

# Nepal Biodiversity Resource Book

Protected Areas, Ramsar Sites,  
and World Heritage Sites

Ukesh Raj Bhuju  
Puspa Ratna Shakya  
Tej Bahadur Basnet  
Subha Shrestha



# About the Organisations

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The Ministry can be reached through its website-[www.moest.gov.np](http://www.moest.gov.np) and email-[info@moest.gov.np](mailto:info@moest.gov.np).

# Nepal Biodiversity Resource Book

## Protected Areas, Ramsar Sites, and World Heritage Sites



International Centre for Integrated  
Mountain Development  
ICIMOD



Government of Nepal,  
Ministry of Environment,  
Science and Technology  
MOEST



United Nations Environment  
Programme - UNEP

*Prepared by*



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# Nepal Biodiversity Resource Book

## Protected Areas, Ramsar Sites, and World Heritage Sites

**Ukesh Raj Bhuj**  
**Puspa Ratna Shakya**  
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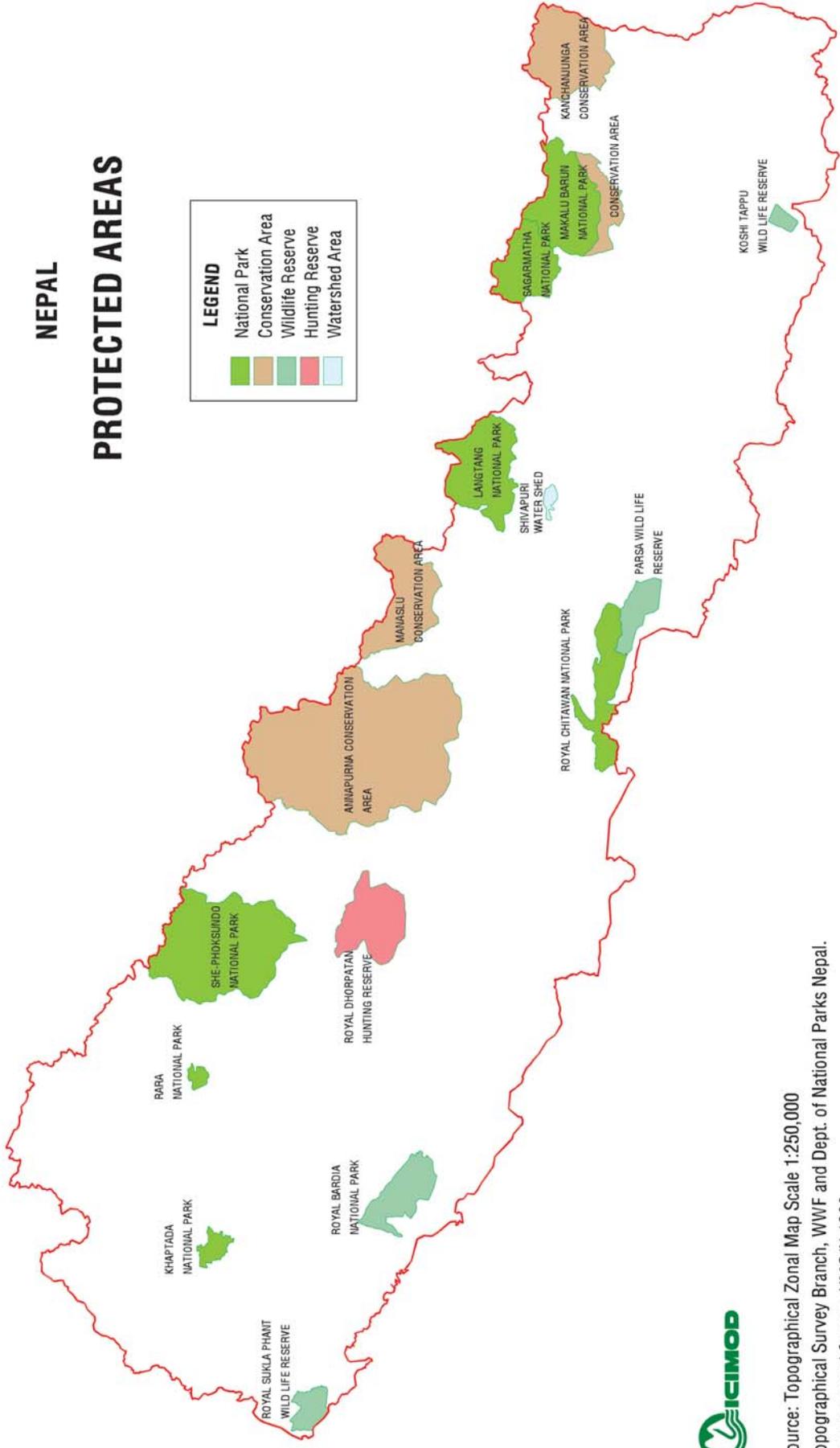
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International Centre for Integrated Mountain Development  
Ministry of Environment, Science and Technology, Government of Nepal  
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June 2007

# NEPAL PROTECTED AREAS

LEGEND	
	National Park
	Conservation Area
	Wildlife Reserve
	Hunting Reserve
	Watershed Area



Source: Topographical Zonal Map Scale 1:250,000  
 Topographical Survey Branch, WWF and Dept. of National Parks Nepal.  
 Department of Survey, HMG/N 1988.

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# Message

**State Minister**

**Ministry of Environment, Science and Technology**

**B**iological resources and associated traditional knowledge play important roles in the livelihoods of Nepalese society. Food security, human health, and environmental balance are interlinked with the state of these resources. Some flora and fauna have religious importance in Nepalese society.

Nepal faces ongoing and emerging challenges in conserving biodiversity due to, inter alia, growing population, poverty, habitat loss, erosion of crop genetic diversity, and climate change. Although emission of greenhouse gases from Nepal is negligible, the impact of climate change is being felt in the changes in biodiversity distribution and its production timings including additional threats to and extinction of important species.

Realising the importance of biological resources, the people and the Government of Nepal are actively involved in conserving these resources since time immemorial. By adhering to conservation-friendly policies and laws, it has extended its support to empower community users and to share benefits accrued from the conservation of biodiversity. Nepal has also joined the international community in conserving biodiversity by ratifying environment-related international legal instruments including the Convention on Biological Diversity. As a Party to this Convention in February 1994, Nepal has made significant progress to further mainstream biodiversity conservation in development planning and implementation. With a view to protect flora and fauna including endangered species, over 19 percent of the total area of the country has been managed in the form of protected areas which also includes two World Heritage Sites and one Ramsar site and their buffer zones. Forests outside the protected areas, and a community-based natural resource management regime such as community forests have been exemplary.

The Government of Nepal is implementing the biodiversity strategy and its implementation plan in collaboration with its development partners through widened institutional networks, capacity building, and people's active participation. The changing political scenario has given additional impetus for meaningful participation of and benefit to local communities from biodiversity conservation.

I believe that this Nepal Biodiversity Resource Book will provide updated information on floral and faunal diversity and encourage further our development partners in assisting our local communities in their continued efforts at biodiversity conservation. We look forward to moving ahead with local and international development partners in the auspicious task of preserving flora and fauna. I also believe that the publication of this book on the occasion of the World Environment Day will encourage all of us to further understand the role of biodiversity in conserving the environment. Finally, I would like to thank all those involved in preparing this

**Mr Mahantha Thakur**

Minister, Ministry of Environment, Science and Technology

Singh Durbar, Kathmandu, Nepal

June 2007



# Foreword

**Director General**

**International Centre for Integrated Mountain Development**

**N**ow at the turn of the 21st Century, a large part of Nepal's efforts towards biodiversity conservation has been institutionalised in the form of protected areas, Ramsar sites, and World Heritage Sites. Backed by powerful legislative tools like the 1973 National Parks and Wildlife Conservation Act, and progressive policies that aim to include local communities in every conservation programme, Nepal's protected areas covers nearly 20 per cent of the country's land, compared to a global figure of 11 per cent. The main challenge for the last few decades has been the continuous struggle of reconciling and saving threatened species and managing their habitats while still fulfilling the basic needs of the people who depend on these natural resources, and as in all countries the challenges remain.

