

Classification of Nepalese Forests and Their Distribution in Protected Areas

Tirtha Bahadur Shrestha, Ph.D.¹

Abstract

Nepal is nature's paradise. It's a small attractive package of nature embracing the rich biological diversity in the tiniest area. One of the nature's gifts to Nepal is its vegetation. The narrow strip of land harbours over 170 parcels of vegetation. The need of categorisation of Nepal's forest type is thus not only needed to acknowledge the rich diversity but also to make it applicable in scientific studies and researches. This paper endeavours to classify the Nepal's forest according to all the rational parameters yet avoiding the strict compartmentalisation which is near to impossible as in the case of natural and life bearing heritage like forest.

Key Words: Forest type, Ecological map, Classification, Protected areas

Introduction

The Himalaya creates a complex mountain ecosystem to give rise to diverse flora, vegetation and forest types. As such classification of vegetation types or forest types becomes very complex too. Mutually exclusive divisions or strict compartmentalization in terms of forest type coverage is not possible nor is desirable because it does not exist in nature. Difficulties in classification are further aggravated due to human intervention and modification of natural vegetation. Some degree of generalization, therefore, becomes necessary, and general adoption of a classification would become more practical. Classifications are aimed for a certain purpose. For the purpose of understanding biodiversity and preparing ecological map of Nepal an integrated classification and nomenclature is arrived on the basis of physiognomy, structure, flora and bioclimate. It has been adopted by Department of Forest (DoF) and has been published under Tree Improvement and Silviculture Component (TISC) Document Series No. 105, 2002.

Basis of Classification

For a mountain country like Nepal altitudinal limits are most convenient to define ecological zones or life zones. Geographical locations and habitat types provide easy means to differentiate various types within the same or similar physiognomic-structural type. Floristic dominance often provides lead identification and nomenclature of forest types.

The parameters (Table 1)

- ***Bioclimatic zonation***

Nepal lies just outside of the tropics in the global climatic zonation. However, bioclimatic tropicality extends into it up to an elevation of 1,000 m altitude. The Sub-

¹ *Life Member, Nepal Academy, tirtha@infofamily.com.np*

tropical zone (1,000-2,000 m), the Temperate zone (2000-3000 m), the Sub-alpine zone (3,000-4,000 m), the Alpine zone (4000-5000 m) and the Nival zone (5,000 and above) appear juxtaposed along mountain slopes. This allows us to specify alpine pasture, sub-alpine mountain oak, temperate juniper, tropical mixed hardwood and so on in the process of vegetation/forest classification.

- ***Geographical locations***

Geographical specification allows to readily separate out vegetation types such as trans-Himalayan steppe, temperate mountain oak forest or hill Sal forest. Geographical notion of western or eastern type also helps to differentiate forest types such as east Himalayan and west Himalayan, as well as north facing or south facing forests.

- ***Physiognomy & structural parameter***

Physiognomy is most apparent and hence convenient to describe and delineate forest types such as closed forest, open or dense forests, one-layered or multilayered forests, open woodland or grassland and so on. Structural features such as evergreen, deciduous, coniferous or broadleaved type contribute to aid visual identification. Such features can readily be used as environmental indicators. Besides, the carbon sink capacity of various forest types may also be assessed on the basis of structure. Deciduous forests for example remain inactive in photo-synthesis during winter. As such global carbon sink drops during October-March when northern hemisphere is largely deciduous, and devoid of broadleaves.

- ***Floristic parameter***

Floristic classification is efficient but it remains too technical when botanical names are used such as Tsuga forest, Schima-Castanopsis forest etc. Latin names may be replaced by common english names such as Hemlock forest for Tsuga forest or Sal forest for Shorea forest based upon local names. Stainton (1972) used mostly botanical names while Forest Statistics (1973) used common english names. Similarly, the Forestry Sector Master Plan (1989) also used common english names such as Birch forest, Fir forest, Khair-Sisso forest and so on.

