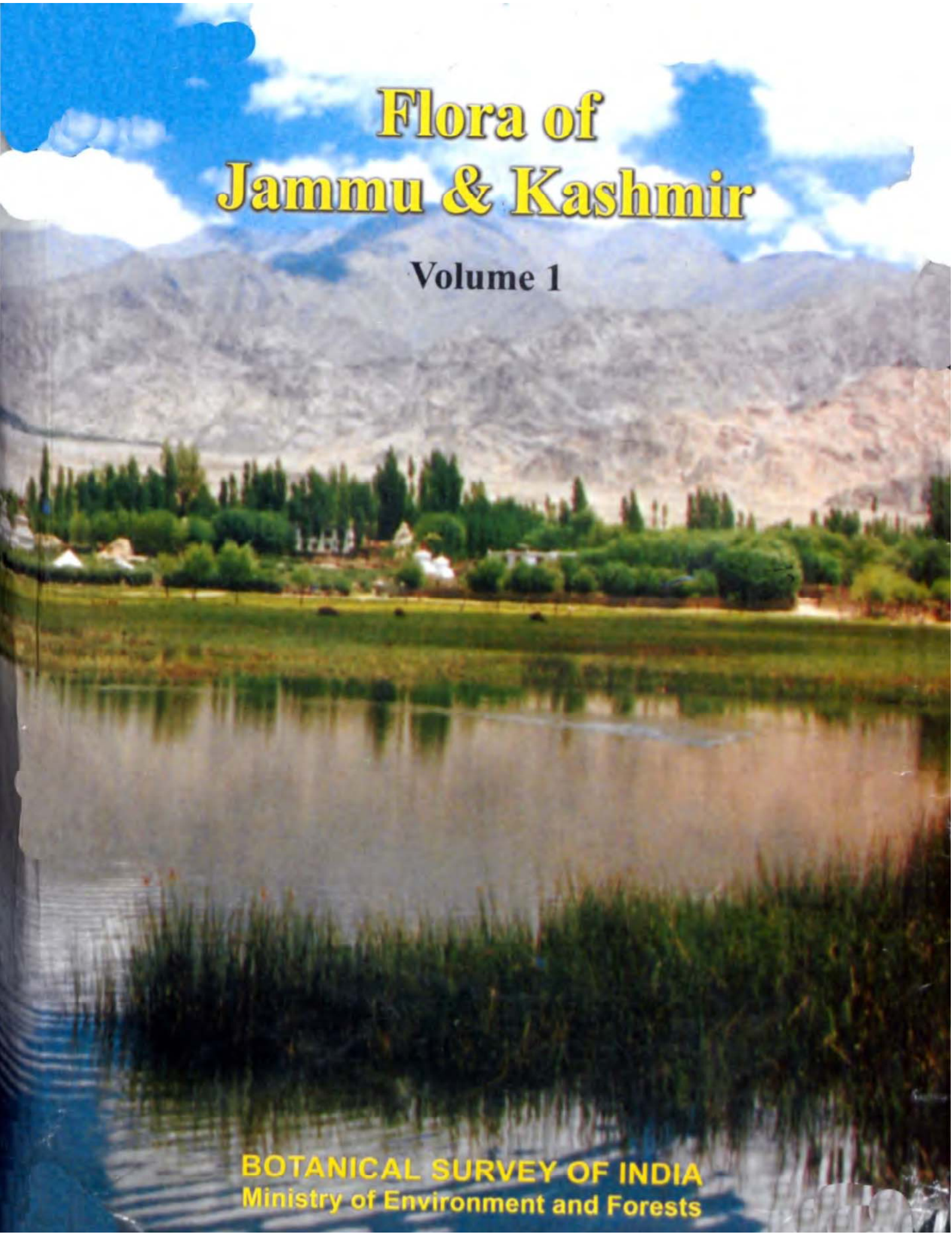
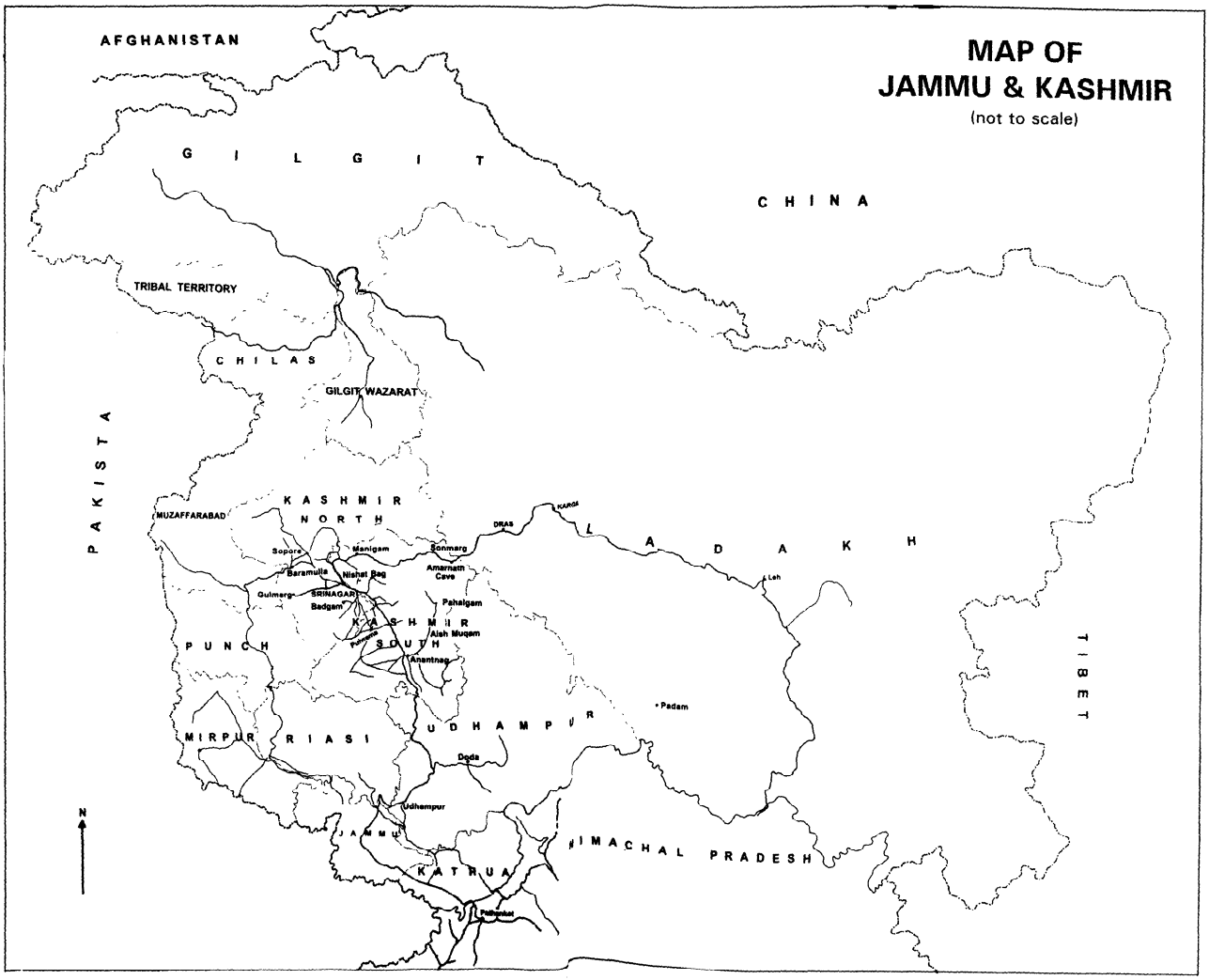
Flora of Jammu & Kashmir