This publication provides a compilation of the rich flora and fauna found in Nepal's protected areas, Ramsar sites, and World Heritages Sites. The resource book is another landmark in the conservation history of the country, following in wake of the 1996 'Biodiversity Profiles of Nepal' and provides a great opportunity for sharing and exchanging of information among conservation partners.

ICIMOD, as a knowledge and learning organisation focusing on the improved well-being of the people of the greater Himalayas allied to conservation of the natural environment, is concerned with making the information available that is needed for planning related to these goals. The Centre is delighted to join with the Government of Nepal and the United Nations Environment Programme in publishing this document, which will provide a backbone for awareness-raising efforts on the need for biodiversity conservation in the region, as well as a useful planning tool for years to come.

The further steps described in this document will provide a useful road map for the way forward. We believe that documents like this will help the rich biodiversity of the region to receive better attention from the global community. The companion CD along with the publication will provide a useful source of rich sources of data and information for the many people concerned with biodiversity conservation in Nepal and the Himalayas.

A handwritten signature in black ink, appearing to read 'Andreas Schild'.

**Dr. Andreas Schild**

Director General

International Centre for Integrated Mountain Development



# Foreword

**Executive Director**  
United Nations Environment Programme

**T**he protected areas of the world—from World Heritage to Ramsar sites-- are facing a growing set of challenges as a result of human activities. These threaten their existing capacity to protect and maintain not only valuable biodiversity but the ecosystem services upon which all of us ultimately depend. A detailed inventory and assessment of the status of the floral and faunal species in protected areas is among the pre-requisites towards sustainable management of their biodiversity and gene pools.

The Nepal Biodiversity Resource Book is a timely contribution to these needs in a period when the United Nations network has urged the governments, organisations and the people to join hands to achieve the Millennium Development Goals and the 2010 Targets and Indicators. Nepal has made its road map clear through this Resource Book, which has opened up a new avenue of looking into the opportunities for us to identify specific conservation actions.

Nepal's conservation endeavors have been carefully watched by the international community. Its conservation policies of trusting the local people in biodiversity conservation and sharing the revenue of the protected areas with the community have added new dimensions to its conservation strategies. We believe that the emerging concept of establishing community-conserved areas will be well rooted in a country like Nepal where community forests and buffer zones have already been part of the country's response to the global biodiversity challenge.

On behalf of the United Nations Environment Programme, I would like to thank the Ministry of Environment, Science and Technology (MOEST) and the International Centre for Integrated Mountain Development (ICIMOD) for bringing out this publication and the Nepalese conservationists, biologists, scientists, and managers for conserving the unique biodiversity of Nepal that has global significance. We take pride in having had an opportunity to support the work documented in the Nepal Biodiversity Resource Book.

A handwritten signature in black ink, reading "Achim Steiner". The signature is fluid and cursive, with a large initial 'A' and 'S'.

**Dr. Achim Steiner**

United Nations Under-Secretary General and Executive Director  
United Nations Environment Programme  
Nairobi, Kenya  
June 2007

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The book could not have been prepared without the continuing support and encouragement of the United Nations Environment Programme Regional Office for Asia and the Pacific, especially Mr. Surendra Shrestha and his team consisting of Mr. Max Zieren, Dr. Dechen Tsering, Dr. Jinhua Zhang, Dr. Subrato Sinha, Dr. An Bollen, and Mr. Purna Chandra Lal Rajbhandhari.

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# Executive Summary

## Introduction

**Biodiversity Profiles of Nepal 1996 (BPN)** is a landmark endeavour to document all the information available and also recorded in the field on Nepal's biodiversity. In 16 volumes of documents, the profiles recorded 181 mammal species, 844 bird species, 100 reptile species, 43 amphibian species, 185 freshwater fish species, and 635 butterfly species. In the context of flora, BPN recorded 5,160 species of flowering plants and 1,120 non-flowering plants. According to BPN, Nepal ranks 10<sup>th</sup> in terms of richest flowering plant diversity in Asia, and 31<sup>st</sup> in the world.

Since 1996 when the BPN documents were published, Nepal has advanced further in biodiversity conservation and protected areas management. A total of 8,778 sq km of protected areas has been added to the country's protected areas between 1996 and 2004, including Shivapuri National Park, Kangchenjunga and Manaslu conservation areas, and 11 buffer zones.

In 1996, IUCN-Nepal prepared a detailed wetlands inventory of 163 sites from the Terai and 79 sites from the hills and mountains; three sites, Bishazari Tal, Jagdishpur reservoir, and Ghodaghodi Tal, have been designated as Ramsar sites in 2003.

Since 1996, at least seven species of birds have been newly recorded in Nepal, and the number of bird species recorded in the protected areas has increased significantly. In Shivapuri National Park, for example, the number of bird species recorded in 1996 was 151; in 2002 it was 177, and 311 in 2005. The number of species of flowering plants on record to date is about 5,900 compared to 5,160 recorded by BPN in 1996. A new chapter on entomology has been opened following the publication of the inventory of insects of Nepal in 1997 and 1998.

The overall goal of the Nepal Biodiversity Yearbook Project (NBYP) was to establish a system for updating Nepal's biodiversity resources every year into a Nepal Biodiversity Resource Book 2006, 2007, 2008, and so on, based on scientific studies.

The main objective of NBYP was to prepare a resource book 2006 on Nepal's biodiversity by updating the 1996 Biodiversity Profiles of Nepal using published information between 1996 and 2005 and field verification.

The NBYP was implemented in five stages preparatory to publication. Upon completion of the preparatory stage, Nepal Nature dot Com formed a working team to implement the Project. Team formation approach followed the steps taken by BPP in 1996, with essential modifications.

The checklists of fauna and flora compiled for the resource book have been derived primarily from the BPP documents. To update the checklists, references were made to publications made by various conservation organisations.

The first draft of the resource book was reviewed by six experts. A consultative meeting of 26 other experts representing 13 organisations was also held in Kathmandu on November 28, 2006 to discuss the draft. Conservation organisations were provided access to the digital version of the draft to facilitate review and feedback.

The major outputs of NBYP were the two resource book documents, one in English, one in Nepali, and a digital version of both. NBYP 2006 focuses on flora and fauna diversity in protected areas, Ramsar sites, and World Heritage Sites of Nepal.

## Country Background

Nepal, with area 147,181 sq km, occupies the central part of the Himalayas standing between the Palaearctic (Holartic) and Plaeotropical (Indo-Malayan) regions. The country is located between latitudes 26°22' and 30°27' N and longitudes 80°40' and 88°12' E. Altitude varies from 67m above sea level at Kechana Kalan, Jhapa in the south-eastern Terai to 8848m at Mt. Sagarmatha, the highest point in the world. Nepal's biodiversity is a reflection of its unique geographic position and variations in altitude and climate.

The extreme altitudinal gradient has resulted in 11 bio-climatic zones ranging from tropical to Nival within a short horizontal span. The Terai belt (67-300m) is a flat stretch of fertile agricultural land in southern Nepal, which forms part of the alluvial Gangetic plain. The Siwalik Hills Zone (700-1500m) rises abruptly from the Terai plains and is mainly composed of sedimentary rock and big boulders. The Mahabharat Lek (1500m to 2700m) lies between the Siwalik Hills to the south and the midlands to the north. The Midlands (average altitude 2000m) occupy the central region of the country. The Himalayan zone (above 4000m) lies in the north and stretches from east to west of the country. It consists of sub-alpine and alpine climates where summer grazing pastures are found in the lower elevations and high altitude plant species adapted to extremes of cold and desiccation grow in higher elevations. There are several inner Himalayan valleys with desert conditions such as the upper Kaligandaki and Bheri valleys located at altitudes above 3600m.

