNPWC
International Tropical Timber Agreement	Provide an effective framework for cooperation and consultation and promote the expansion and diversification of international trade in tropical timber	<ul style="list-style-type: none"> <li>• Establishment of ITTO and ITTC (Council) to administer the provisions and supervise the operation of the Agreement</li> <li>• Make arrangement for consultation with relevant organization by the Council</li> <li>• Establish permanent Committees on Economic Information and Market Intelligence, Reforestation and Forest Management and Committee on Forest Industry</li> </ul>	18.11.1983	Geneva	1.4.1985	Accession 3.7.1990	MFSC Department of Forests

Convention/Agreement	Objectives	Summary of Provisions	Date of Adoption	Place of Adoption	Entry into Force	Date of Signature and Ratification	Dealing Institution
Convention on Biological Diversity	Conserve biological diversity, promote the sustainable use of its components, and encourage equitable sharing of the benefits	<ul style="list-style-type: none"> <li>• Restatement of the principle of national sovereignty over domestic natural resource</li> <li>• Requirement of cooperation in preserving biodiversity in areas out of national jurisdiction</li> <li>• Conferment of responsibility in formulating and implementing strategies, plans and programs for the conservation and sustainable use of biological diversity</li> <li>• Attribution of responsibility to State Parties in respect of <u>in-situ</u> and <u>ex-situ</u> conservation of biological diversity</li> <li>• Obligations to provide for environmental impact assessment on project that are likely to have significant adverse impact on biodiversity</li> <li>• Provisions on access to transfer of technology etc</li> </ul>	5.6.1992	Rio de Janeiro	29.12.1994 <u>21.2.1994</u> entry into force in Nepal	Signature 12.6.1992  Ratification 23.11.1993 (Ratification by the House of Representatives in September 15, 1993)	MFSC
United Nations Framework Convention on Climate Change	Regulate levels of greenhouse gas concentration in the atmosphere, so as to avoid the occurrence of climate change on a level that would impede sustainable economic development, or compromise initiatives in food production	<ul style="list-style-type: none"> <li>• Protect the climate system for present and future generations and work in cooperation, so as to obtain maximum benefit from initiatives in the control of the climate change system</li> <li>• Prepare national inventories on greenhouse gas emissions, and on actions taken to remove them, formulate and implement programs for the control of climate change, undertake forest conservation activities</li> <li>• Establishment and promotion of network and programmes of research into and systematic observation of the climate change</li> </ul>	9.5.1992	New York	31 July 1994	Signature 12.6.1992  14.3.1994 (Ratified by the House of Representatives)	Ministry of Water Resources

## **Appendix 8-5**

---

### **Chronology of major events related to biodiversity conservation**



## APPENDIX 8-5 CHRONOLOGY OF MAJOR EVENTS RELATED TO BIODIVERSITY CONSERVATION

Date	Major Events
1932	Central Zoo established
1942	Department of Forests established
1950	Establishment of first school of forestry
1951	Ministry of Forests and Agriculture
1952	Royal Land Commission formed to promote national land reform
1956	Commencement of national economic planning with the First Five-Year Plan (1956-'61)
1957	Private Forest Nationalization Act enacted to nationalize all privately owned forest any compensation
1958	Wildlife Conservation Act passed (enforced until 1962)
1961	Forest Act introduced to encourage forestry management through the Panchayat system. (repealed by forest act 1993)
	Aquatic Animals Protection Act enacted to safeguard, in particular, the fishery resources
1962	Second plan (1962-'65) commences, with emphasis on land reform food production and transport communications infrastructure
1965	Third Plan (1965-'70) launched, giving emphasis to increased food production land reform, forest management and cultural heritage conservation and urban sanitation
August 12	State Party to the Plant Protection Agreement for the South-East Asia and Pacific Region (As amended)
1967	Rapti Doon Development Area, Land Management (Sale Distribution) Act enacted to facilitate land distribution and resettlement of landless people in the forest area
	Canal, Electricity and Water Resources Related Matters Act enacted to prohibit activities that create soil erosion and floods or landslides
	Forest Conservation (Special Arrangements) Act introduced to control forest clearing activities and to provide for the judicial settlement of disputes
1970	Fourth Plan (1970-'75) formulated giving emphasis to the development of special areas of national priority. Regional development planning concepts emerged
1971	Jhora Area Related Act promulgated
1972	Plant Protection Act enacted for the restriction of the export and import of plant and plant products that may carry disease through quarantine stations
	NPWC Section established in DoF which was upgraded to NPWR Office in December
1973	National Parks and Wildlife Conservation Act promulgated for the conservation of important ecological areas and the protection of endangered wildlife
	Wildlife Committee chaired by HRH Prince Gyanendra formed
	Kharka (pasture) Land Nationalization Act promulgated to nationalize alpine pasture
1974	Department of Soil and Water Conservation established
	Public Road Act provides for land acquisition during road construction and to promote plantation on roadside.
	Enactment of RCNP Regulations, 2030