Volume 1



BOTANICAL SURVEY OF INDIA
Ministry of Environment and Forests


MAP OF
JAMMU & KASHMIR
(not to scale)
AFGHANISTAN
G I L G I T
CHINA
TRIBAL TERRITORY
CHILAS
GILGIT WAZARAT
PAKISTA
KASHMIR NORTH
MUZAFFARABAD
Sopore
Manigam
Sonmarg
DRAS
KARGIL
LADAKH
Baramulla
Nishat Bag
Amarnath Cave
Leh
Gulmarg
SRINAGAR
Badgam
Pahalgam
KASHMIR SOUTH
Alsh Muqam
PUNCH
Anantnag
Padam
MIRPUR
RIASI
UDHAMPUR
Doda
Udhampur
JAMMU
KATHUA
HIMACHAL PRADESH
TIBET
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FLORA OF JAMMU & KASHMIR

Volume 1

Pteridophytes, Gymnosperms and Angiosperms
(Ranunculaceae - Moringaceae)

Editors
N.P. SINGH
D.K SINGH
B.P. UNIYAL

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and assistance from
Amit Chauhan & Prashant K. Pusalkar

भारतीय वनस्पति सर्वेक्षण
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FOREWORD

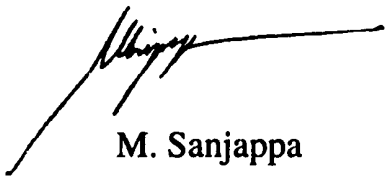
Biodiversity is the biological wealth of the planet earth, which is absolutely essential for environmental safety and economic security of the world. According to estimates of some biologists there are over five, or perhaps as many as ten million species of plants, animals and microorganisms in the world. It has taken millions of years of evolution to bring about this enormous diversity of life on earth. However, in recent years man has not been careful enough in handling this biological wealth and merrily continues with his incompatible activities that have impoverished this 'gene bank'

India as one of the twelve mega-biodiversity countries in the world is committed to implementing the basic tenets of the Convention on Biological Diversity it signed a decade ago at Rio de Janero. These are conservation, sustainable use, and fair and equitable sharing of benefits arising out of the utilisation of the components of biodiversity. Flowering plants form a sizeable part of this biodiversity. They play an important role in sustainable economic development and form a major part of the habitat for other elements of biodiversity. Identification of the plant resources of a country and development of a sound database on them are prerequisites for effective conservation, management and sustainable utilisation of these resources.

The Botanical Survey of India has been documenting the plant diversity in the country in the form of district, state, regional and national Floras. This first volume of the Flora of Jammu & Kashmir, one of the

richest states in terms of plant diversity, endemism and uniqueness of certain species and ecosystems, is another important contribution by the department which is singularly significant since it is published at a time when the country joins the rest of the world in celebrating the "International Year of Mountains". It presents an exhaustive taxonomic account of pteridophytes, gymnosperms and angiosperms comprising 195,20 and 664 species respectively. I am sure that this volume will be useful to various stakeholders of the biodiversity in the country in general and the state of Jammu & Kashmir in particular.

I congratulate the contributors and editors of this comprehensive work for the commendable job.



Date: 13. 12. 2002
Place: Kolkata

M. Sanjappa

PREFACE

Biodiversity is one of the most defining features of the nature, vital for the ecological security of a region and livelihood security of millions of those who critically depend upon it for their daily sustenance. Floristic component of the biodiversity is the major provider of ecosystem services and is basic to meet livelihood needs of not only the human beings but all other animals at large. The judicious management of floristic resources is, therefore, paramount to ensure the conservation of biodiversity, its sustainable utilization and equitability in benefit sharing as ordained in the Convention on Biological Diveristy. In this context the floristic inventories play a significant role in increasing our understanding and information level on the availability of resources and its relationship with the mankind.

The biogeographically strategic location of Jammu & Kashmir, coupled with varied phyto-climatic conditions met in its different physiographic divisions, makes it one of the hyper-biodiversity states of the Indian Union. The rich biodiversity of the state and its scenic grandeur have attracted the botanists, naturalists and the travellers, who all have contributed to our knowledge about its flora, since early nineteenth century. Yet, Sir J.D. Hooker's monumental *Flora of the British India,* published between 1872 and 1897, is the only comprehensive treatise available on the flora of the state. Despite significant contributions made on the plant resources of the state during the twentieth century, the information on its flora is not only widely scattered but incomplete as well.