A wide range of climatic conditions exists in Nepal, mainly as a result of variations in altitude. This is reflected in contrasting habitats, vegetation, and fauna. Other important climatic factors influencing biodiversity and the composition of flora and fauna in Nepal include rainfall, winter snowfall, temperature, and aspect.

Soil formation is related to the physiographic zone. In the Terai, the soil is alluvial and fine to medium-textured. In the Siwalik Hills, it is made up of sedimentary rocks with a sandy texture, while in the Mid-Hills soil is medium to light in texture with a predominance of coarse-grained sand and gravel. The soil in the high mountains is shallow, stony, and glacial.

The country's major perennial river systems are the Mahakali, Karnali, Narayani, and Koshi rivers, all of which originate in the Himalayas. These rivers contain water resources that hold tremendous potential for large-scale hydropower and irrigation development. Medium-sized rivers include the Babai, West Rapti, Bagmati, Kamla, Kankai, and Mechi rivers that generally originate in the Mid-hills or in the Mahabharat range. The Terai region contains many small and usually seasonal rivers most of which originate in the Siwalik Hills.

The latest physiographic data show that Nepal comprises around 4.27 million hectares (29% of total land area) of forest, 1.56 million hectares (10.6%) of scrubland and degraded forest, 1.7 million hectares (12%) of grassland, 3.0 million hectares (21%) of farmland, and about 1.0 million hectares (7%) of uncultivated lands. Forest cover in the Terai and Hill areas is reported to have decreased at an annual rate of 1.3% and 2.3%, respectively between 1978/79 and 1990/91.

Nepal has a population of 23.2 million (2001 census). Some 48.5% of the population lives in the Terai, 44.2% in the Hills, and 7.3% in the Mountains. Average population density is 157.73/km<sup>2</sup>, with the highest density (330.78/km<sup>2</sup>) in the Terai, medium density in the Hills (167.44/km<sup>2</sup>), and lowest in the Mountains (32.62/km<sup>2</sup>). In relation to Nepal's five development regions, the Central Development Region accommodates 34.7% of the total population, followed by the Eastern Development Region, 23.1%; the Western Development Region, 19.6%; the Mid-Western Development Region, 12.9%; and the Far-Western Development Region, 9.5%.

Nepal ranks 138<sup>th</sup> out of 177 countries in the 2006 Human Development Index, with 62.1 years life expectancy at birth, 48.6% adult literacy rate, and 147<sup>th</sup> ranking in purchasing power parity of US\$1,490. The country ranks 68<sup>th</sup> among 102 developing countries in Human Poverty Index.

The economic well being of Nepal is closely bound to its natural resources – agricultural land, wetlands, forests, and protected areas. Although only 20% of land area is agricultural, agriculture is the major determinant of economic activities and the nation's socio-political identity. Forests cover some 29% of the land area. The high demand for agricultural land has led to considerable deforestation and loss of land cover. Natural phenomena such as floods and landslides contribute to an annual soil loss of 20-25 tonnes/ha. The majority of protected areas including the major national parks comprise forested land. Their contribution to the national economy through foreign exchange earnings is of major importance.

Nepal's bioresources in the international trade are mostly wild in origin. The 188 biomaterials commonly found in international trade consists of various plant parts such as roots and tubers (39 plants), barks (seven plants), leaves (26 plants), flowers (14 plants), fruits and seeds (61 plants), whole plants (12 plants), gums and resins (eight plants), and miscellaneous other plants (11).

Tourism is the second most important source of foreign exchange for Nepal. During the period 1996-2005, over 45% of total visitors to Nepal, on average, visited the protected areas. Tourist arrivals in Nepal, as well as in its protected areas, are expected to grow by 8-10% annually.

The National Parks and Wildlife Conservation Act (NPWCA) 1973 and its seven associated regulations are the principal legal instruments that govern the management of Nepal's protected areas. Section 3 of the NPWCA prohibits hunting of animals or birds, building any house, hut, or structure, clearing or cultivation on any part of the land, or harvesting any crops, cutting, burning, or damaging any tree, bush, or other forest product, and mining within national parks or protected areas. The Act provides complete protection to 27 species of mammals, nine species of birds, and three species of reptiles. Since its promulgation in 1973, five amendments have been made to this Act. Four amendments were made effective 1993. The Fifth Amendment in 2005 accommodated the provision handing over management responsibility for the protected areas to organisations established under the Act. Three regulations formulated after 1996 mainly reflect upon government policy involving local communities in the management of protected areas.

Acts and regulations pertinent to forests, watersheds, the environment, livestock, self- governance, and tourism are equally significant for the conservation of flora and fauna.

The government recently formulated four main policies pertaining to biodiversity conservation. They are, the Working Procedure for the Implementation of the Policy with Regard to the Handover of the Management of National Parks, Wildlife Reserves and Conservation Areas to Non-governmental Organisations or Other Organisations; the Domesticated Elephant Management Policy 2003; the Working Policy on Wildlife Farming, Breeding and Research 2003; and the National Wetland Policy of Nepal 2003.

As a signatory to the Convention on Biological Diversity at the Earth Summit (1992), Nepal has fulfilled its commitment and has developed a Nepal Biodiversity Strategy in 2002 to meet the obligations of the Convention and to serve as an overall framework for the conservation and sustainable use of its rich biodiversity and biological resources. Nepal is a party to eight major international agreements and conventions on biodiversity conservation (**Table 4**). Methods for transforming international treaty norms into internal law are in progress in Nepal.

Apart from international conventions and treaties, global affiliations pertinent to biodiversity conservation and sustainable development that Nepal has been affiliated with include the World Trade Organization (WTO), the World Conservation Union - IUCN, and the Global Tiger Forum. Nepal has also followed the spirit of the World Conservation Strategy 1980 and the World Charter for Nature 1982.

Using the authority empowered by the 1973 NPWC Act, and in response to international conventions and treaties, the Government of Nepal has established a network of 16 protected areas (nine national parks, three wildlife reserves, three conservation areas, and one hunting reserve). Buffer zones have been established in eight of the nine national parks (except for Shivapuri National Park), and three wildlife reserves.

Four properties have been inscribed in the UNESCO List of World Heritage Sites. They include two natural properties namely Sagarmatha and Chitwan national parks, and two cultural properties namely Lumbini and the Kathmandu Valley. Of the seven monument zones of the Kathmandu Valley, three properties of national significance are Swayambhu, Pashupati, and Changunarayan.

There are four Ramsar sites of which Koshitappu is a wildlife reserve, and Beeshazar and Associated Lakes fall within the buffer zone of Chitwan National Park. The Jagdishpur reservoir is an artificial water body, whereas Ghodaghodi Tal is a natural lake.

The network of protected areas cover almost 20% of the country's land compared to the global figure of 11% of the earth's land surface under the protected area system. The protected areas of the world face a growing set of global challenges that threaten the existing capacity to protect and maintain the valuable diversity of life and the sources of ecosystem services for people.

## **Biodiversity Assessment**

Nepal has a complex biogeography due to its past geological history and its presence at the crossroads of two bio-geographic realms, Palaeartic and the Palaeotropic (Udvardy 1975), and two major zoogeographical Kingdoms: Palaeartic in the north and Indo-Malayan in the south.

Furthermore, Nepal lies at the crossroad of six floristic regions namely Central Asiatic in the north, Sino-Japanese in the east, South East Asia-Malaysia in the south east, Indian in the south, Sudano-Zambian south west, and Irano-Turanian in the west.