	Enactment of NPWC Regulations, 2030
	Protection Units of RNA initiated
	State Member to the UNESCO Man and Biosphere Program (MAB)
	State Member to the IUCN - The World Conservation Union
1975	Fifth Plan (1975-'80) launched with emphasis on land use planning and development.
	NPWC Act and Regulations amended
	Preparation of Management Plans for Royal Chitwan, Rara, Langtang, Sagarmatha NPs
Sept. 16	State Party to the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES)
1976	National Forestry Plan introduced with a view to involve local people in forestry management and utilization, including wildlife protection
	Sagarmatha, Langtang and Rara NPs and Koshi Tappu, Royal Shuklaphanta and Royal Bardia WRs gazetted
	National Forestry Plan prepared
1977	Enactment of Wildlife Reserve Regulations, 2034
	Hattisar transferred to DNPWC from DoF
	Forest Products Development Board established
1978	Panchayat Forest Panchayat Protected Forest Rules and Leasehold Forest Rules promulgated in order to promote decentralized forest management and encourage community participation in forestry conservation
1978	NPWC Regulations amended
Sept. 20	State Party to the Convention Concerning the Protection of the World Cultural and Natural Heritage
	Community forestry activities initiated
1979	Enactment of Himalayan National Park Regulations, 2036
<hr/>	
1980	National Commission for the Conservation of Natural Resources established with the objective of coordinating and formulating environmental policy and resource conservation activities
	Department of National Parks and Wildlife Conservation set up
	Sixth Plan (1980-'85) commenced with greater consideration of environmental policies and programs
	World Conservation Strategy accepted in principle
1982	Environmental Impact Study Project established to study the environmental consequences of selected development projects
	Soil and Water Conservation Act enacted in order to promote environmentally sound agricultural practices and conservation of watershed areas.
	King Mahendra Trust for Nature Conservation Act enacted with the mandate to promote conservation and management of natural areas and wildlife.
	Nepal Environment Conservation Group established as a non-government organization to promote community environmental awareness.
	National Parks and Wildlife Conservation Act, 1973 amended
	King Mahendra Trust for Nature Conservation established and the Act enacted with the mandate to promote conservation and management of natural areas and wildlife.
1983	Shivapuri area declared as Watershed Conservation and Wildlife Reserve
	International Center for Integrated Mountain Development founded to address mountain development issues of its member countries
	National Conservation Strategy (prospectus) prepared
1984	Shivapuri Management Committee formed