To fill this gap as well as to prepare an up to date inventory of the plants at district, state, regional and national level, the work on the Flora of Jammu & Kashmir was undertaken by the scientists of the Botanical Survey of India, Dehradun. It is largely based on over 35000 specimens collected by the scientists of the department from different parts of the state since 1956 and deposited in the herbarium of the Northern Circle, BSI, Dehradun (BSD) and the Central National Herbarium, Calcutta (CAL). Besides, the specimens collected by others since early nineteenth century and deposited in various Indian herbaria as well as all the published

information on the State's floristic diveristy were also taken into account for preparation of this flora.

It is proposed to bring out the *Flora of Jammu & Kashmir* in five volumes. The present volume, dealing with general chapters, like introduction, physiography, drainage, climate, geology and soil, people, forests, forest types, floristic diveristy, etc., includes detailed taxonomic account of 195 species in 57 genera and 31 families of Pteridophytes, 20 species in 7 genera and 4 families of Gymnosperms and 664 species in 225 genera and 51 families of Angiosperms from Ranunculaceae to Moringaceae along with keys to the family within each group, and to the genus, species and the infraspecific categories, where ever needed. It is supported by two maps, 123 line-drawings and 28 coloured plates.

The contributors thank the Principal Chief Conservator of Forests, Jammu & Kashmir and the Army Commanders in the border areas of the state for their generous help during the plant explorations. We are also thankful to the Director General, Indian Council of Forestry Research & Education, Dehradun and the Director, Regional Research Laboratory, Jammu for facilitating the study of specimens deposited in their respective herbaria. Thanks are also due to Dr. Rajendra Sarkar, Superintending Anthropologist, Anthropological Survey of India, Dehradun for some valuable information on the ethnic communities of Jammu & Kashmir state.

We also express our deep sense of gratitude to Dr. M. Sanjappa, Director, Botanical Survey of India and all the former Directors of the department for the facilities and constant encouragement during the progress of this work, and to Dr. R.R.Rao, ex-Joint Director and Dr. J.N. Vohra, Dr. U.C. Bhattacharyya, Dr. A.S. Rao and Dr. M.A. Rau, former Deputy Directors, Northern Circle, BSI, Dehraun for the keen interest evinced by them in this study. Thanks are also due to Prof. B.N. Kaul (Retd.) of Amar Singh College, Srinagar, Kashmir and Dr. R.D. Dixit, Additional Director, Central Circle, BSI, Allahabad for critically going through the portion on economic plants and the manuscript of Pteridophytes respectively.

We are thankful to Shri Dev Raj Agarwal, Photographer and Shri Sanjay Uniyal, Data Entry Operator, for most of the photographs and

computer type-setting and formating of the manuscript respectively. The contributors also express their thanks to all the past and present staff members of the Northern Circle, Botanical Survey of India, Dehradun but for whose sincere efforts and cooperation this work would not have been possible. The help and assistance rendered by the staff of the Publication Section, Botanical Survey of India, Kolkata in arranging the publication of this volume is also acknowledged.

Finally we thank M/s Shiva Offset Press, Dehradun for its quick printing in present form.

Botanical Survey of India
Northern Circle, Dehradun

D.K. SINGH
Joint Director

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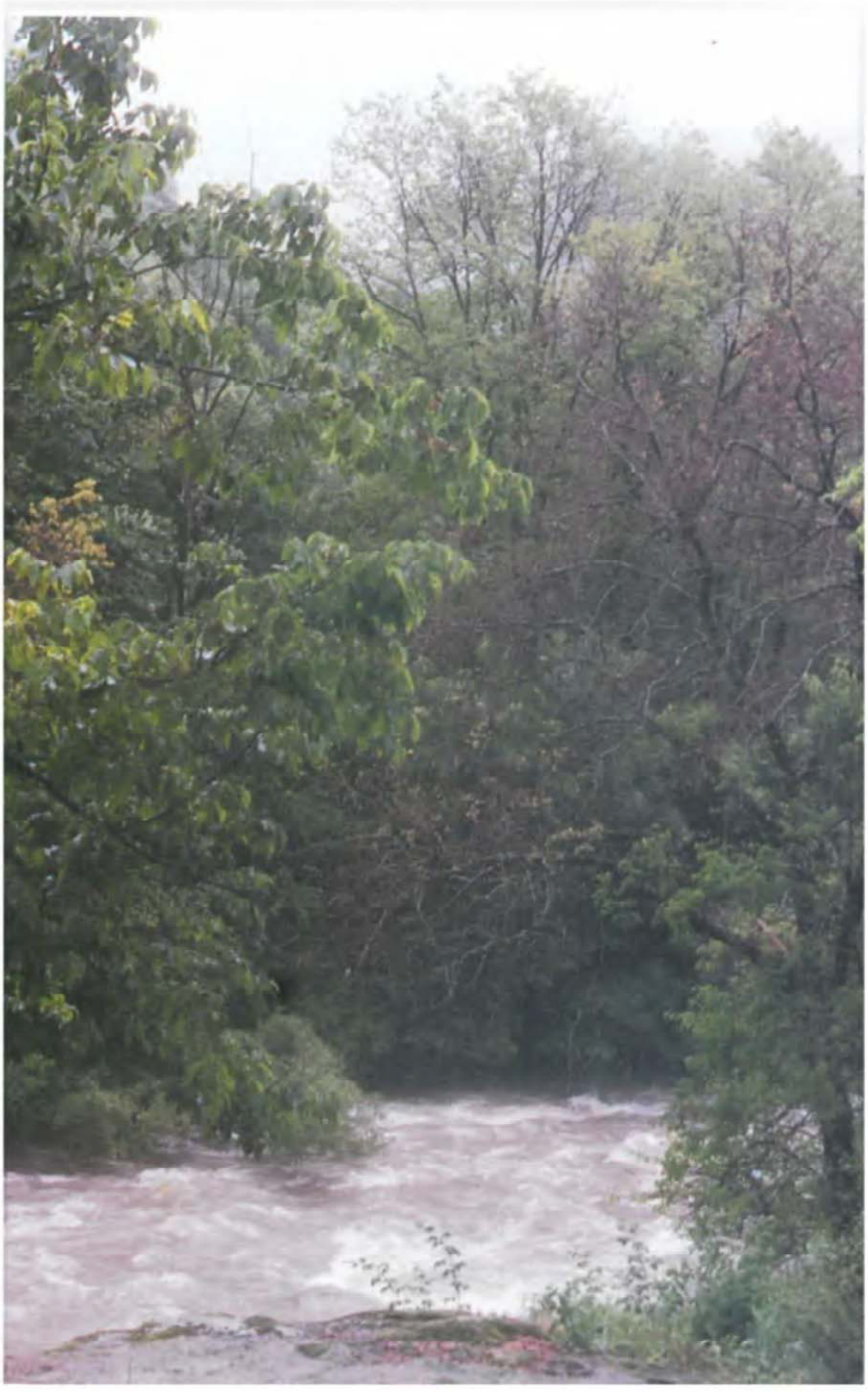
A view of Mansar lake in Jammu region