Adam Stainton (1972) used six climatic and vegetation divisions in his classification of forest types of Nepal, and recognised 35 forest types classified into ten major groups which have been widely adopted in later work. Jean-François Dobremez (1972, 1976) recognised four domains (western; northwestern; central; and eastern); six levels and 11 sublevels of bioclimatic zones, and 75 vegetation types.

According to the ecoregional classifications made by the Conservation Science Program of WWF US, Nepal's landmass includes nine land-based ecoregions defined by ecological features, climate, and plant and animal communities. Of them, three each are in three different conservation statuses such as Critical/Endangered, Vulnerable, and Stable/Intact.

The vegetation types described by Dobremez and his Nepalese colleagues totaled 198 categories. The Biodiversity Profiles Project 1995 attempted to synthesise them into 118 categories. During 1998-99, IUCN revised the vegetation types and devised 59 vegetation types for the use of the Tree Improvement and Silvicultural Component/Natural Resource Management Sector Assistance Programme (TISC/NARMSAP). The 59 types have been further reduced to 36 in order to give a simplified ecological picture of Nepal's vegetation based upon climax or near-climax vegetation type spread over potential areas of ecological homogeneity.

The monsoon climate and huge altitudinal range found in Nepal create a wide array of habitats, from the lowland (as low as 67m above mean sea level) evergreen tropical forests in the Terai and low hills (below 1000m) through temperate broadleaved and coniferous forests to the tree line. Above this, Rhododendron scrubland extends up to the high alpine meadows before plant life gives way to the frozen and biologically barren snow capped peaks including Mount Sagarmatha (8848m). The highest recorded flowering plants like *Ermania himalayensis* of the Brassicaceae family are found at around 6000m. The deep river valleys and gorges create their own microclimates. Dramatic vegetation changes can be seen in relatively small areas with differing aspects and altitudes.

Nepal comprises only 0.1% of land area on a global scale, but it possesses a disproportionately rich diversity of flora and fauna at genetic, species and ecosystem levels. These species are found in the dense tropical monsoon forests of the Terai, in the deciduous and coniferous forests of the subtropical and

temperate regions, and in the sub-alpine and alpine pastures and snow-covered Himalayan peaks. Nepal falls within two biogeographical realms - the Indo- Malayan and the Palaearctic realms – which add to the high biodiversity level.

There has been comparatively much work carried out on the higher groups of plants (angiosperms and gymnosperms), but research on the lower groups has not been extensive or systematic.

Lichenologists estimate about 2,000 lichen species in Nepal of which 48 species are reported to be endemic to Nepal. There are 1,822 species of fungi, 687 species of algae, 853 species of bryophytes, and 534 species of ferns and fern allies in Nepal. Similarly, there are 6,391 angiosperm flora of which 25 species of gymnosperms have been listed in Nepal.

Nepal has a relatively high number of fauna species. Higher fauna groups have been relatively well studied; however, the taxonomy and distribution of lower fauna groups except for butterflies, and to some extent spiders, have yet to be studied. A comprehensive Fauna of Nepal guide is essential to understand the status of species for their conservation.

A checklist of 168 species of helminth parasites, 33 species of trematodes, 67 species of nematodes, 36 species of cestodes, and 32 species of plant nematodes has been recorded. There are 144 species of spiders, and approximately 5,052 species of insects.

So far, 2,253 species of moths (excluding Microlepidoptera) have been recorded in Nepal. The current list includes 651 species of butterflies and 785 species of moths.

There are 187 species of fish and 195 species of herpeto fauna (117 amphibians and 78 reptiles) in Nepal. The number of bird species is 874, and mammals, 185.

Of the total 874 species of birds, 62% are resident birds, 14% winter visitors, 12% passage migrants, 6% summer visitors, 5% residents and migrants, and 1% summer and winter visitors. The four new additions in the mammal checklist are the Binturong (*Arctictis binturong*), Indian Mongoose (*Herpestes nyula*), Himalayan marmot (*Marmota himalayana*) and Tibetan gazelle (*Procapra picticaudata*). Mammals are well represented in the protected areas of Nepal.

Species distributions are viewed from two perspectives: confinement, and richness.

Of the total number of mammal species, the Terai-Siwaliks region harbours the highest number of confined species (35 mammal species, 111 bird species, 46 Herpeto species, and 106 fish species). The central phytogeographical region harbours the highest number of confined species (28 mammal species, 24 bird species, 40 Herpeto species, and 31 fish species). Both the regions combined, the central Terai-Siwaliks region, holds the highest number of species.

Based on phytogeographical and altitudinal zoning, Nepal's landmass can be divided into nine blocks. The Mid Hills Centre block harbors the highest number of mammals (55%) and birds species (77%), whereas Terai-Siwaliks Centre harbours the highest number of herpeto (45%) and Fish species (74%). Overall, the Mid Hills Centre has the highest species richness followed by the Terai Siwaliks Centre.

There are 399 endemic flowering plants in Nepal of which about 63% are from the High Mountains, 38% from the Mid Hills, and only 5% from the Terai and Siwaliks. Similarly, the central region contains 66% of the total endemic species followed by western (32%) and eastern regions (29%).

The Himalayan field mouse (*Apodemus gurkha*) which is found in central Nepal between 2200-3600m, is the endemic mammal species of Nepal. The Spiny Babbler (*Turdoides nipalensis*) and the Nepal Kalij (*Lophura leucomelanos leucomelanos*) are endemic to Nepal. There are 14 species of herpetofauna and six species of fish that are endemic to Nepal. Similarly, one hundred and eight species of spiders are reported to be endemic to Nepal.

The updated version of the **National Red Data Book of Nepal** includes 59 mammal species, 279 bird species, 35 Herpeto species and 34 fish species. Of these, two species namely the Cheetah (*Acinonyx jubatus*) and Black musk deer (*Moschus fuscus*) have not probably been recorded in Nepal, and the pigmy hog (*Sus salvanius*) and the Indian Chevrotain (*Moschiola meminna*), have probably become extinct in Nepal.

Of the 11 bird species that were listed as Extinct in Nepal in the BPN, the presence of three species has been recently reported.

Thirty-four species of plants have been included in the IUCN Red List. Of them, two species (*Andrewsianthus ferrugineus* and *Diplocolea sikkimensis*) are considered Endangered, five Vulnerable (*Cycas pectinata*, *Dalbergia latifolia*, *Scaphophyllum speciosum*, *Takakia ceratophylla* and *Ulmus wallichiana*), two Near Threatened (*Aglaia cucullata* and *Cupressus torulosa*), 24 of Least Concern, and one Data deficient (*Taxus wallichiana*).

Altogether, 173 mammal species are listed as Threatened by IUCN: one as Critically Endangered (pigmy hog, *Sus salvanius*), eleven as Endangered, 21 as Vulnerable, 19 as Near Threatened, 120 of Least Concern, and one Data deficient (Csorba's Mouse-Eared Bat *Myotis csorbai*).

Of the total number of bird species (874), three species are critically endangered (Slender-Billed Vulture *Gyps tenuirostris*, Pink-Headed Duck *Rhodonessa caryophyllacea*, and White-Rumped Vulture *Gyps bengalensis*), six Endangered, 23 Vulnerable, 25 Near Threatened and 813 are of Least Concern.

Under the Forest Act 1993, the Government of Nepal has banned the collection use, sale, distribution, transportation, and export of three species effective from February 12, 2001. They are the Pancha ounle (*Dactylorhiza hatagirea*), Okhar ko bokara (*Juglans regia* bark) and 'Kutki' (*Neopicrorhiza scrophulariflora*). The government has also banned the export of eight species of plants and rock exudes (*shilajit*), except for their processed product, and upon the permission of the Department of Forests. Likewise, the government has banned transportation, export, and felling of seven tree species for commercial purposes.

In addition, 26 mammal species, nine bird species, and three reptile species have been listed as protected under the 1973 NPWC Act. However, 10 species of fish and 12 species of butterflies are in need of protection.