	Shey Phoksundo, Khaptad NPs and Parsa WR gazetted
	National Parks and Wildlife Conservation Act, 1973 amended
1985	National Main Policy issued containing several environment and wildlife conservation related policies.
	NPWC Regulations amended
	Dhorpatan HR field office established
	Annapurna CAP initiated by KMTNC
	Preparation of Management Plans for Rara, Langtang and Sagarmatha NPs for review
	Seventh Plan (1985-90) initiated with the introduction of environment as a national policy.
	National Main Policy issued containing several environment related policies.
1986	Annapurna Area Conservation Project inaugurated, administered by the King Mahendra Trust for the Conservation of Nature
1987	Khaptad NP Regulations drafted
	Dhorpatan HR gazetted
1987	National Conservation Strategy for Nepal endorsed, in principle
1988	Master Plan for the Forestry Sector endorsed, in principle
April 17	Ratified Convention on Wetlands of International Importance Especially as Waterfowl habitat (Ramsar Convention)
1989	Eight Plan (1990-'95) prepared, with a major objective to promote environmental management and natural resources conservation
	EISP merged onto the Environment Division of the Department of Soil Conservation and Watershed Management which was later adjusted in the Ministry
1989	Forestry Bill drafted in the spirit for implementing the Forestry Sector Master Plan
1990	Policy Guidelines of the Interim Government issued with the requirement that no new major development projects are to proceed which have potential adverse environmental consequences
1990	Panchayat system abolished. New administrative units given various environmental management responsibilities
1990	Council for the Conservation of Natural and Cultural Resources established (now replaced by EPC)
1991	Forest Policy revised
	Makalu Barun NPCA gazetted
1992	Ministry of Forests and Soil Conservation renamed as Ministry of Forests and Environment
	Environment Protection Council, a high level environmental body established in order to coordinate environmental policies & activities and the Ministry of Forests and Environment again renamed as Ministry of Forests and Soil Conservation
1993	Forest Act promulgated for the protection, management and the utilization of forestry resources with emphasis on user groups and community forestry
	National Parks and Wildlife Conservation Act, 1973 amended (fourth amendment) incorporating the concept of buffer zone in parks management
	National Environmental Impact Assessment Guidelines endorsed by the government
May 19	General Agreement signed between HMG and WWF. WWF involvement initiated in Nepal since 1967
	Nepal Environmental Policy and Action Plan endorsed by the EPC
Sept. 15	Convention on Biological Diversity (CBD) ratified
Nov. 23	Instruments of ratification of the CBD deposited to the UN Secretary General

Sept. 17	Agreement signed on Biodiversity Conservation in Nepal (a five years GEF funded project) executed by the MFSC
Febr. 21	Convention on Biological Diversity entered into force in Nepal
March 24	State Member to the SACEP (Ratified from the Parliament)
	Institutional reform in forestry sector strengthened the local field level institutions in manpower and responsibility
July 7	Signed Biodiversity Profiles Project, funded by the Netherlands Government
July 31	Framework Convention on Climate Change entered into force in Nepal
August 9	Signed Park-People Project, funded by UNDP
Sept 12	Supplementary agreement signed between DNPWC and WWF on Biodiversity Conservation Program to implement activities in Royal Bardiya NP, Shey Phoksundo NP and strengthening DNPWC
	Forestry Rules, 1995 passed and enforced
1995	
April 5	Environmental Impact Assessment Guidelines for the Forestry Sector approved by the government
	Supplementary Agreement signed between Central Zoo and WWF to strenthen zoo's facilities
	Buffer Zone Management Rules drafted

## **Appendix 9-1**

---

**Biodiversity conservation  
related responsibilities of  
HMGN and other agencies**



**APPENDIX 9-1 BIODIVERSITY CONSERVATION RELATED RESPONSIBILITIES  
OF HMGN AND OTHER AGENCIES**

Organizations	Main Responsibilities
Ministry of Forests and Soil Conservation (based on HMGN Work Division Rules, 1991)	<ul style="list-style-type: none"> <li>* Formulate forest related policies and plans for government, religious, community, leasehold and private forests</li> <li>* Survey, measurement, and map national forests</li> <li>* Demarcate government and non-government forest area</li> <li>* Provide guidelines for land use and the utilization of forests and their products, and forest conservation and promotion.</li> <li>* Manage forest products development related works, and arrange for supply of forest raw materials to industries</li> <li>* Afforestation and forest related research</li> <li>* Conservation and utilization of wildlife and birds, national parks, wildlife reserves and hunting reserves, and elephant camp and zoo</li> <li>* Conservation, promotion, development and coordination of the soil and watershed areas</li> <li>* Natural environmental conservation and balance</li> <li>* Policy, survey, collection, promotion, processing, production and utilization related research on plants and herbs (medicinal plants)</li> <li>* Royal Botanical Garden, herb's industry, and plant herbarium</li> <li>* Wood-energy development related issues</li> </ul>
Department of National Parks and Wildlife Conservation	<ul style="list-style-type: none"> <li>* Co-ordinate ecological research, formulate and review national park and wildlife management plan, launch conservation awareness programmes</li> <li>* Co-ordinate national parks and wildlife conservation works, tourism promotion related works, and conduct training programmes</li> </ul>
Department of Forests	<ul style="list-style-type: none"> <li>* Scientific management, conservation, and production of forest resources</li> <li>* Implement activities for the conservation of endangered and economically important wildlife and plants</li> <li>* Ensure forest conservation with people's participation in community forests, provide technical advise for promoting private forests, introduce and develop agro-forestry, and tree improvement programmes</li> <li>* Formulate forest plans and programs, ensure monitoring and evaluation, launch training, and public awareness programs</li> <li>* Facilitate forest management plan and forest working scheme, sustainable use of forest products, promotion of leasehold forests by drafting relevant rules</li> </ul>