A view of mixed temperate forest in Dachigam National Park

A view of Dachigam National Park



A view of Dachigam National Park

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D.K. Singh

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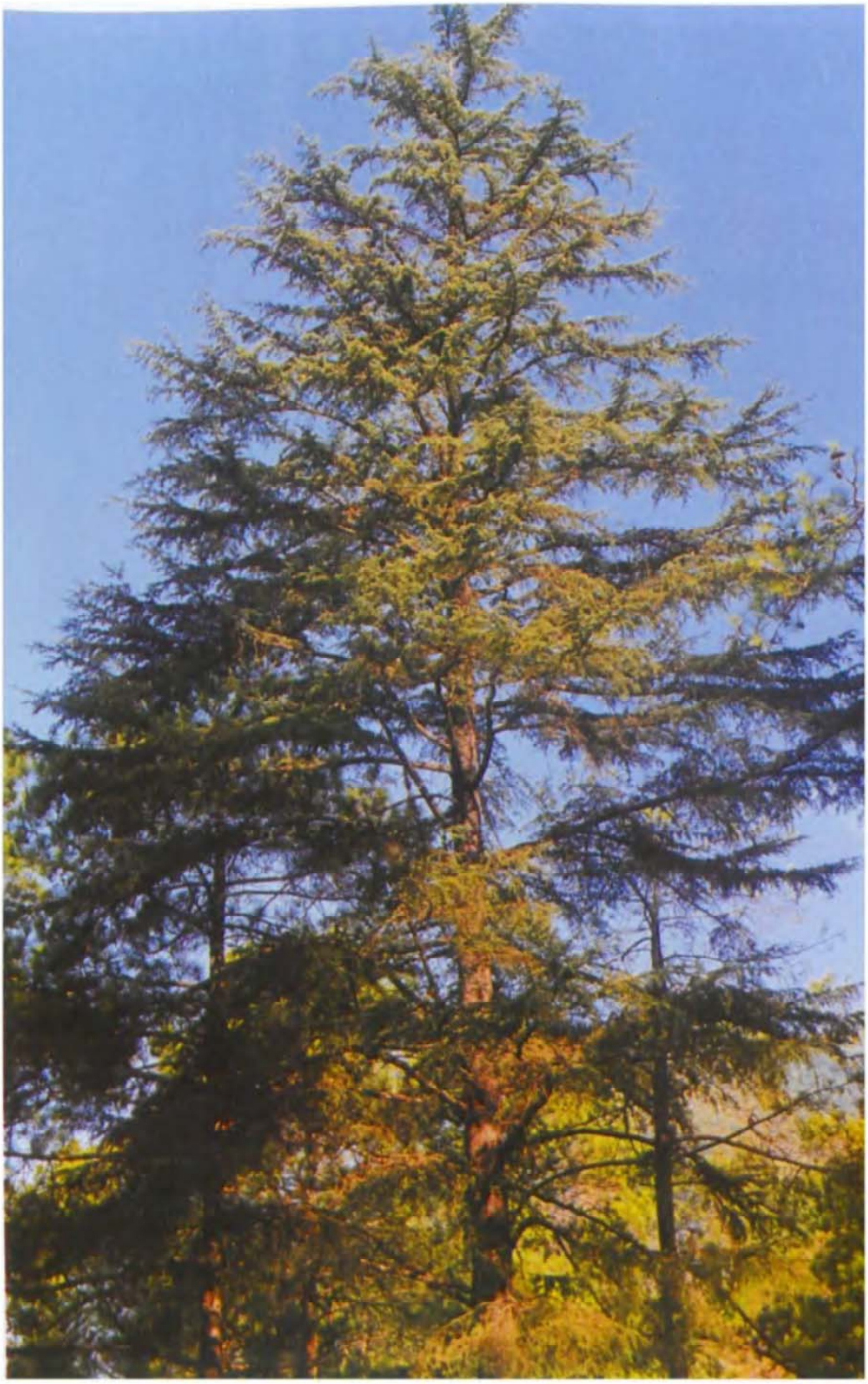
Ephedra regeliana Florin

D.K. Singh

Pinus roxburghii Sargent



D.K. Singh

Cedrus deodara (Roxb. ex D. Don) G. Don

Aconitum heterophyllum Wallich ex Royle

Aquilegia fragrans Benth.

Clematis gouriana Roxb. ex DC.

Delphinium brunonianum Royle

Caltha palustris L.

Caltha palustris L. var. *alba* (Cambess.) Hook.f. & Thomson

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Anemone polyanthes D. Don

Bipin Balodi

Podophyllum hexandrum Royle

Nelumbo nucifera Gaertn.

Corydalis crassifolia Royle

Corydalis govaniana Wallich

Pycnoplinthus uniflorus (Hook.f. & Thomson) O. Schulz

D.K. Singh

Capparis spinosa L.

Viola biflora L.

Arenaria festucoides Royle

D.K. Singh

Dianthus orientalis Adams var. *angulatus* (Royle ex Benth.) Majumdar

Gypsophila cerastioides D. Don

Silene moorcroftiana Wallich ex Benth.

