

Forest Diversity of Nepal's Protected Areas in the Mountains

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Abstract

Mountain protected areas in Nepal are rich in forest bio-diversity and they represent highest territorial ecosystem on earth. This paper reports the forest types and endemic flowering plants in 12 protected areas in Nepal. Since the country is linked with six phyto-geographical provinces and there are over 47 types of vegetation represented in the protected areas of Nepal. Our knowledge on mountain ecology is incomplete and scientific research and education are yet to become important part of protected area activities.

Key words: *Terrestrial ecosystem, Protected area, Phytogeographic provinces, Bio-diversity.*

Introductory

Mountain Protected Areas (MPA) in Nepal Himalaya represents the highest terrestrial ecosystem of the earth. There is a special responsibility to safeguard this unique heritage for the present and the future generations as well. These properties are facing ever increasing human threats that are local as well as global in nature. Therefore, these properties need a sound management system that ensures a harmony between man and nature. Such a management system must be equipped with information which are accurate and reliable in order to prescribe appropriate interventions. A long-term scientific studies of MPA would be most essential to monitor impacts and biospheric changes.

The high altitude laboratory established in 1990 at an altitude of 5050 m in the Mt. Everest region (Sagarmatha National Park of Nepal) functions as an inter-disciplinary scientific laboratory and a permanent meteorological and seismic monitoring station. The Royal Nepal Academy of Science and Technology is collaborating with the Italian National Research Council (CNR) to promote scientific researches through the project EV-K2-CNR. Research facilities in the "Pyramid" are being used by a number of scientists from various disciplines such as earth science, environmental science, biological science, human sciences and technological research. Research agenda for such facilities should be based upon local relevance and global significance. The protected area management hardly uses the research results. As such the facility has not yet been internalized by Nepalese scientists.

Protected Areas and Forest Type Diversity

The physiographic diversity of Nepal has aggravated the occurrence of several vegetation types even in a small area. Altitudinal range of some protected area like the Makalu-Barun National Park is one of the highest in the world. Its valley floor drops down to less than 1000 m altitude while mountain crests rise to over 8000 m. This happens within a distance of less than 25 km. Some MPA, like the Annapurna Conservation Area, encompasses the wettest south side of the main Himalayan crest (over 4000 mm annual rainfall) as well as the arid (less than 100 mm annual rainfall) trans-Himalayan Tibetan plateau within a geographical distance of less than 50 km. Therefore, it has 23 types of vegetation within the protected area. Main while, the number of endemic plants also amount to 55 species (Figure 1). Forest diversity is reduced towards Southern Nepal, which is not mountainous. The protected areas of southern Nepal lie in the Tropical Zone of Nepal's Tarai and Dun Valleys. Thus the number of vegetation Types is low. The climate and vegetation is uniformly contiguous with Indian territories. As a result the number of endemic plants come very low or even nil.

Bio-geographically Nepal is a "Land-linked" country that provides linkages to six phytogeographical provinces i.e. (i) Sino-Japanese, (ii) Central Asiatic, (iii) Indian (South Asiatic), (iv) South-East Asiatic, (v) Sudano-Zambian, and (vi) Irano-Turanian (Dobremcz, 1972). Therefore, it has representation from various phytogeographic provinces, and endemic is not so pronounced. Most cases of endemism are rather restrictive to small areas. Endemic plants of one protected area do not necessarily occur in another protected areas even within same bioclimatic zone. Distribution of protected areas and the number of forest types and endemic plants occurring there in are presented in Table I.

Environmental Capital in the Mountains Region

Nepal's environmental capital, in terms of her biomass, landmass, biological diversity, water resources and human capacity, stands at high level. However, their valuation at current market price and their marketing to generate common economic wealth remain at a very low level of development. As a result Nepal contributes to an annual run-off of 170 billion cubic metre of fresh water from her territory. Nepal's over 6000 rivers and streams are potential source of hydro-power for an estimated amount of 83,000 Mega Watt.

Nepal's landmass that ranges from 60 m from the mean sea level to over 8,000 m at the crest of Himalaya is the home for all types of world's agro-climate from tropical to alpine and Arctic types. The biological diversity of Nepal claims about 9 percent of the world's bird species and 4 percent of the mammals and over 2 percent of the flowering plants in an area which is no more than 0.1 percent of the world's land surface. Nepal's forest covers which is estimated to be at 37 percent is still one of the highest figures in south Asia, and this forest cover is represented by over 35 forest types ranging from tropical hard woods to sub-alpine conifers. Nepal's recorded list of medicinal plants amounts to 700 species and a number of them are also marketed in India and abroad. Economic returns for Nepalese collectors remains no more than daily wages for collection and transportation. The resin pine which is extracted from one of our medicinal plants (*rauwolfia serpentina*) holds something like US \$ 400 million market in USA. Nepal was a suppliers of this drug till 1960's when it depleted drastically and because of the market force of a cancer curing chemical Taxol, which is obtained from the tree. This plant has proved to be very significant in economic terms but its sustainable harvest and equitable sharing of the benefit to the people are being questioned off and on.