Organizations	Main Responsibilities
Department of Plant Resources	<ul style="list-style-type: none"> <li>* Carry out scientific and practical research for the conservation, promotion and sustainable use of plant, herbs, medicine based on plants for socio-economic development</li> <li>* Collect plants and develop their scientific classification; develop germplasm centre, develop technologies for commercial farming of herbs, conserve endangered and rare plants even through landscaping techniques, publish the Flora of Nepal, carry out ecological studies in different ecosystems, and assess plant species' economic importance</li> <li>* Carry out biological and chemical studies including tissue culture technology, cytological and anatomical studies.</li> </ul>
Department of Soil Conservation	<ul style="list-style-type: none"> <li>* Formulate annual and periodical programmes, standardize monitoring indicators, prepare land use plans for soil conservation and watershed management, develop a watershed information system, and assist relevant agencies in implementing environmentally benign development programmes</li> <li>* Develop appropriate technologies for soil conservation, integrate them in watershed management, launch public awareness programmes on soil conservation, technology and natural environment conservation aspects</li> <li>* Conduct research studies on erosion processes and the hydrological cycle in different ecological zones, soil and nutrient loss from different land uses, bio-engineering conservation measures, and integrate results of soil and water analysis for preparing watershed development plans</li> </ul>
Forest Research and Survey Centre	<ul style="list-style-type: none"> <li>* Conduct research activities in the field of afforestation, studying natural growth rates, silvicultural methods, utilization of forest resources, agro-forestry technology, tree improvement and publish research findings.</li> <li>* Carry out forest inventory, and analyse remote sensing information, and biomass studies.</li> </ul>
Central Zoo	<ul style="list-style-type: none"> <li>* Ensure exhibition and <i>ex-situ</i> conservation of wildlife and birds, and increase their population by breeding</li> <li>* Carry out research studies on endangered wildlife and increase their population</li> </ul>
Herbs Production and Processing Co. Ltd.	<ul style="list-style-type: none"> <li>* Intensify herbal farming, herbs processing, and extract medicinal and aromatic constituents</li> </ul>
Makalu-Barun National Park and Conservation Area Project	<ul style="list-style-type: none"> <li>* Protect the biodiversity and fragile ecosystems of the Makalu-Barun region</li> <li>* To intergrate protection of the biodiversity of the national park with community development in the conservation area</li> <li>* To work alongside and strengthen the capacity of DNPWC in managing this area.</li> </ul>
International Centre for Integrated Mountain Development	<ul style="list-style-type: none"> <li>* An international, multidisciplinary documentation and information centre for the Hindu Kush Himalaya region (HKH) - from Afghanistan in the west to Myanmar in the east)</li> <li>* A focal point for the mobilisation, conduct, and co-ordination of applied problem-solving research activities</li> <li>* A focal point for training on integrated mountain development</li> <li>* A consultative centre to provide expert services on mountain development and resource management.</li> </ul>

King Mahendra Trust for Nature Conservation	<ul style="list-style-type: none"> <li>* Ensure conservation, promotion and management of wildlife and their habitats</li> <li>* Work for the development of national parks and wildlife reserves</li> <li>* Carry out research and studies on wildlife and other natural resources.</li> </ul>
Annapurna Conservation Area Project	<ul style="list-style-type: none"> <li>* To manage Annapurna Conservation Area to ensure sustainable community development, nature conservation and tourism development.</li> </ul>

Note: This information reflects the situation after the institutional restructuring of the ministry and its departments in 1993. The responsibilities of the KMTNC are as in the King Mahendra Trust for Nature Conservation Act, 1982.