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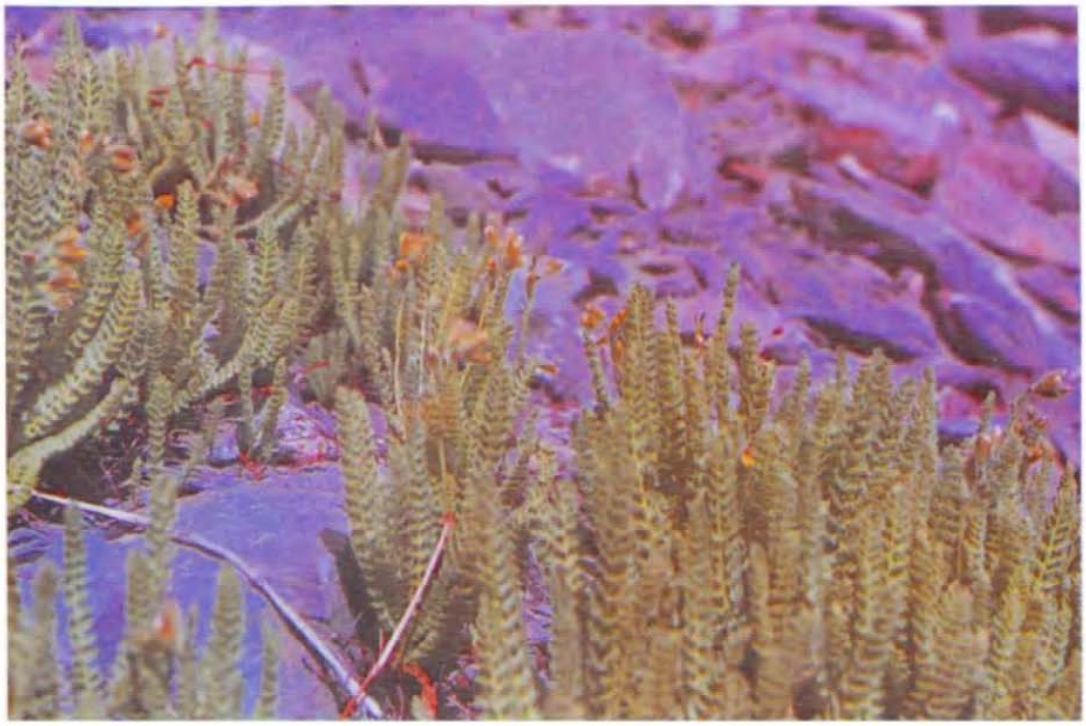
Thylacospermum caespitosum (Cambess.) Schischk.

Myrtama elegans (Royle) Ovcz. & Kinz

Hypericum perforatum L.

Hiptage benghalensis (L.) Kurz

Peganum harmala L.



Amit Chauhan

Biebersteinia odora Steph. ex Fischer

Geranium collinum Steph. ex Willd.

Geranium pratense L.

Murraya koenigii (L.) Spreng.

INTRODUCTION

(D.K. Singh & B.P. Uniyal)

Perched like a majestic crown in the extreme north of the Indian Union, the state of Jammu & Kashmir lies between the coordinates 32°17' to 37°20' north latitude and 73°25' to 80°30' east longitude. The entire territory extends to over 640 km from north to south and 480 km from east to west, covering a total area of about 2,22,236 sq. km in the north western Himalaya. The state comprising 14 districts largely covers rugged mountainous terrain, except for the small tracks adjoining the Punjab plains and the valley of Kashmir. Leh, with an area of *ca* 82,665 sq. km is the largest district of the state. The total population of the state, as per the 2001 census, is 10,069,917 with an average population density of about 99 persons per sq. km. Wedged between Afghanistan and North West Frontier Province of Pakistan on the west and the north-west, Turkmenistan and China on the north and Tibet in the east, as it is, the state is strategically located from the phytogeographical point of view representing the floristic gateway to the west Asian, Mediterranean and Central Asian elements in the Flora of India. On the south it is bordered by Punjab and Himachal Pradesh.

The entire state is broadly divided into three main structural groups resulting from the stratified rock formations. These are the Panjal, the Zanskar and the Tertiary groups. The Panjal comprises the outer hills, outer plains and the middle mountains of the Lesser Himalaya, the Zanskar, the entire tract from Lahaul and Spiti in the east to Karakoram in the north, and the Tertiary group is represented by the valley of Kashmir and other river valleys. The three geological constituents have resulted into considerable physiographic as well as climatic variations with direct bearing on the seasons, soil and vegetation in the state. In fact the state forms a transitional region of diverse physical and phyto-climatic features.

Physiography

Biogeographically the state falls under Boreal zone with two subzones, viz. Sino-Siberian or the Trans-Himalaya, and Sino-Himalayan

or the North Western Himalaya, and four Biomes, viz. Tundra zone, Alpine zone, Temperate zone and Subtropical zone (Rodgers 1985; Khoshoo, 1993). The relief features of the state are comparable with a three storeyed structure, each representing a distinct geomorphological and climatological regime.

The province of Jammu with the Shivaliks, the undulating ravinous plains and the outer hills on the south of Pir Panjal represents the first storey. The Shivalik hills in the region are largely anticlinal and on an average rise to an elevation of 600-1200 m overlooking a series of 'Duns'. The area receives an average annual precipitation of about 170 cm through south-west monsoon. The tectonic valley of Kashmir, originally a synclinal valley, with its lacustrine deposits called 'Karewas' covering more than half the area and some 'duns' between the Pir Panjal range on the south and south-east, and the Great Himalayan range in the north and the north-east represents the second storey. The valley of Kashmir, with an average height of about 1600 m, experiences a submediterranean climate with average annual precipitation of about 105 cm, which is mostly in the form of snow during winter months. And the Trans-Himalayan region comprising the territories of Gilgit, Baltistan and Ladakh, north of the Great Himalayan ranges, forms the third storey with some of the loftiest inhabited tracts of the world. Ladakh, including the territories of Rupshu, Nubra and Zanskar is the largest tract of the state, covering almost half its area. The region presents a Holarctic climate with extreme cold arid condition and receives average annual precipitation of less than 10 cm at Leh.

The Pir Panjal and the great Himalayan ranges almost divide the state into three distinct physiographic divisions, which are isolated from one and other by lofty mountain barriers. The passage from one region to another is usually facilitated through high altitude passes.