Table 1: Parameters for Vegetation/Forest Classification

Bioclimatic Zone	Geography	Physiognomy	Structure & Life Form
Alpine	Trans-Himalayan	Closed forest	Evergreen
Sub-alpine	Mountain	Open forest	Deciduous
Temperate	Eastern	Grasslands	Coniferous
Sub-tropical	Western	Shrublands	Hardwood
Tropical			

Floristic Component	Dynamics	Habitat	Management
Pine forest	Climax forest	Riverine forest	Community forest
Sal forest	Secondary forest	Mountain Oak forest	Private forest
Larix forest	Plantation forest		Religious forest
			Protected forest

Classification of Forests/Vegetation

The government of Nepal has attempted to provide forest classification for the use of forest officers and managers. Currently the wide spread Community Forest User Groups (CFUGs) are using 8 forest types in their operational Plans (Table 2). The Forestry Sector Master Plan (1989) used just 12 forest types where as the Forest Statistics (1973) was already using 21 types. The Land Resource Mapping Project 1986 (LRMP) used only 7 types to cover whole of Nepal. Stainton's Forest of Nepal (1972) elaborated forest types on the basis of detailed floristic studies. The TISC (2000) came up with 37 vegetation types in order to prepare the ecological map of Nepal (2000). It was based upon the extensive work of Dobremez (1972) and his collaborators. Forest types adopted by various contributions are spelled out in Table 2. Details of the TISC Classification (2000) are to be found in TISC Doc. Series No. 105 published in the aegis of NARMSAP (Natural Resource Management Sector Assistance Programme) supported by DANIDA.

Table 2: Forest Types Correspondences

FUG Forest Types as of 1999	Forestry Sector Master Plan 1989	Forest Statistics, 1973	LRMP, 1986	Stainton, 1972	TISC, 2000
Sal Forest	Sal Forest	Sal	Sal	Sal Hill Sal	Lower Tropical Sal And Mixed Hardwood Forest Hill Sal
	Khair-Sisso	Khair-Sisso	Acacia-Dalbergia	Dalbergia-Acacia	Sal Zone Riverine Habitat
Sub-Tropical Deciduous Forest	Terai/Lower Slope Mixed Hardwood	Terai Hardwood	Tropical Mixed Hardwood	Terminalia Tropical Deciduous Riverine Forest	Hills Sal Upper Tropical Riverine Forest
				Tropical Evergreen Forest Sub-Tropical Evergreen Forest Sub-Tropical Deciduous Hill Forest	Hill Sal Eugenia-Ostodes Forest Hill Sal

Schima-Castanopsis		Lower Slope Mixed Hardwood		Schima-Castanopsis	Schima-Castanopsis
Alnus nepalensis				Alnus Forest	Schima-Castanopsis
				Sub-Tropical Semi-Evergreen Hill Forest	Schima-Castanopsis
				Castanopsis tribuloides – C. hystrix Forest	Schima-Castanopsis
Oak-Rhododendron	Oak Forest	Oak Forest	Quercus sps.	Q. Incana – Q. Lamuginosa	Lower Temperate Oak
Pinus roxburghii	Chir Pine	Chir Pine	Chir Pine	Q. Dilata Pinus roxburghii Forest	Lower Temperate Oak Chir Pine Forest
		Chir Pine-Oak			Chir Pine Broadleaved
	Chir Pine-Sal	Chir Pine-Sal			Chir Pine Broadleaved
		Chir Pine-Lower Slopes Mixed Hardwood			Chir Pine Broadleaved
Upper Slope Mixed Hardwood	Upper Slope Mixed Hardwood	Upper Slope Mixed Hardwood		Upper Temperate Mixed Broadleaved	Deciduous Maple-Magnolia-Sorbus
				Upper Temperate Mixed Broadleaved	Mixed Rhododendron-Maple
				Lower Temperate Mixed Broadleaved	Mixed Oak-Laurel
				Q. Lamellosa	East Himalayan Oak Laurel
				Lithocarpus pachyphylla	Lithocarpus Forest
Upper Slope Conifer	Blue Pine	Blue Pine	Blue Pine	Pinus excelsa	Upper Temperate Blue Pine Mixed Blue Pine-Oak
		Hemlock-Upper Slopes Mixed Hardwood		Abies pindrow	West Himalayan Fir-Hemlock-Oak Fir-Blue Pine
				Picea smithiana	Spruce
				Cupressus Rhododendron Forest Cedrus	Cypress Rhododendron Forest Cedar