## **Appendix 10-1**

---

### **Overview of ongoing biodiversity projects in the Highlands**



## APPENDIX 10-1 ONGOING PROJECTS ON BIODIVERSITY IN NEPAL

## Annapurna Conservation Area Project

Goals/Objectives	Activities	Donor Agencies	Implementing Agencies	Consulting Agencies	Contact Person	Status	Project Term	Est. Budget US\$/Yr.
A. resource conservation	<ol style="list-style-type: none"> <li>1. natural forest management</li> <li>2. nursery establishment and operation</li> <li>3. soil and water conservation</li> <li>4. training, study tours, surveys etc.</li> </ol>	KМУKT/ODA, WWF, CIDA, TRAS, SNV/DGIS, AHF, MOT, DOT, ADB, USAID, ILO	KMTNC		Mr. Arup Rajouria Mr. S. Thakali Mr. S.B. Bajracharya	ongoing	1986 to 2002	1 000 000.
B. heritage conservation	<ol style="list-style-type: none"> <li>1. gumpa restoration and repair</li> <li>2. formation of gumpa management</li> <li>3. wall preservation</li> <li>4. documentation of religious wall painting</li> <li>5. local festival support</li> <li>6. monastic school support</li> </ol>							
C. alternative energy	<ol style="list-style-type: none"> <li>1. micro-hydro electrification schemes</li> <li>2. promotion of Backboiler, improved cooking stoves kerosene and LPG depots</li> <li>3. distribution of pressure cooker and thermos</li> </ol>							
D. sustainable rural development	<ol style="list-style-type: none"> <li>1. school support</li> <li>2. health post support</li> <li>3. drinking water and drainage</li> <li>4. toilet construction</li> <li>5. clean-up campaign</li> </ol>							
i. community development	<ol style="list-style-type: none"> <li>6. construction and repair of trail, bridges</li> <li>7. soil and water conservation (irrigation, river training, land slide control etc.)</li> </ol>							
ii. women development	<ol style="list-style-type: none"> <li>1. education and extension (adult literacy class)</li> <li>2. awareness programmes</li> <li>3. health and sanitation (mother-child health clinic, traditional birth attendant, day care centre etc)</li> <li>4. skill development and income generation</li> <li>5. developing women's entrepreneurship in tourism (DWET)</li> </ol>							

### WWF Nepal Program

Goals/Objectives	Activities	Donor Agencies	Implementing Agencies	Consulting Agencies	Contact Person	Status	Project term	Est. Budget US\$/Yr.
<b>integrated pest management (IPM) in Nepal</b>  1. develop a feasibility study project to demonstrate the economic and environmental benefits on chemical pesticides (on a reduction basis) for the commercial growing of cotton.	feasibility study for the demonstration project on IPM. implementation of IPM.  awareness program for the farmers  training programme for the farmers	WWF International	WWF Nepal Program DNPWC	Nepal Pesticide Board	Mr. Devendra Amatya		July 95 June 98	105,600
<b>Abraham Conservation Award</b> 1. create a mechanism award dedicated to field conservationist in Nepal on an annual basis.  2. to increase conservation awareness and motivation at the grassroots level by providing a monetary award.	develop criteria to evaluate and select dedicated grassroots conservationists.  WWF Nepal to select and distribute conservation awards throughout the fiscal year.  WWF Nepal to prepare a report on each year's recipients for the donor on an annual basis.	WWF Nepal Program					July 95 June 96	1,500
<b>Annapurna Conservation Area</b>  1. support ACAP until it reaches its goal of self-sufficiency with increasing tourist entry fees revenue by 1997/98.  2. strengthen the capacity of the local grassroots-level organizations such as the conservation and development committees  3. help enhance the capability of the project staff in conservation education, and leveraging funds from other sources.	conduct 2 day workshops on M&E, one each for the members of Conservation and Development Committees (CDCs) and the Lodge Management Committees (LMCs) in Ghandruk sector in October 1995  review and develop operational plan for the project upon consultation with the project staff by June 1995  develop educational packages for women's development programs by January 1996	WWF USA		Mr. Mingma Norbu Sherpa			June 85 June 98	105,542
			KMTNC	WWF Nepal Programme	Mr. Sidhartha Bajracharya			