The outer plains : Approaching from the Punjab district of Gurdaspur, a stretch of level land, averaging between 300 to 360 m altitude, continue with the Punjab plain. This is bordered by a low, sparsely vegetated and irregularly broken low hilly terrain. The subaerial denudation

in this region has resulted into depressions out of anticlinal tops, leaving more rigid and compressed synclinal systems of strata to standout as elevated ground. The succession of escarpments and deep slopes with broad longitudinal valleys is a conspicuous feature of this region of Shivaliks of Jammu division. The erosion and depositions from the sediments of the Himalayan rivers have resulted into finer soil characteristic of the region. This area lying between the rivers Ravi in the east and Jhelum in the west is known as *Kandi.* This division, comprising parts of Jammu, Kathua and Mirpur districts, is full of ravines which carry off the flood waters of the monsoon rains with soil exposing the sandy beds of seasonal streams which are full of pebbles and boulders.

The outer hills : This region shows a diverse and complex physiogrpahy. The region rises gradually from the north-western limits of the outer plains in the form of low-lying hills and broken mounds with average height between 700 to 1500 m. It ends in an abrupt, steep escarpment. These young tertiary hills, known as the Shivaliks, separate the middle Himalaya from the plains. The region is conspicuous by the sight of bare grey sandstone with uncovered soil. The narrow hills open into small valleys, called *duns,* longitudinally extending up to Devsal in the west. To the north of the Devsal Dun a longitudinal valley runs on the opposite side of Ramkot and is enclosed by Karai Thar hills which is above 1500 m.

The physiography of this region shows an unusual rate of deposition with undulating topography having abrupt steepness in the north. In outer hill region, the orthoclinal structures appear with steep escarpments on the southern face and a gentle inclination on the north. The southern limbs of the folds of this part are faulted in their anticlines. Whereas, towards the interior there is a compression of synclinal folds with an autochthonous position. The river Chenab divides this region into two flanks which covers the upper reaches of Jammu and Kathua districts and lower reaches of Poonch, Rajouri and Udhampur districts. The numerous streams forming tributaries of Chenab, Ravi and Tawi rivers have special significance in collecting water to irrigate the outer plains and beyond in the south.

The middle Himalaya : The middle Himalayan region of the state consists of the Panjal-trap. The southern aspect of these mountains faces the outer plains and occupy the middle and upper reaches of Doda, Poonch and Rajouri districts, while its northern aspect comprise the valley of Kashmir and other Himalayan valleys, like Sind, Lidder, Kishenganga, Lolab, etc. The average height of this region varies from *ca* 1500 to more than 4,700 m above the mean sea level. The region, famous for its scenic beauty and grandeur, is criss-crossed with deep cut ravines with precipitous cliffs. More or less converging ranges in this division are intersected by deep gorges through which rivers flow. The middle Himalayas have a very rich drainage system with upper coarses of river Chenab (Chandrabhägä) and its tributaries. The orthoclinal mountains help preserve moisture in the region and support rich vegetation.

To the north of these parallel ranges lies the Pir Panjal. The Panjal trap is largely composed of Permo-Carboniferous volcanic rocks. Beyond Reasi and Basoli, this physiographic division is not very distinct except towards Muzaffarabad beyond Hazara where the river Kishenganga joins Jhelum at Domel.

In the higher reaches in this division, there are a number of small valleys, comparable with mountain glades, which dot the mountains at Ramnagar, Bhaderwah, Ramban, Kishtwar, Padar, Reasi, Rajouri and Basoli. There are a number of high altitude passes in the Pir Panjal range, like Pir Panjal (3505 m), Bundil (4200 m), Banihal (2832 m), Haji Pir (2490 m), etc. which facilitate the movement across this range.

North of the Pir Panjal, lies the famous valley of Kashmir with an average altitude of *ca* 1600 m. Surrounded on all sides by high mountain ranges, except for the passes and a narrow gorge at Baramulla, the valley is the drainage basin of river Jhelum and its tributaries. With the lacustrine *Karewas* protruding throughout the valley from Shopian to Baramulla, it presents an interesting geomorphology with no physical monotony.

Geologically the valley of Kashmir has undergone many changes. Having been part of the geosynclinal Tethys even up to the Permian, when it was a region of calm and quite sedimentation, it suffered many violent changes. The mountain walls abruptly rising on sides exhibit massive quartzites and Silurian to the west of Wullar lake. Glacial boulders, conglomerates and *dogra* slates appear beyond the Baramulla gorge towards Hazara.

The inner Himalaya : The valley of Kashmir narrows towards the north with the massive structure of Kazi Nag range. The Great Himalaya or the innermost mountains rise above the limits of perpetual snow with an average height ranging from over 3000 m to above 8000 m, with Peaks like Nanga Parbat or Diyamir (8128 m). The central Himalayan axis bifurcates near Kullu in Himachal Pradesh, with its north-western branch known as Zanskar Range reaching the twin peaks of Nun Kun (7055 m). The other, Dhauladhar Range extends further to the north west. This physiographic division covers nearly 70 per cent of the total area of the state and includes the territories of Ladakh, Gilgit and Baltistan. It is a high plateau with cold-arid conditions. The Karakoram Range to the north of this plateau culminates into the second highest peak of the world the Godwin-Austin or the Mt. K_2 (8615 m). The glaciers on this mountain are the source of river Hunza which drains into river Gilgit.

The valley beds in the north-west part of this physiographic division descend on the mountains till Gilgit is reached at about 1524 m. On its north and north-east, this river valley has vast flat plains, like Deosai (3962 m) and Lingzhitang (4877 m). Some of the major passes in Great Himalayan and Karakoram mountain ranges are : Khardung la (5666 m), Sarsank la (5716 m), Poat la (5716 m), Tanglang la (5328 m), Chang la (5267 m), Singo la (5034 m), Lachulang la (5034 m), Baralacha la (4891 m), Chilung la (4401 m), Zoji la (3529 m), Karakoram pass (5352 m), Muztagh pass (5706 m), Sia la (5432 m), Marpo la (5611 m), Sasar la (5300 m).