Biodiversity like other environmental resources is still regarded as public goods and even national sovereignty has not been fixed on them. Valuation of biodiversity has not gone any further than the consumptive value of its biomass. The value of a *Brahmin duck* is no more than its 2 kg. of meat in a local restaurant. The value of a bundle of firewood from Rhododendron tree is no more than its fuelwood value in a local lodge. Adding value to these resources should be the function of mountain research in Nepal.

There are over 47 types of vegetation represented in the protected areas of Nepal. Of them, 23 types of vegetation are represented in the Annapurna Conservation Area because of its being located in the central sector of Nepal where the East Himalayan flora and forests merge with those of West Himalayan walls. This area also consists of the monsoon drenched Southern slope of the Himalayas as well as the arid Trans Himalayan region akin to the

contiguous Tibetan plateau. This protected area, however, does not allow to the occurrence of tropical forests. It is the Makalu-Barun Conservation area that offers a habitat or the occurrence of saal forest, protected areas of Nepal do encompass all forest types and vegetation types of Nepal except the Eugenia-Ostodes forest which occurs towards the extreme East of Nepal bordering Sikkim.

Table 1: Occurrence of Forest Types and Numbers of Endemic Flowering Plants in Protected Areas

Forest Types/Ecological Zones	SNP	KCA	MBC -A	MBN P	ACA	MCA	LNP	SPNP	DHR	KNP	RNP	SWW R
Nival Zone (about 5,000 m)	*	*		*	*	*	*	*	*			
Alpine Zone (4,000-5,000 m)												
Alpine Pasture	*		*	*	*	*	*	*	*			
Juniper Scrub	*					*	*					
Alpine Meadow				*	*				*			
Dwarf Rhododendron Scrub		*		*			*					
Alpine Mats and Scrub								*			*	
Sub-alpine Zone (3,000-4,000)												
Trans-Himalayan Steppe					*	*	*	*				
Fir-Blue Pine Forest					*							
Blue Pine Forest					*			*				
Fir-Birch-Rhododendron Forest	*		*	*		*						
Rhododendron-Juniper Shrubland				*								
Birch-Rhododendron Forest			*	*	*	*	*	*	*		*	
Rhododendron Shrubberies		*		*			*	*				
Fir Forest		*	*	*	*	*	*	*	*		*	
Larch Forest		*				*	*					
Sub-alpine Juniper Forest	*				*							
Fir-Oak-Rhododendron Forest										*		
Sub-alpine Mountain Oak Forest								*			*	
Temperature Zone (2,000-3,000 m)												
Upper temperature Blue Pine Forest	*				*	*	*	*			*	
Temperate Juniper Forest					*		*	*	*		*	
Spruce Forest					*							
Blue Pine-Spruce Forest						*					*	
Blue Pin-Oak Forest									*			
West Himalayan Fir-Hemlock-Oak Forest					*					*		
Hemlock-Oak-Rhododendron Forest					*							
Temperate Mountain Oak Forest			*	*	*	*	*	*	*		*	
Rhododendron Forest							*					
Mountain Oak-Rhododendron Forest										*		
Deciduous Maple-Magnolia/Sorbus Forest			*	*								
Mixed Broad Leaved Forest		*		*								
Cedar Forest								*				
Cypress Forest								*				
Blue Pine-Cypress Forest					*							
Mixed Blue Pine-Oak Forest					*		*					
Lower Temperate Oak Forest			*	*	*	*	*		*	*		
Mixed Oak-Laurel Forest					*					*	*	
Deciduous Walnut-Maple-Alder Forest					*			*	*	*	*	
East Himalayan Oak-Laurel Forest		*	*	*	*		*	*	*			
Sub-tropical Zone (1,000-2,000 m)												
Chir Pine Forest						*	*			*		*
Chir Pine-Broad Leaved Forest			*			*	*	*	*	*	*	*
Alder Forest					*					*		
Schima-Castanopsis Forest		*	*	*	*		*				*	
Steppe with Euphorbia royleana, Grasses and Artemisia								*	*			
Tropical Zone (below 1,000 m)												
Hill Sal Forest			*									
Lower Tropical Sal and Mixed Broad Leaved Forest												
Riverine Khair-Sissoo Forest												
Ravine Broad Leaved Forest												
Pseudosteppe with Gramineae, Tropical Elephant Grasses												
Total	6	8	11	15	23	13	18	14	13	8	8	5
Endemic Flowering Plants	11	?	?	7	55	?	15	30	36	4	16	16

Note: ACA	Annapurna Conservation Area	PWR	Parsa Wildlife Reserve
DHR	Dhorpatan Hunting Reserve	RBNP	Royal Bardia National Park
KCA	Kanchanjungha Conservation Area	RCNP	Royal Chitwan National Park
KNP	Khaptad National park	RNP	Rara National Park
KTWR	Koshi Tappu Wildlife Reserve	SNP	Sagarmatha National Park
LNP	Langtang national Park	SPNR	Shey-Phoksundo National Park
MBCA	Makalu-Barun Conservation Area (Buffer Zone)	SPWR	Sukla Phanta Wildlife Reserve
MBNP	Makalu-Barun National Park	SWWR	Shivapuri Watershed and Wildlife Reserve (Now designated as national Park)
MCA	Manaslu Conservation Area		