<b>Institutional Support for Department of National Parks &amp; Wildlife Conservation</b>  1. assist the Department to establish a biodiversity database and conservation awareness programs.  2. provide logistic support and necessary field equipment including computers.  3. enable the Department staff to attend technical meetings and workshops  4. support for anti-poaching activities in and around the parks.	Procure two sets of field gear, four bicycles, one motorbike, and eight handsets of communication equipment.  Sponsor two DNPWC staff for a 3-months park management training program organized by the Smithsonian Institution.  Develop public awareness materials on the control of illegal trade in wildlife products for displays at the airport and hotels, and mass media coverage e.g. radio, television, and newspaper.	Mac Arthur Foundation and WWF USA	DNPWC	WWF Nepal Program	Dr. Tirtha Man Maskey	Sep 90 June 98	172,162
--	---	-----------------------------------	-------	-------------------	-----------------------	-------------------	---------

<p><b>A Strategy for Management, Protection and Improvement of Shey Phoksundo National Park</b></p> <p>1. manage the natural resources of the park, and help elevate the living standards of the local people with their participation.</p>	<p>Prepare guidelines for biological survey of the park by December 1995.</p> <p>Develop training manuals on survey methodology by December 1995.</p> <p>Establish communication set in two places by June 1996.</p> <p>Strengthen anti-poaching activities in the park by providing field gear, equipment, and incentives.</p> <p>Organize an orientation program for the protection unit by April 1996.</p> <p>Organize public meetings on park regulations and facilities by May 1996</p> <p>Develop eco-tourism plan and integrated pasture management strategy by March 1996.</p> <p>Finalize a five year operational plan for the park by June 1996.</p> <p>Sponsor one park staff for 3-months park management training program organized by the Smithsonian Institute.</p> <p>Sponsor one park staff for the certificate course at WII, India.</p> <p>Maintain the existing building complex.</p> <ul style="list-style-type: none"> <li>* Improve 15 km trails and one bridge by October 1995.</li> <li>* Procure and demonstrate solar panel rechargers in the office building by October 1995.</li> <li>* Organize two forest users groups for community forestry March 1996.</li> <li>* Conduct literacy programs, one each for adults and women by April 1996.</li> <li>* Promote community services through people's participation (10 km trail, one bridge, one kerosene depot, pasture management) by May 1996.</li> <li>* Study potential income generating activities, and promote one activity by May 1996</li> <li>* Develop educational packages for schools, adult and women education programs, and displays at the park information centre by May 1996.</li> <li>* Operate the existing forest nursery</li> </ul>	WWF USA	DNPWC	WWF Nepal Program	Dr. Tirtha Man Maskey	Jan 92 June 98	224,274
---	---	------------	-------	-------------------------	--------------------------------	-------------------	---------

	<p>Finalize eco-tourism plan and a five year operational plan by June 1996</p> <p>Sponsor the park staff to participate in the training programs at WII, India, and Wildlife Management Training courses offered by the Smithsonian Institute.</p> <p>Organize orientation for the park protection unit on park management and public support in December, 1995.</p> <p>Organize public meetings to disseminate information of new policy e.g. buffer zone in January 1996.</p> <p>Maintain guard posts, 10 km road, 10 km trails, and 2 culverts.</p> <p>Organize one-week orientation for the antipoaching unit by the park office in October 1995.</p> <p>Procure one set of field gear, one motorbike, 2 bicycles, communication sets for the antipoaching unit.</p> <p>Procure a pair of elephants for park management and anti-poaching work.</p> <p>Prepare a status report on rhino and tiger by April 1996.</p> <p>Organize five user groups for community forests and establish nurseries by March 1996.</p> <p>Develop and implement adult and school education packages by March 1996.</p> <p>Promote community services through people participation (two drinking water schemes, medicines for a health post, toilets in two schools, heritage conservation, one public toilet) by May 1996.</p> <p>Publish one booklet and one brochure on RBNP regulations and buffer zone policy.</p> <p>Assess, design and develop educational packages for schools around the Park.</p> <p>Conduct public meetings by March 1996.</p>	WWF USA, DGIS	DNPWC	WWF Nepal Program	Mr. Mingma Norbu Sherpa	Jan 91 June 98	430,097
--	--	---------------------	-------	-------------------------	----------------------------------	-------------------	---------