Drainage

The Hindukush and the Karakoram ranges in the north-west and

the north, with perpetual snow cover and a large number of world renowned glaciers, like Siachen, Baltoro, etc. form the watershed of the central Asian drainage flowing into the Indian ocean. An important feature of the river system in the state is its antiquity as compared to the mountains they traverse through. The major rivers in the three divisions of the state are Ravi, Ujh, Tawi and Chenab in Jammu; Jhelum, Liddar, Vishav, Rambiara, Sukhnag, Dudganga, Indus, etc. in Kashmir; and the Indus, Shyok, Zanskar, etc. in Ladakh (Map-1).

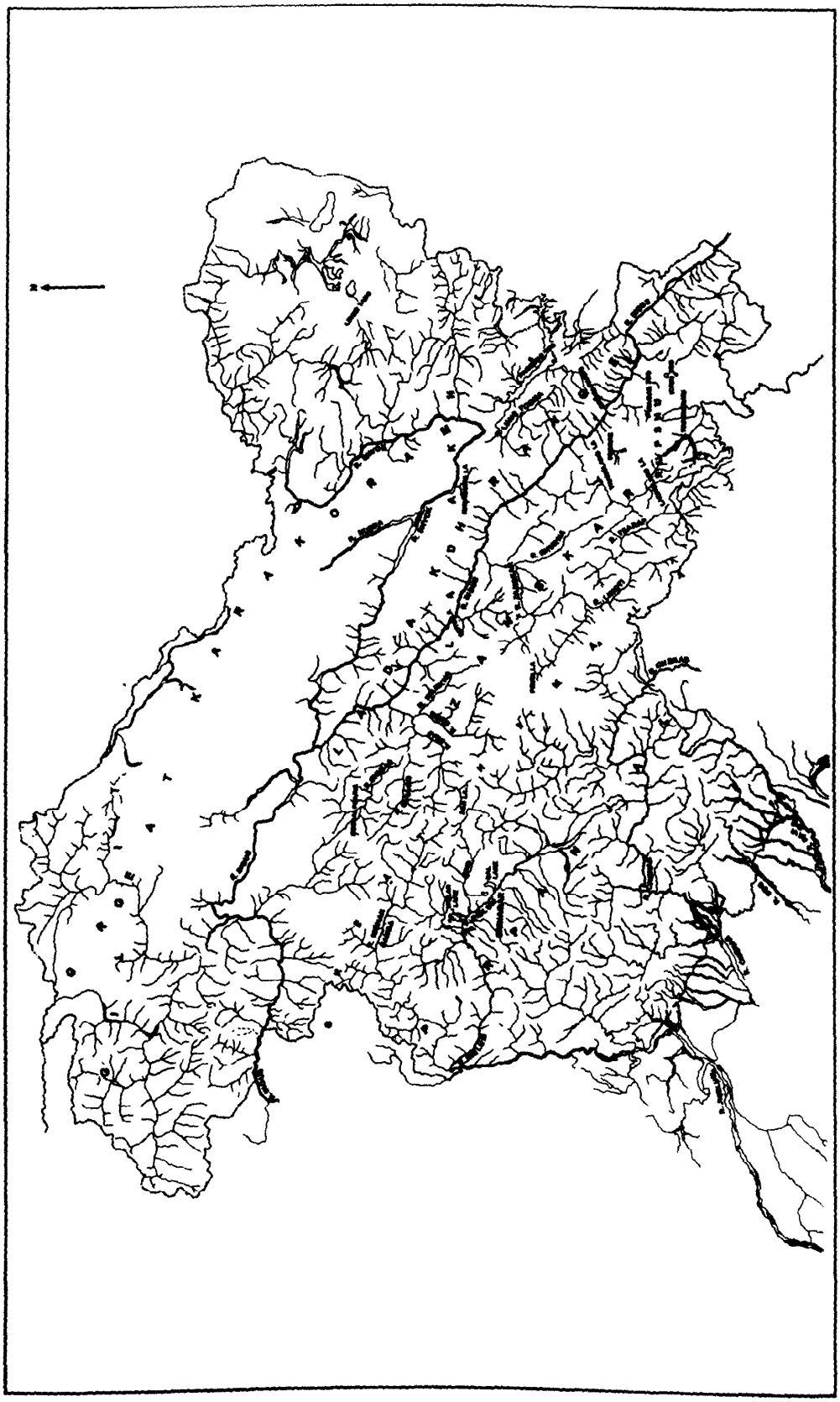
The Ravi : The Ravi, known as Iravati in Sanskrit and Hydrotes in Greek, is the smallest river of Punjab and drains the southern slopes of Pir Panjal range and northern slopes of Dhauladhar range. It leaves the Himalaya at Basoli and passes close to Kathua, near Madhopur, where it enters the plains of Punjab.

The Ujh : It is the typical Shivalik stream draining the Shivalik hills in the summer months, when the monsoon rains flood these small valleys.

The Tawi : The Tawi drains the outer hill region. It flows round the city of Jammu after draining the interior mountains to the north-east of the city.

The Chenab : Chenab originates in the Himalayan contours of Lahaul-Spiti in Himachal Pradesh as two streams, Chandra and Bhaga. The Chandra issues from Chandra tal in the south-eastern lap of Baralacha la, while Bhaga originates from the north-western slopes of the same range. The two streams meet at Tandi and form Chandrabhaga which is called Chenab once it enters the state near Kishtwar. At Kishtwar it is joined by the river Wadvan, which is fed by snow at Nun Kun. The Chenab is a typical middle Himalayan river with rapids in its upper course and deep gorges cut through the rocks at the lower reaches.

The Jhelum : Known as 'Vyeth' in Kashmiri, 'Vitasta' in Sanskrit and Hydaspes in Greek, the river Jhelum originates from a spring near Ananthnag at the bottom of a spur of Pir Panjal range. With its canals and lakes, Jhelum forms the main arterial system of the valley of



Map 1 : Major rivers and lakes of Jammu & Kashmir

Kashmir. The basin of Jhelum in the valley is like a oval trough between the Great Himalayan and Pir Panjal ranges. The alluvium, that filled the valley, has a depth of over 1800 m and has resulted into an unique geomorphological feature of the valley of Kashmir the lacustrine and fluviatile *Karewas.*

The river flows north-west through the middle of the valley and after a winding course it forms the Wular lake. It leaves the lake at south-western side near Sopore and flows slowly south-west to the gorge at Baramulla. From this point the river is more rapid and flows westward to Muzaffarabad, where it sharply turns southward and is joined by the river Kishenganga.