In 2003, the Government of Nepal approved the Working Policy on Wild Animal Farming, Breeding and Research. Under its provision, seven species of mammals, one species of amphibian (Ghrial crocodile *Gavialis gangeticus*), all snakes (77 species in total), and all species birds (874 species) including three protected ones.

Nepal is a signatory of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) since 1975; a number of Nepali species are listed under various CITES Appendices, such as 139 species of plants, 66 species of mammals, 128 species of birds and 26 species of fish.

Of the total 181 mammal species excluding four extinct species, 28 species are found only outside the protected sites. Fifteen of these species are bats, 10 species are rats, shrew, and Pikas, and three others are Large-toothed ferret badgers (*Melogale personata*), Malayan porcupines (*Hystrix brachyura*), and Tibetan antelopes (*Pantholops hodgsoni*).

Of the total 867 bird species found in Nepal excluding seven extinct species, only 37 species (5%) are found outside protected sites. Of them, 14 species are migrants, four species are summer/winter visitors, and 19 species are resident birds.

One-third of the total number of Herpeto species (65) and only 25 species of fish are found outside protected sites.

## Protected Areas

### **Khaptad National Park** (225 km<sup>2</sup>) and buffer zone (216 km<sup>2</sup>)

Site code: 7953

A unique landscape of rolling plateau with grasslands harbouring four species of endemic flowering plants, and many religious sites and temples constitute the Park's major significance. The Khaptad Lake is a major feature.

Of the total number of faunal species found in the area, 23 are mammals, 287 birds, and 23 herpeto species. The area harbours 295 recorded vascular plants.

### **Bardia National Park** (968 km<sup>2</sup>) and buffer zone (328 km<sup>2</sup>)

Site codes: 1308 (Park) and 303303 (buffer zone)

The Park provides habitat for many threatened species including the tiger, sloth bear, swamp deer, hispid hare, elephant, dolphin, black buck, mugger, gharial, and a second-generation of rhinos.

The Park is indirectly linked with the Katarniaghat Wildlife Sanctuary in India and features the Karnali and Babai rivers, and the Thakurdwara shrine. It harbours 59 faunal species of mammals, 407 birds, 42 herpeto and 124 fish species. Recorded number of vascular plants from the area is 173.

### **Rara National Park** (106 km<sup>2</sup>) and buffer zone (198 km<sup>2</sup>)

Site code: 806

The smallest national park in Nepal, Rara National Park provides habitat for leopards, the Red panda, Danphe pheasants, and musk deer, as well as harbours 16 species of endemic flowering plants. Established to maintain the natural beauty of Rara Lake and protect it from sedimentation and other adverse impacts of human activities, the Park had to completely evacuate local people, however. The numbers of faunal species found in the Park include 51 mammals, 241 birds, two herpeto and three fish species. The number of vascular plants recorded in the area is 88.

### **Shey-Phoksundo National Park** (3,555 km<sup>2</sup>) and buffer zone (1,349 km<sup>2</sup>)

Site codes: 7952 (Park) and 313457 (buffer zone)

This is the largest national park in Nepal and represents the Trans-Himalayan ecosystem. Home to the Snow leopard and musk deer, the Park's prominent feature is Phoksundo Lake, and the area is a proposed World Heritage Site for its cultural significance. Local people inhabit the Park, as well as 30 species of endemic flowering plants and faunal species that include 35 mammals, 208 birds, and three Herpeto species. The number of vascular plants recorded from the area is 174.

### **Chitwan National Park** (932 sq km<sup>2</sup>) buffer zone (750 sq km<sup>2</sup>)

Site codes: 805 (Park) and 303694 (buffer zone)

The first national park in Nepal, Chitwan National Park is also a World Heritage Site, a tourist destination famous for exotic fauna such as the Greater one-horned rhino, tiger, bison, gharial, migratory birds and elephant and crocodile breeding centres. The Ranital and Bishazari Tal (Lakes), Narayani and Rapti rivers, and other wetlands, and Bikram Baba's temple, the Valmiki Ashram and other cultural sites are also found here. The Park is connected to Valmiki Tiger Reserve in India. The numbers of faunal species found in the Park include 58 mammals, 539 birds, 56 herpeto, and 124 fish species. There are 234 recorded vascular plants in the area.

### **Langtang National Park** (1,710 km<sup>2</sup>) and buffer zone (420 km<sup>2</sup>)

WDPA Site code 803 and Site code: 313458

Of Nepal's protected areas, Langtang National Park (over 6450m) is distinguished as having one of the greatest altitudinal ranges within its boundaries. The Park is linked with Qomolangma Nature

Preserve in the Tibet Autonomous Region of China, and is famous for the Red panda, religious shrines like Gosainkund, and 15 species of endemic flowering plants. Local people inhabit the Park. The numbers of faunal species found in the area include 45 mammals, 345 birds, four herpeto, and two fish species. The number of vascular plants recorded in the Park is 1,043.

**Shivapuri National Park** (144 km<sup>2</sup>)

Site code: 10910

This national park is the nearest to the capital city, Kathmandu, and is a major watershed providing drinking water to Kathmandu's burgeoning urban population. The Park is rich in bird species and plants, and is the only walled protected area in Nepal. It serves as habitat for the relict Himalayan dragonfly, and harbours 16 species of endemic flowering plants. The numbers of other faunal species found in the Park include 19 mammals, 311 birds, and three herpeto species. Some 449 species of vascular plants are recorded present in the Park.

**Sagarmatha National Park** (1,148 km<sup>2</sup>) and buffer zone (275 km<sup>2</sup>)

Site codes: 804 (Park), 313459 (buffer zone)

Sagarmatha National Park is the 120<sup>th</sup> World Heritage Site. The Park is characterised by a rugged terrain, features Mount Everest (the world's highest peak at 8848m), and other peaks and glaciers, Sherpa settlements below, and is linked with Qomolongma Nature Preserve in the Tibet Autonomous Region of China. Twenty-one species of endemic flowering plants and 10 species of rhododendron grow in the area. The numbers of faunal species include 33 mammals, 208 birds, five herpeto and one fish species. The Park records 160 vascular plants.

**Makalu Barun National Park** (1,500 km<sup>2</sup>) and buffer zone (830 km<sup>2</sup>)

Site codes: 26606 (Park) 26605 (buffer zone)

Makalu Barun National Park provides ecological support to the Mt. Everest Ecosystem, and habitat for threatened species of the Black bear, Red panda, and Musk deer. The Park is linked with Qomolongma Nature Preserve in the Tibet Autonomous Region of China. Twenty-five species of rhododendrons thrive in the area, and eight species of endemic flowering plants; the presence of archive species (*Tetracentron chinense*) has also been noted. The numbers of faunal species found in the Park area include 81 mammals, 421 birds, 14 herpeto and 13 fish species. The area has 284 recorded vascular plants.

**Shuklaphanta Wildlife Reserve** (305 km<sup>2</sup>) and buffer zone (243.5 km<sup>2</sup>)

Site code: 1309

Characterised by extensive grasslands (*phanta*) and forests, and featuring the Mahakali River, the largest pool of swamp deers, tiger, rhino, elephant, python, monitor lizard, cobra. The numbers of faunal species are 46 Mammals, 351 birds, 7 herpeto, and 28 fish. The number of vascular plants as recorded from the available records is 553.

**Parsa Wildlife Reserve** and (499 km<sup>2</sup>) and buffer zone (298.2 km<sup>2</sup>)

Site code: 10089

The numbers of faunal species are 37 mammals, 503 birds, eight herpeto and eight fish  
The number of vascular plants as recorded from the available records is 298.

The major protected area related significances are eastern extension of CNP, Representative Churia ecosystem, portion of *char-kose jhadi*, home to species like wild elephant, gaur and tiger; and Shiva temple.