<b>Sagarmatha Pollution Control Project</b>  1. manage garbage waste in the khumbu region 2. promote environment education 3. coordinate with the Sagarmatha National Park and the local community in conservation and development programs	<p>Endorse and implement the SPCC office management guidelines by October 1995</p> <p>Review 1993-96 operational plan to prepare a draft plan for the period 1997-99</p> <p>Finalize and implement community forest management plan through users group in collaboration with Department of Forests by March 1996.</p> <p>Complete construction works for the kerosene depot by October 1996.</p> <p>Sponsor two SPCC staff to participate in conservation related training programs (SPCC will implement conservation and development programs including education as outlined in its operational plan with government funding).</p>	The Waste Management Inc. and WWF USA	Sagarmatha Pollution Control Committee	WWF Nepal Program and Ministry of Tourism and Civil Aviation	Mr. Mingma Norbu Sherpa	Jan 91 June 98	118,732
<b>Community Forestry and Wildlife Habitat Conservation Royal Chitwan National Park</b>  1. test the BCN hypotheses:  1) established economic incentives to promote local guardianship of biodiversity  2) the most extensive database of project interventions on trends in biodiversity conservation.	Organize villagers as local guardians to protect and restore the wildlife habitats and buffer areas surrounding the eastern section of Chitwan.	BCN, USAID, WWF USA	KMTNC	WWF Nepal Program and DNPWC	Dr. Eric Dinerstein	July 93 July 98	263,852



<b>Field Action Research Grant</b>  1. support studies of species and habitats for which little or no data exists  2. support researchers who are unable to proceed their thoughtfully designed proposals due to lack of funds  3. support researchers and conservationists to attend seminar and training  4. support NGOs and other agencies to undertake conservation projects	Review proposals and award grants  Organize small grant seminar in September 1995 and May 1996 and set priorities  Disseminate research findings and program results through the Eco-Circular WWF Nepal Program quarterly newsletter and media	WWF USA	WWF Nepal Program	Small Grant review Committee	Mr. Mingma Norbu Sherpa	Jan 91 June 98	98,943
<b>Non Formal Education</b>  1. support non-formal environmental activities through various organisations  2. develop educational packages and  3. expand mass media coverage.	Workshop for school teachers on eco clubs in September 1995  Develop displays and posters on wildlife trade control to be put in the airport, immigration office and the major hotels in Kathmandu by March 1996.  Produce public awareness materials for the mass media from October 1995 through June 1996  Conduct study tour for the press people on the control of wildlife trade in December 1995  Develop an educational strategy for the involvement of the business community in conservation by September 1995  Strengthen education components of the Central Zoo  Develop non-formal education programs for schools around protected areas by December 1995.	WWF USA, WWF Belgium	WWF Nepal Program	Various agencies	Mr. Ukesh Bhuj	July 94 July 98	92,347

<b>Institutional Support for Grassroots Non Governmental Organisations (NGO)</b>  1. identify grassroots NGOs and  2. assist them with small grants to build their institutional capacities	Organise workshop training for NGO representatives on proposal writing and monitoring & evaluation.  Sponsor national and international conference in Nepal organized by the Nepalese NGOs and associations	WWF USA	WWF Nepal Program	Various NGOs	Mr. Mingma Norbu Sherpa	August 93 July 98	197,890
<b>Conservation in Kanchenjunga</b>  1. protect the unique environmental of the region and help the local communities improve their standard of living.  2. prepare a conservation plan to implement the Kanchenjunga Conservation Project.	Construct building for project office, staff quarters, 3 guard posts by June 1996  Appoint a project officer and three field officers by September 1995  Develop five year operational plan for Kanchenjunga area by June 1996  Organize three community forestry users groups by June 1996  Explore and promote income generating programs by December 1995  Improve 10 km of trails, and maintain 2 suspension bridges by June 1996	WWF USA and others	WWF Nepal Program	Dept. of Forests, DNPWC MFSC	Mr. Devendra Amatya	July 95 June 98	567,282