The Vishav : It is an important tributary of river Jhelum which it joins below Bijbehara. Originating from the Kaunsarnag lake, it drains the Kulgam area which is known as the rice-bowl of southern Kashmir.

The Lidder : It is again an important tributary of the river Jhelum with its source in the Sheshnag lake.

The Rambiara : It is another tributary of the river Jhelum originating from the northern sloeps of Pir Panjal.

The Sukhnag : It drains the Gulmarg area of the Kashmir valley.

The Dudganga : It flows from Ludurmarg in the central Pir Panjal, and near Tarakuti mountains it divides into two streams, the Sang-Safed and the Yachera. It flows to the south of Srinagar and in the western mountain of Baramulla-Gulmarg area with a number of springs below the Apharwat, Khilanmarg, Alapather, Gagrimarg, Banilanag and Kantarnag.

The Sind : It is an important tributary of Jhelum. Its traditional source is the sacred lake of Gangabal in the Harmukh mountains. The headwater emerges at Zoji la and the Amarnath peak in a limestone

cave. In its about 96 km course, the Sind drains the loftiest mountains till it joins the Jhelum at Shadipur. Sind feeds the Anchar lake near Ganderbal.

The Kishenganga : The river Kishenganga originates in the valley of Tilel and Gurez in the mountains of Dras. It passes through Keran, Karnah, Teetwal, Ghori, etc. and empties into Jhelum at Domel near Muzaffarabad.

The Indus : The river Indus drains the largest tract of the state comprising the territories of Ladakh, Baltistaṇ and Gilgit. It enters Ladakh from south-east and flows in north-westerly direction through a barren land of granites, granulites, gneisses, phyllites and schists. It is joined by the river Zanskar below Leh and others, like Shyok, Shigar, etc. before it enters the North West Frontier Province of Pakistan after circling the Nanga Parbat at the western-most end of the Great Himalayan range.

Besides, there are about 18 natural lakes in the state covering a total area of over 700 sq km, the prominent among them being the Mansar, Surinsar, Sanasar (Jammu); Dal, Anchar, Hokarsar, Manasbal, Wular, Kaunsarnag, Gangabal, Tarsar Marsar, Sheshnag, Anantnag, etc. (Kashmir); and Pangong, Tso Morari, etc. (Ladakh).

Climate

Like its extremely diverse physiography, the state of Jammu & Kashmir shows an equally remarkable diversity in climate in its different regions (Table-1).

Temperature : In the outer plains and the outer hill regions of Jammu division the average annual temperature ranges around 30.1° celsius with the maximum of 40.6° C and minimum of 26.8° C during summer months (April October) and 22°C and 11.5°C respectively during the winter months (November - March). The mean annual temperature in the interior of middle Himalayan region and its adjoining regions averages 13.3°C. The mean maximum and minimum temperatures between

Table – 1 : Mean average temperature and rainfall data at selected places in Jammu & Kashmir (source: ClimatologicalTables of India Meterological Department, 1951 -1980).

	Jammu (367m)			Banihal (1630m)			Quazidund (1739m)			Srinagar (1587m)			Gulmarg (2655m)			Leh (3514m)		
	Temperature (°C)		Rain-fall (mm)	Temperature (°C)		Rain-fall (mm)	Temperature (°C)		Rain-fall (mm)	Temperature (°C)		Rain-fall (mm)	Temperature (°C)		Rain-fall (mm)	Temperature (°C)		Rain-fall (mm)
	Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.	
January	18.8	7.4	50.0	9.9	-0.5	154.4	4.4	-4.0	146.4	4.7	-2.3	56.5	0.6	-8.5	161.2	-2.0	-14.4	9.5
February	21.9	9.6	46.4	10.9	1.0	206.0	7.5	-1.8	180.4	7.8	-0.6	64.9	1.1	-7.6	274.6	1.5	-11.0	7.1
March	26.6	13.6	53.4	15.7	4.4	217.3	13.6	2.8	202.2	13.6	3.8	98.5	5.7	-2.9	231.8	6.5	-5.9	11.0
April	32.9	19.0	26.3	21.2	8.7	130.5	19.0	7.1	142.3	19.4	7.7	87.5	11.2	1.6	166.8	12.3	-1.1	9.1
May	38.3	24.4	16.0	24.9	11.3	83.0	22.8	10.0	113.0	23.8	10.7	71.9	15.2	4.5	138.8	16.2	3.2	9.0
June	40.6	26.8	51.8	28.9	15.1	51.0	27.7	14.3	64.4	29.2	14.7	37.2	20.2	7.7	76.3	21.8	7.4	3.5
July	35.5	24.5	283.4	28.2	17.6	104.5	28.0	17.2	95.8	30.0	18.2	48.7	21.2	10.3	100.3	25.0	10.5	15.2
August	33.7	24.5	344.5	27.6	17.1	100.0	27.8	16.4	74.3	29.7	17.5	69.7	20.2	10.1	95.3	25.3	10.0	15.4
September	33.6	23.0	123.9	26.4	12.4	59.3	25.8	11.3	61.9	27.8	12.9	33.3	18.4	6.3	54.1	21.7	5.8	9.0
October	31.7	18.4	38.1	23.4	7.1	34.8	21.3	6.0	41.3	21.9	6.1	36.4	14.5	2.7	68.1	14.6	-1.0	7.5
November	26.8	12.6	11.9	17.9	3.2	57.1	14.9	1.1	49.8	14.7	0.9	27.0	9.1	-2.0	19.2	7.9	-6.7	3.6
December	21.1	8.5	42.2	12.3	0.5	107.1	7.6	-2.3	96.1	8.2	-1.6	43.3	4.2	-5.5	67.3	2.3	-11.8	4.6