**Koshitappu Wildlife Reserve** (175 km<sup>2</sup>) and buffer zone (173 km<sup>2</sup>)

Site code: 1310

Refuge for the last remaining population of wild buffalos (below 150 in number), Koshitappu Wildlife Reserve is rich in water fowl and other birds, features the Koshi River, and is the first Ramsar site of Nepal. The numbers of faunal species found in the Reserve include 23 mammals, 485 birds, 17 herpeto and 105 fish species. Some 158 vascular plants are recorded in the area.

#### **Dhorpatan Hunting Reserve (1,325 km<sup>2</sup>)**

Site code: 10087

The only hunting reserve in the country, Dhorpatan is renowned for the Blue sheep (*Pseudois nayaur*), and 36 species of endemic flowering plants. The numbers of faunal species found in the area include 18 mammals, 137 birds, and two herpeto species. Fifty-eight vascular plants have been recorded as present in the reserve.

#### **Annapurna Conservation Area (7,629 km<sup>2</sup>)**

Site code: 10091

The largest protected area in Nepal, the Annapurna Conservation Area's habitat represents the Trans-Himalayan and mountain ecosystems, contains the deepest gorge of the Kali Gandaki River, and is both the highest and lowest rainfall area in Nepal. The Annapurna is home to the Snow leopard, Musk deer, pheasants, and records the presence of 97 mammal species, 476 birds, 56 herpeto and two fish species. The Muktinath, the famous Hindu and Buddhist pilgrimage site, is located here, as well as other shrines and ancient monasteries. Fifty-five species of endemic flowering plants have been recorded present in the area, as are 456 vascular plants.

#### **Manaslu Conservation Area (1,663 km<sup>2</sup>)**

Site code: 143002

Habitat for the Snow leopard, Grey wolf, musk deer, blue sheep and the Himalayan tahr, Manaslu has on record 21 mammals and 193 bird species, and 587 species of vascular plants.

#### **Kangchenjunga Conservation Area (2,035 km<sup>2</sup>)**

Site code: 143001

Habitat for the Snow leopard, Musk deer; rhododendrons, Himalayan larch, and some of the world's largest glaciers, Kangchenjunga also presents an opportunity for realising a tri-nation peace park linking it with Qomolongma Nature Preserve in the Tibet Autonomous Region of China and Kangchenjunga Biosphere Reserve in Sikkim, India. This conservation area has on record faunal species of 13 mammals, and 280 birds and 77 species of vascular plants.

Apart from the 16 protected areas, there are nine additional sites (five conservation areas covering in total 50,600 ha, four hunting reserves with a cumulative area of 98,500 ha, and one national park extension of 96,200 ha (WDPA).

## **Ramsar Sites**

#### **Ghodaghodi Tal (area: 2,563 ha)**

Ramsar site number 1314 Site code: 901298

A large and shallow oxbow lake with associated marshes and meadows surrounded by tropical deciduous forest, 98% of which is dense forest and 2% pasture, this Ramsar site is a wildlife corridor between the lowland and the Siwalik fed by direct precipitation during the monsoon season. The area is intensively used for traditional fishing and agriculture while at the same time serves as an important religious landmark. The Department of Forest has management authority over 16 local community-based organisations involved in managing the site. A management plan for the site has been prepared, and community-based anti-poaching operations are in practice. The site has 34 mammals, 96 birds, nine herpeto, and 23 fish species on record and 388 species of vascular plants.

### **Jagdishpur Reservoir** (area: 255 ha)

Ramsar site number 1315 Site code: 901299

The reservoir has been constructed for irrigation purposes for 6,200 ha; water is fed from the Banganga River. The reservoir is surrounded by cultivated land, and serves as shelter for some rare and endangered species. Management responsibility for the area is shared by the Department of Irrigation, the District Forest Office, and the local community. The area has green belt plantations, and land uses include fishing, grazing, fuel wood and fodder collection, household consumption, with potential for commercial stock fish production, and a proposed for bird sanctuary. The reservoir has on record faunal species of six mammals, 45 birds, nine herpeto, and 18 fish species and floral species of 16 vascular plants.

### **Beeshazar and Associated Lakes** (3,200 ha)

Ramsar site number 1313 Site code: 901297

An extensive typical oxbow lake system inside the buffer zone of Chitwan National Park, Beeshazar and its Associated Lakes is a World Heritage site that consists of 30% open forest, 40% dense forest, 15% grassland, and 15% pasture. Water is fed from direct precipitation and the Khageri irrigation canal and is supplied to the canal during the dry season. The site helps control flooding in the Khageri River and recharges the ground water, and provides excellent habitat as a watering hole and corridor for endangered wildlife species. The numbers of faunal species on record in the site are 26 mammals, 271 birds, 18 herpeto, and 25 fish species and floral records of seven vascular plants. Nearly 100,000 people practice farming and fishing in the lake and its environs. A buffer zone management committee has been constituted for the area, and invasive weeds have been manually removed from the site and associated lakes.

### **Koshitappu Wildlife Reserve**

Ramsar site number 380 Site code: 14196

A section of the Sapta Kosi River and its floodplains which consists of extensive mudflats, reed beds, and freshwater marshes, this reserve is an important staging area for water birds. The area is subjected to livestock grazing and attempts by local people to re-establish themselves in the reserve. Subsistence fishing and rice cultivation are the major sources of livelihood of people living near the reserve.

## **World Heritage Sites**

### **Lumbini, the Birth Place of the Lord Buddha** (area 64.5 km<sup>2</sup>)

Site code: 900334

This is the 666<sup>th</sup> World Heritage Site and is the birth place of Lord Buddha (Siddhartha Gautama, born in 623 BC in the famous gardens of Lumbini). Also famous for the Ashok pillar and as a Buddhist pilgrimage centre, the site features the Harhawa river catchment (21 km<sup>2</sup>), the Telar mentioned by Chinese travelers as flowing close to the birthplace of Buddha. The area consists of grassland (400 ha) 58.8%, forest plantation (270 ha) 40%, and open bodies of water (10 ha) 1.5%, and a plantation of over 65 species of more than 370,000 saplings, and a nesting place in 2005 of the 25 Sarus crane and 50 Blue bulls. The numbers of faunal species recorded in Lumbini includes 26 mammals, 207 birds, 39 herpeto, and 44 fish species and records of 72 vascular plants.

### **Chitwan National Park**

Site Code: 10905

The 284<sup>th</sup> World Heritage Site, Chitwan National Park contains the largest and least disturbed example of natural Sal hill forest and associated communities of the Terai. The site is rich in flora and fauna, with populations of the Single-horned Asiatic rhinoceros, the Bengal tiger, and other endangered species. A system of controls has been established in the Park on the use of the Kasara

Bridge and associated roads. There are threats of invasive plants and a paper mill, however. (Also see Chitwan National Park and Buffer Zone)

### **Kathmandu Valley**

Site Code: 900068

The Kathmandu Valley, the 121<sup>st</sup> World Heritage Site, is a bowl shaped valley with average 25km diameter and features four of the seven monument zones namely Swayambhu, Pashupati, and Changunarayan located in their natural settings. Biological explorations of the Valley was initiated as early as 1793. It contains six major forest types and is home to about 550 species of birds. Management of the site is community based, with legally-formed management bodies.

### **Swayambhu Monument Zone (0.6 km<sup>2</sup>)**

Swayambhu monument zone is the type locality for 27 species of flowering plants discovered by Francis Buchanan, later Hamilton, in 1802-03. The zone contains a plantation and natural forests, 64 species of birds, and is colonised by about 300 Rhesus macaques. The Natural History Museum of Nepal, with over 55,000 biological specimens managed under a master plan, is located in the zone. The numbers of faunal species recorded in the zone include six mammals and 64 birds, and the number of vascular plant records is 109. Lively festivals are celebrated here throughout the year.