### East Himalayan Programme for Collaboration in Biodiversity, ICIMOD

Goals/objectives	Activities	Donor Agencies	Implementing Agencies	Consulting Agencies	Contact person	Status	Project Team	Estimated Budget	Remarks
To improve biodiversity management in the E-Himalaya through institutional collaboration and field level activities with focus on protected areas and its bufferzone/surrounding agroecosystems	Field case studies in one National Park (to be identified in Nepal, but likely to be Langtang National Park)  training of local people on biodiversity management networking in transboundary conservation	Mac Arthur Foundation	DNPWC	SAGUN	Prof. Pei Shengji	in preparative stage	Pei Shengji J.D. Gurung  B. Shrestha  D. Miller	US\$ 150,000	Regional Project involving China, Myanmar and Nepal

**Nepal Community-Based Biodiversity Conservation Project (NCBBCP), Sustainable Agriculture and Natural Resource Management (SA/NRM), Save the Children US, Nepal Field Office (SC/US, NFO)**

Goals/Objective	Activities	Donor Agencies	Implementing Agencies	Consulting Agencies	Contact Person	Status	Project Term	Estimated Budget	Remarks
To demonstrate, through implementation of a project, that through motivation and appropriate incentives in form of economic and social benefits from the utilization of its forest resources, the resident community of ecologically significant areas of the midhills can be mobilized to actively participate in protection of the biodiversity of that area.	Formation of plan proposal and its submission to BCN for implementation grant.	BCN (Biodiversity Conservation Network, USA)	NCBBCP;SA/NRM,SC/US,NFO	Non	Program Officer SA\NRN	The present planning phase will terminate on July 15, 1995. Implementation phase will start after approval of grant from BCN or other donor agencies.	December 15 to July 15, 1995 (for planning phase)	Approx US\$50,000 for the planning phase	The estimate budget for the implementation activities as proposed to BCN has not yet been approved; hence not included.

## Nepal Conservation Research and Training Centre

Goals/Objectives	Activities	Donor Agencies	Implementing Agencies	Consulting Agencies	Contact Person	Status	Project Term	Est. Budget US\$/Yr.	Remarks
A. Tourism Development	Machan Construction	BCN WWF/US	KMTNC		Mr. A. Rajouria	ONGOING	1994-1997	188,000	
B. Biodiversity Conservation	Nature guide training	UNDP			Mr. J.S. Thapa				
	By-laws preparation revenue generation from the				Mr. S. Thakali				
C. Stakeholder Committee formation to draft the management plan	Stakeholder Committee formation								
D. Meet local demand of fuelwood, timber and fodder.	Community Plantation								
Research/Monitoring									
E. Study different habitats within & outside RCNP	Vegetation survey								



### Biodiversity Conservation Project (GEF) in Nepal

Goals/objectives	Activities	Donor Agencies	Implementing Agencies	Consulting Agencies	Contact Person	Status	Project Term	Estimated Budget	Remarks
The main objectives of the Global Environment Facility (GEF) Project is to conserve existing biological diversity, demonstrate effective approaches for doing so, and encourage the replication of these approaches in appropriate contexts throughout and outside the of Nepal		UNDP	DNPWC	UNDP, MBCP, KMTNC	Dr. T.M. Maskey	Ongoing	1995-1998	US\$ 3800000	Work plan to be identified after the Biodiversity Action Plan to be implemented

### Environment and Forest Enterprise Activity project USAID

Goals/objectives	Activities	Donor Agencies	Implementing Agencies	Contact Person	Status	Project Term	Estimated Budget
With regard to Shey-Phoksundo National Park and Dhorpatan Wildlife Reserve	NTFP identification and harvesting plans	USAID	DNPWC	Dr. T.M. Maskey	Ongoing	October 1995-May 2000	US\$ 8.840.000
- Accelerating the local control and management of natural resources	Pilot studies to develop appropriate value-added processing techniques						HMGN 2.947.000
- Developing natural resource based micro-enterprises	Development of eco-tourism micro enterprises						
	Initiation of user groups based development efforts in the areas adjoining the two protected areas						
	Enhancement of the-extension activities of DNPWC field staff to develop and strengthen resource Conservation Committees through provision of training and technical assistance to Park Rangers and Game Scouts.						