				Temperate Mountain Oak
Mixed and Other Conifer	Mixed Conifer-Oak		Q. semecarpifolia	Mixed Oak-Laurel
				Mountain Oak-Rhododendron
Mixed Hardwood Conifer	Hemlock Mixed Conifer		Tsuga dumosa Juniper wallichiana Larix	Fir-Hemlock-Oak Temperate Juniper Larch
Birch Forest Fir Forest	Birch Forest Fir Forest Fir-Upper Slopes Mixed Hardwood Fir-Oak	Birch Forest	Betula utilis Abies spectabilis Q. semecarpifolia	Birch-Rhododendron Fir Fir-Oak-Rhododendron Sub-alpine Mountain Oak
	Birch-Fir			Steppe Sutherlandia-Artemisia Olea cuspidata
			Hippophae	Trans-Himalayan Steppe
			Populus	Trans-Himalayan Steppe
			Moist Alpine Scrub	Dwarf Rhododendron Scrub
			Dry Alpine Scrub Aesculus- Juglans-Acer	Juniper Scrub (Dry Alpine Scrub) Oak-Horsechestnut- Maple Alpine Pasture

Potential Vegetation Types of Nepal

The Potential Vegetation Types of Nepal (2000) appears as the ecological map of Nepal (scale 1:25,000 and 1: 100,000). The map was prepared by Tirtha B. Shrestha, Puspa R. Shakya, Damodar P. Joshi and Govinda Joshi. The project was coordinated by Jens-Peter Barnekow Lillesso (Danish Consultant). Data sources were used from eight ecological maps (scale 1:250,000) published by CNRS-Paris authored by the following scientists during 1970 to 1985.

1. Annapurna – Dhaulagiri by Dobremez & Jest 1970
2. Kathmandu – Everest by Dobremez 1972
3. Central Terai by Dobremez 1973

4. Biratnagar – Kanchanjunga by Dobremez & Shakya 1975
5. Jumla – Saipal by Dobremez & T.B. Shrestha 1978
6. Api – Dhaulagiri by Dobremez 1984
7. Butwal – Mustang by Dobremez, Battner, Jest, Vigny and Joshi 1984
8. Nepalgunj – Dailekh by Dobremez, Joshi and Shrestha 1985

Forest Types in Protected Areas

Sixteen protected areas of Nepal encompassing 9 National Parks, 3 Wildlife Reserves, 3 Conservation Areas and one Hunting Reserve contain 30 types of vegetation with permanent snow in the nival zone. Table 3 details out their distribution. Figure 1 illustrates vertical range of each protected area as marked by altitudinal limits.

Fig. 1: Altitudinal Range of Protected Areas of Nepal

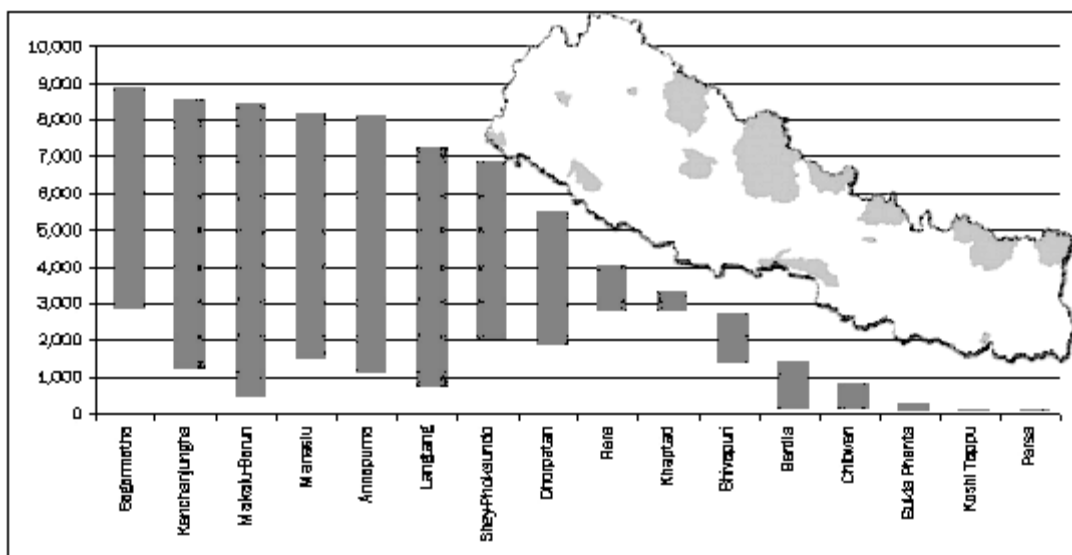


Table 3: Occurrence of Forest Types and Number of Endemic Flowering Plants in Protected Areas