### **Pashupati Monument Zone (2.64 km<sup>2</sup>)**

Lying on both banks of the Bagmati River, Pashupati monument zone harbours forests (50.27 ha) in three main plots and is home to 63 species of birds, populated by over 200 Rhesus macaques, 32 ungulate species including the Barking deer, Spotted deer, and Blackbuck translocated from the Central Zoo. The Guheshwori wastewater treatment plant (5ha) is also in the area and the zone is managed under the Pashupati Area Development Trust Act. The numbers of faunal species recorded in the zone include nine mammals and 63 birds. The number of recorded vascular plants is 74.

### **Changunarayan Monument Zone (0.5 km<sup>2</sup>)**

One of the oldest Hindu temples of the Valley (3rd century), the oldest stone inscription discovered in Nepal (5th century) can be found in the zone. It contains community forests (47 ha), natural forests (21.25 ha) dominated by a *Schima wallichii*, plantation forest (15 ha) mainly of pines (*Pinus roxburghii*), and is home to over 51 species of birds, seven recorded mammals, and 21 recorded vascular plants. Soil conservation with bioengineering work in the zone is ongoing.

### **Sagarmatha National Park (120<sup>th</sup> World Heritage Site)**

Site Code: 2007

An exceptional area with dramatic mountains, glaciers, and deep valleys dominated by Mount Everest, the highest peak in the world (8848m), Sagarmatha National Park is home to several rare species (the Snow leopard, Musk deer and Red panda), and is noted for the presence of the Sherpas, plantation and natural forest management, waste management involving community participation. (Also see Sagarmatha National Park and Buffer Zone)

## **Conclusion**

Based on the biodiversity assessment the following conclusions have been made:

### **Vegetation**

Of the 36 types of vegetation as simplified from the previous classifications, 31 types are represented in the 16 protected areas. Annapurna Conservation Area represents 16 vegetation types. The five types of vegetation that are not represented in the 16 protected areas are forests of Fir (*Abies lasiocarpa*), Hemlock (*Tsuga* spp. *Viburnum*, *Viburnum* spp) –Oak (*Quercus laurifolia*), Lithocarpus, Rhododendron, *Olea* (Olives), and *Eugenia* (myrtle family Myrtaceae) and *Ostodes* (family Euphorbiaceae).

## Flora

By 2006, total number of flowering plant species recorded from Nepal is 6,391 representing 1,590 genera and 231 families compared to 4,259 species representing 1,447 genera and 194 families in 1995. Nepal's share of flowering plants species is 2.76% of global totals compared to earlier records of 2.36%. Nepal's share of pteridophytes is 5.15% compared to earlier records of 4.45%.

The present number of flowering plant species endemic to Nepal is 399 compared to earlier records of 246, which has been reduced by 40 due to possible extinction (eight species) and new reporting elsewhere (32). The number of species included in the IUCN Red List is 34, which is approximately 0.5% of the total number of species in the IUCN Red List. There are 72 plant species regarded as having high commercial value. The Government of Nepal has banned commercial exploitation of 18 species of plants, and the CITES appendices include 139 species.

There are 2,532 species of vascular plants represented by 1,034 genera and 199 families in the protected sites. Some 130 endemic species are found in the protected sites. On average, the NBY records of flowering plant species are 40% more compared to the BPN estimates for protected areas.

## Fauna

The current checklist includes 185 species of mammals of which four species are believed to be extinct from Nepal, and four new additions. In general, the total number of reported fauna species has increased since 1996. The number of bird species is 874 compared to 843 in 1995, and herpeto species 195 compared to 143 in 1995.

A new field of entomology has been opened with the publication of the IUCN Red List, among others, which has recorded 536 species under 17 orders from Protura to Odonata, 789 species of moths, and 656 species of butterflies. Remarkably, of the known 5,052 species of insects recorded from Nepal, 1,131 species, which is over 22% of the world list, are species that have been first discovered and described from Nepalese specimens.

Nepal's share of the mammal species is 3.96% of global totals, and bird species 8.9%.

The Terai-Sivaliks region harbors the highest number of confined species (35 mammal species, 111 bird species, 46 herpeto species, and 106 fish species) compared to other physiographical regions. Similarly, the central phytogeographical region harbors the highest number of confined species (28 mammal species, 24 bird species, 40 herpeto species, and 31 fish species) compared to the eastern and western regions. For both combined regions combined, the central Terai-Sivaliks region has the highest recorded number of confined species.

There are 11 mammal species found in all nine regions, but there are 11 other mammal species that are not reported in any of these regions. In case of the birds, 104 species are found in all nine regions, but 41 species are not reported in any of the regions.

Among the nine regions, the Mid Hills Center harbors the highest number of mammals (55%) and birds species (77%), whereas Terai-Sivaliks Center harbors the highest number of herpeto species (45%). The eastern Terai-Sivaliks houses 74% of all fish species found in Nepal. Overall, the Mid Hills Centre has the highest species richness, followed by the Terai Sivalik Center, the Terai Sivalik East, the Terai Sivalik West, the Mid Hills East, the Highlands Center, Mid Hills West, Highlands East, and Highlands West.

Annapurna Conservation Area (ACA) harbors 97 mammal species (52%), and Chitwan National Park (CNP) harbors 539 species (62%). The CNP and ACA combined are home to 29% herpeto species, and 66% fish species found in Nepal.

The only endemic mammal in Nepal, the Himalayan field mouse (*Apodemus gurkha*), is found in the Central Mid Hills and High Mountain regions. In the case of birds, the endemic Spiny Babbler (*Turdoides nipalensis*), is found in the Terai-Sivaliks and Mid Hills regions. The subspecies, Nepal Kalij (*Lophura*

*leucomelanos leucomelanos*) is also endemic to Nepal and is found in the western regions. Fourteen species of herpetofauna and six species fish are endemic to Nepal.

The NRDB includes 59 mammal species, 279 bird species, 35 Herpeto species, and 34 fish species, of which four species of mammals and seven species birds are believed to be extinct, according to the updated checklists. Altogether, 173 mammal species (nearly 94% of total 185 mammal species) are listed as threatened by IUCN. Of the total number of bird species (874), three species are critically endangered (the Slender-billed vulture *Gyps tenuirostris*, the Pink-headed duck *Rhodonessa caryophyllacea* and the White-rumped vulture *Gyps bengalensis*). Sixty-four species of herpeto (34% of total herpeto species) are listed in the IUCN Red List.

Twenty-seven mammal species, nine bird species, and three reptile species are listed as protected species under the NPWC Act 1973. Ten species of fish and 12 species of butterflies are in need of protection. Sixty-six species of mammals are listed in the CITES Appendices.

In case of fauna, the number of birds reported from the protected areas has increased considerably since 1996. For example, the number of birds listed for Chitwan National Park was 483 in 1996 compared to 539 in 2006, and for Koshitappu 199 in 2006 compared to 485 in 1996. However, the number of mammal species has decreased by one in Sagarmatha National Park, due to non-reporting of the Black musk deer.

Of the total 181 mammal species excluding four extinct species, 28 species are found outside protected sites. Of them, 15 species are bats (out of a total 37 species), 10 species are the shrew, rats, and Pikas, and three other species. Three species namely, the Golden jackal (*Canis aureus*), Rhesus macaque (*Macaca mulatta*) and Common leopard (*Panthera pardus*) are found in the 20 protected sites.

Of the total 867 bird species excluding seven extinct species found in Nepal, 37 species (5%) are found outside protected sites. One-third of the total number (65) of Herpeto species are found outside protected sites, and 25 species of fish are also outside protected sites. In case of herpetofauna, the number of reported species has increased in all protected areas. Similarly, the number of fish species in Chitwan National Park was recorded to be 125 in 1996, and only 124 in 2006.

Separate lists of fauna species have been prepared for globally significant areas such as Ramsar sites and World Heritage Sites. Compared to protected areas, these areas have been studied less and limited data are available.