Source: IUCN Nepal Database, 1999. T.B. Shrestha and R.M. Joshi, 1996

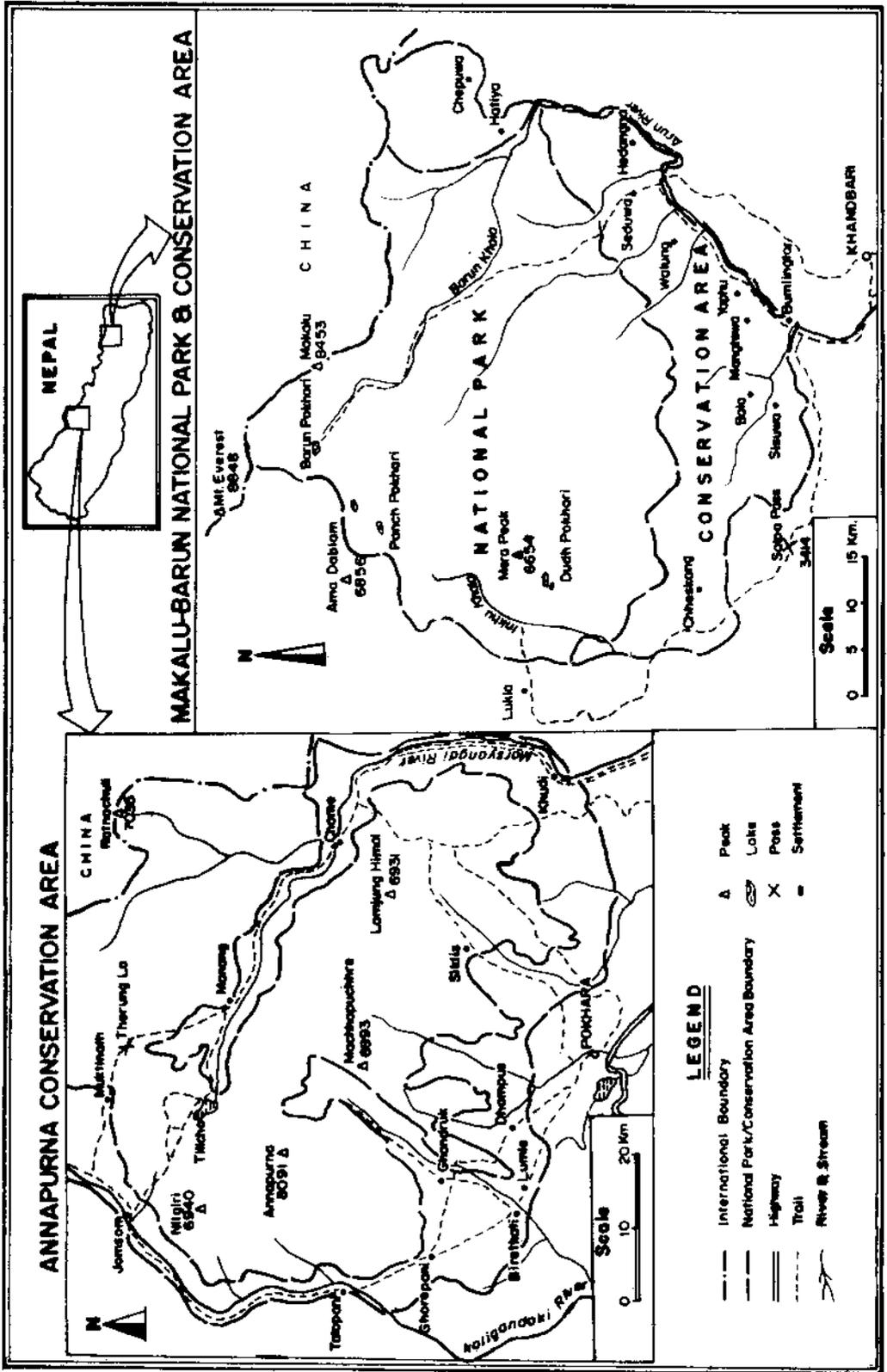
Concluding Remarks

Our knowledge on mountain ecology is far from being complete and hence the notion of protected areas is also built upon conserving the unknowns. Scientific researches to unfold the truth of nature would better be performed in protected areas not only to elucidate the inventory of what are being protected but also to prescribe ways and means for a sustainable mountain development. Unfortunately scientific research and education is not viewed as an integral part of a protected areas as was being prescribed for a Biosphere Reserve by MAB/UNESCO. As such investment on scientific research remains at a very low level of priority. Therefore it is very important that the research agenda be pushed through proper investment on collaborative researches that address the issues of sustainable development, poverty alleviation and conservation of nature. The World Commission on Protected Areas of IUCN has a special vice-chair for the Mountain Protected Areas. It offers great opportunity to link research agenda of MPAs in the context of new millennium.

(This article is based on the poster presented to the International Conference "La montagne: un objet de recherche & Seminaire Recherche Montagne June 2000 Grenoble-Autrans, France")

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