Vegetation Types	ACA	DHR	KCA	KNP	KTWR	LNP	MBCA	MBNP	MCA	PWR	BNP	CNP	RNP	SNP	SPNP	SPWR	ShNP
Permanent Snow	*	*	*			*	*	*	*					*	*		
Upper Alpine Meadows	*	*	*			*		*	*					*	*		
Trans-Himalayan High Alpine Vegetation	*	*							*							*	
Dry Alpine Scrubs						*		*						*	*		
Moist Alpine Scrubs	*	*	*			*	*	*	*				*	*	*		
Trans-Himalayan Upper Caragana Steppe	*					*			*							*	

Trans-Himalayan Lower Caragana Steppe	*																*
Fir-Blue Pine Forest	*																*
Birch-Rhododendron Forest	*	*				*	*	*	*				*	*	*		
Fir Forest	*	*	*			*	*	*	*				*	*	*		
Larch Forest			*			*			*								
Fir-Oak-Rhododendron Forest				*													
Fir-Hemlock-Oak Forest													*				
Upper Temperate Blue Pine Forest	*								*				*	*	*		
Temperate Juniper Forest		*											*				
Spruce Forest	*								*				*		*		
West Himalayan Fir-Hemlock-Oak Forest				*													
Temperate Mountain Oak Forest	*	*				*	*	*	*								*
Mountain Oak-Rhododendron Forest				*													
Deciduous Maple-Magnolia-Sorbus Forest							*	*									
Mixed Rhododendron-Maple Forest			*					*									
Cedar Forest																	*
Cypress Forest	*																*
Mixed Blue Pine-Oak Forest	*					*											
Lower Temperate Oak Forest	*	*	*			*	*	*	*								
Oak-Horsechestnut-Maple Forest		*											*				
East Himalayan Oak-Laurel Forest	*	*				*	*	*									*
Chir Pine Forest				*								*					
Chir Pine-Broad Leaved Forest		*	*			*	*	*	*								*
Schima-Castanopsis Forest	*	*				*	*	*									*
Hill Sal Forest	*						*		*	*	*						
Lower Tropical Sal and Mixed Broad Leaved Forest				*					*	*	*						*
Total	18	11	8	6	1	14	11	13	13	2	3	2	8	7	14	1	4
Endemic Flowering Plants	55	36		4	1	15		7		0	0	0	16	11	30	0	16

Note: ACA Annapurna Conservation Area
DHR Dhorpatan Hunting Reserve
KCA Kanchanjungha Conservation Area
KNP Khaptad National Park
KTWR Koshi Tappur Wildlife Reserve
LNP Langtang National Park
MBCA Makalu-Barun Conservation Area (Buffer Zone)
MBNP Makalu-Barun National Park
MCA Manaslu Conservation Area
PWR Parsa Wildlife Reserve

BNP	Bardia National Park
CNP	Chitwan National Park
RNP	Rara National Park
SNP	Sagarmatha National Park
SPNP	Shey-Phoksundo National Park
SPWR	Sukla Phanta Wildlife Reserve
ShNP	Shivapuri National Park

Conclusion

The ecological complexities of Nepal has allowed to identify over 170 parcels of vegetation types in the CNRS vegetation maps (Dobremez *et.al* 1970 to 1985). They were being reduced to 118 types by the Biodiversity Profiles Project (1995) supported by the GIS unit of ICIMOD. Currently TISC (2000) reduced the 118 types to 36 types excluding the nival zone and the water bodies. The forest type classification through an integration of previous work is expected to be used by forestry practitioners, ecologists and development workers.