According to the mammal checklists (185), based on the available records by 2006, the Annapurna Conservation Area records the highest number of species (97), followed by Makalu-Barun National Park (81), compared to 13 in the Kanchenjunga Conservation Area. Similarly, the number of mammal species in Ghodaghodi Tal Ramsar site is 34 compared to six in Jagdishpur Reservoir Ramsar site, nine in Pashupati, and six in Swayambhu.

According to the bird checklists (874) based on available records by 2006, the Chitwan National Park records the highest number of species (539) followed by Parsa Wildlife Reserve (503), and 137 in Dhorpatan Hunting Reserve. Similarly, the number of species in Bishazari Tal Ramsar site is 271 compared to 45 in Jagdishpur Reservoir Ramsar site, and 64 bird species in Swayambhu compared to 51 in Changunarayan.

These variations in recorded number of faunal species in protected sites are primarily due to differing intensities of biological explorations in these sites.

### **Ex-Situ Conservation**

Apart from conservation of species in the wild, some efforts have been made towards ex-situ conservation and specimen preservation. There is a network of 11 botanical gardens across the country. The central botanical garden of Godavari houses nearly 300 species of plants.

The National Herbarium (KATH) houses over 161,800 specimens, and the Central Department of Botany of the Tribhuvan University (TUCH) houses 20,000 specimens.

The Central Zoo houses 119 species of 970 animals of which there are 33 species of 206 mammals, 60 species of 321 birds, 17 species of 424 fish species, and nine species of 19 reptiles. The Hetauda Municipality Zoo houses species of the Spotted deer, Barking deer, hares, birds, and tortoises, amongst others.

Captive breeding of crocodiles has been carried out successfully in the Gharial farm in Chitwan. Between 1978 and 2005, 661 captive bred Gharials were released into the rivers of Nepal.

There are 171 domesticated elephants in Nepal, of which 77 belong to the government, nine to Nepal Trust for Nature Conservation, and 85 to the private sector.

Since 1986, translocation of rhinos has been carried out successfully using Chitwan National Park as a gene pool. Between 1986 and 2003, a total of 87 rhinos (39 males, and 48 females) have been translocated to Bardia National Park (83), and Shuklaphanta Wildlife Reserve (4). Blackbuck translocation was initiated in 1992 from the Central Zoo to Bardia National Park, and recently to Pashupati World Heritage Site.

The Natural History Museum houses over 40,000 zoological specimens and over 9,000 botanical specimens. The wildlife museums in the protected areas have preserved a number of specimens of wildlife and plants mostly found locally.

## **Recommendations**

Thirteen recommendations have been made to further biodiversity exploration and protection of species outside protected sites, prepare and update the checklists of flora and fauna, verify doubtful species, link the NBY data with other available databases, and review the NRDB, as well as on policies relevant to biodiversity conservation.

# Acronyms and Abbreviations

ACA	Annapurna Conservation Area
BNP	Bardia National Park
BPN	Biodiversity Profiles of Nepal 1996
BPP	Biodiversity Profiles Project
BTRS	Bishazari Tal Ramsar Site, also called Beeshazar and Associated Lakes
BZ	buffer zone
CAMC	conservation area management committee
CBO	community-based organisation
CDR	Central Development Region
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNP	Chitwan National Park
CP	Central Phytogeographical Region
CR	critically endangered
CWHS	Changunarayan World Heritage Site
DD	data deficient
DDC	district development committee
DFID	Department for International Development
DHR	Dhorpatan Hunting Reserve
DNPWC	Department of National Parks and Wildlife Conservation
EDR	Eastern Development Region
EIA	environmental impact assessment
EN	endangered
EP	Eastern Phytogeographical Region
E-W	east-west
EW	extinct from the wild
EX	globally extinct
FAO	Food and Agriculture Organization
FDR	Far-Western Development Region
GDI	Gender-related Development Index
GO	gazetted officers
GoN	Government of Nepal
GTF	Global Tiger Forum
GTRS	Ghodaghodi Tal Ramsar Site
ha	hectare
HDI	Human Development Index
HH	household
HL	Highlands
HL CP	Highlands Central Phytogeographical Region
HL EP	Highlands Eastern Phytogeographical Region
HL WP	Highlands Western Phytogeographical Region
HPI	Human Poverty Index for developing countries
IEE	initial environmental examination
IUCN	The World Conservation Union
JRRS	Jagdishpur Reservoir Ramsar Site
KCA	Kangchenjunga Conservation Area
km	kilometre
km <sup>2</sup>	square kilometre
KNP	Khaptad National Park
kW	kilowatt

KWR	Koshitappu Wildlife Reserve
LC	least concern
LCCC	Lumbini Crane Conservation Centre
LDA	Lumbini Development Area
LDT	Lumbini Development Trust
LNP	Langtang National Park
LRMP	Land Resource Mapping Project
LSG	local self-governance
LWHS	Lumbini World Heritage Site
m	metre
MBNP	Makalu-Barun National Park
MCA	Manaslu Conservation Area
MDR	Mid-Western Development Region
MFSC	Ministry of Forests and Soil Conservation
mg/l	milligram per litre
MH	Mid Hills
MH CP	Mid Hills Central Phytogeographical Region
MH EP	Mid Hills Eastern Phytogeographical Region
MH WP	Mid Hills Western Phytogeographical Region
mm	millimetre
MOCTCA	Ministry of Culture, Tourism and Civil Aviation
MOEST	Ministry of Environment, Science and Technology
NA	Nepal Army
NARMSAP	Natural Resource Management Sector Assistance Program
NBS	Nepal Biodiversity Strategy
NBYP	Nepal Biodiversity Yearbook Project
NE	not evaluated
NG	non-gazetted staff
NGO	nongovernment organisation
NNC	Nepal Nature dot Com
NP	National Park
NPWC	National Parks and Wildlife Conservation
NRDB	National Red Data Book
NRs	Nepalese rupees
NT	near threatened
NTNC	National Trust for Nature Conservation
PA	protected area
PADT	Pashupati Area Development Trust
PALNet	Protected Areas Learning Network
PWHS	Pashupati World Heritage Site
PWR	Parsa Wildlife Reserve
RNP	Rara National Park
RS	Ramsar sites
Rs	Rupees
SAARC	South Asian Association for Regional Cooperation
ShNP	Shivapuri National Park
SNP	Sagarmatha National Park
SPNP	Shey-Phoksundo National Park
SSC	Species Survival Commission
SWHS	Swayambhu World Heritage Site
SWR	Shuklaphanta Wildlife Reserve
TAL-N	Terai Arc Landscape - Nepal
TCM	traditional Chinese medicine
TISC	Tree Improvement and Silvicultural Component
TRAFFIC	Trade Records Analysis of Flora and Fauna in Commerce

TRPAP	Tourism for Rural Poverty Alleviation Project
TS	Terai and Siwalik
TS CP	Terai and Siwalik Central Phytogeographical Region
TS EP	Terai and Siwalik Eastern Phytogeographical Region
TS WP	Western Phytogeographical Region Terai and Siwalik
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
v2.3	IUCN Red List of Threatened Species version 2.3 (1994)
v3.1	IUCN Red List of Threatened Species version 3.1 (2001)
VDC	village development committee
VU	vulnerable
WCMC	World Conservation Monitoring Center
WCPA	World Commission on Protected Areas
WDPA	World Database on Protected Areas
WDR	Western Development Region
WG	women's group
WHC	World Heritage Committee
WHS	World Heritage Sites
WP	Western Phytogeographical Region
WR	wildlife reserve
WS	wetland site
WTO	World Trade Organization
WWF	World Wildlife Fund



Pine, rhododendron, and barren snowcapped mountains characterise the landscape of Sagarmatha National Park  
(Govinda Joshi)