Acknowledgements

This work is the product of a number of scientists of CNRS-Paris and the department of Plant Resources, Govt. of Nepal. I acknowledge all of those who contributed to the vegetation maps produced by CNRS-Paris. I sincerely acknowledge Prof. J.F. Dobremez for his continued support to improve ecological works in Nepal. I duly acknowledge the invaluable support of TISC/NARMSAP staff especially Mr. Prayag Raj Shrestha, Mr. Lokendra Purush Dhakal and Mr. Rabin Shrestha during the entire process of revising and publishing new set of maps and the supporting document "Forest and Vegetation of Nepal". The role of Jens-Peter B. Lilleso, as Project Consultant and Mr. Bo Schultz and Programme Coordinator remained invaluable. Last but not least the support and encouragements of Mr. Chandi P. Shrestha, Secretary, MoFSC and Mr. Dibya D. Bhatta, Director General, DoF are highly acknowledged by the team working for revising the forest and vegetation types of Nepal.

Reference:

- 2002, Forest and Vegetation Types of Nepal. *TISC Document Series No. 105*. Dept of Forest, HMG/NARMSAP, International Year of Mountain Publication, Nepal.
- Bhujju, U.R; Shakya, P.R.; Basnet T.B. and Shrestha, S. (2007). *Nepal Biodiversity Resource Book* – Protected areas, Ramsar Sites and World Heritage Sites. ICIMOD/MOEST, GON/UNEP/Nepalnature.com
- BPP (1995a). An Assessment of the Representation of the Terrestrial Ecosystems in the Protected Areas System of Nepal. *Biodiversity Profiles Project Publication No. 15*. Department of National Parks and Wildlife Conservation, Ministry of Forests and Soil Conservation. His Majesty's Government of Nepal, Kathmandu.
- Dobremez, J.F. (1976). *Le Népal Ecologie et Biogeography*, Editions du Centre National de la Recherche Scientifique, Paris, France.

- Dobremez, J.F. (1984). Carte Ecologique du Nepal. Region Dhangarhi – Api 1:250,000. *Cahiers Nepalais Documents 10*, Centre Nationale de la Recherche Scientifique, Paris, France.
- Dobremez, J.F. and Shakya, P.R. (1975). Carte Ecologique du Nepal. IV. Region Biratnagar - Kanchenjunga 1:250,000. *Doc. Carte Ecol. XVI*, pp. 33-48
- Dobremez, J.F. and Shrestha, T.B. (1978). Carte Ecologique du Nepal. Region: Jumla-Saipal. *Cahiers Nepalais Documents 9*, Centre Nationale de la Recherche Scientifique, Paris, France
- Dobremez, J.F.; Joshi, D.P.; Shrestha, T.B. and Vigny, F. (1985). Carte Ecologique du Nepal. Region: Nepalganj – Dailekh 1:250,000. *Cahiers Nepalais Documents 12*, Centre Nationale de la Recherche Scientifique, Paris, France
- ICIMOD (1996). GIS Database of Key Indicators of Sustainable Mountain Development in Nepal. Mountain Environment and Natural Resources Information Services (MENRIS), Internal Centre for Integrated Mountain Development.
- Kenting Earth Science Limited (1986). Land Resource Mapping Project: *Land utilization report appendices two and three*. Kenting Earth Science Limited, Canada.
- MPFS (1988). *Master Plan for Forestry Sector Nepal*. Soil Conservation and Watershed Management Plan., HMG Ministry of Forest and Soil Conservation/ADB/FINNIDA, Kathmandu, Nepal.
- Shrestha, T.B. (1982). *Ecology and Vegetation of North-West Nepal (Karnali Region)*. Royal Nepal Academy, Kathmandu, Nepal.
- Stainton, JDA (1972): *Forests of Nepal*. John Murray, London.

विजया दशमी तथा शुभ-दिपावली २०६५ को उपलक्ष्यमा
समस्त संरक्षणप्रेमी एवं उपभोक्ता वर्गहरूमा हार्दिक मंगलमय
शुभ-कामना व्यक्त गर्दै वन र वन्यजन्तुको संरक्षणमा
सहभागी हुन हार्दिक अपिल गर्दछौं ।



वाघमारा मध्यवर्ती सामुदायिक वन उपभोक्ता समूह परिवार

सौराह, चितवन

फोन नं. ०५६-५८०११०