

TRANS HIMALAYA (Jammu & Kashmir, Himachal Pradesh and Sikkim)

Floristic elements

- *Alpine*
- *Cold Desert*
- *Oasitic Vegetation*



Threatened – 68 species

- Vulnerable - 18
- Critically Endangered - 9

Sikkim –

- >600 flowering plants



Ladakh and Tibetan Plateau -

- Angiosperms - 1,400 species (417 genera, 89 families)
- Dicots – 1,030 species (310 genera, 73 families,)
- Monocots 376 species (107 genera, 16 families)
- Gymnosperms - 8 species (5 genera, 3 families)

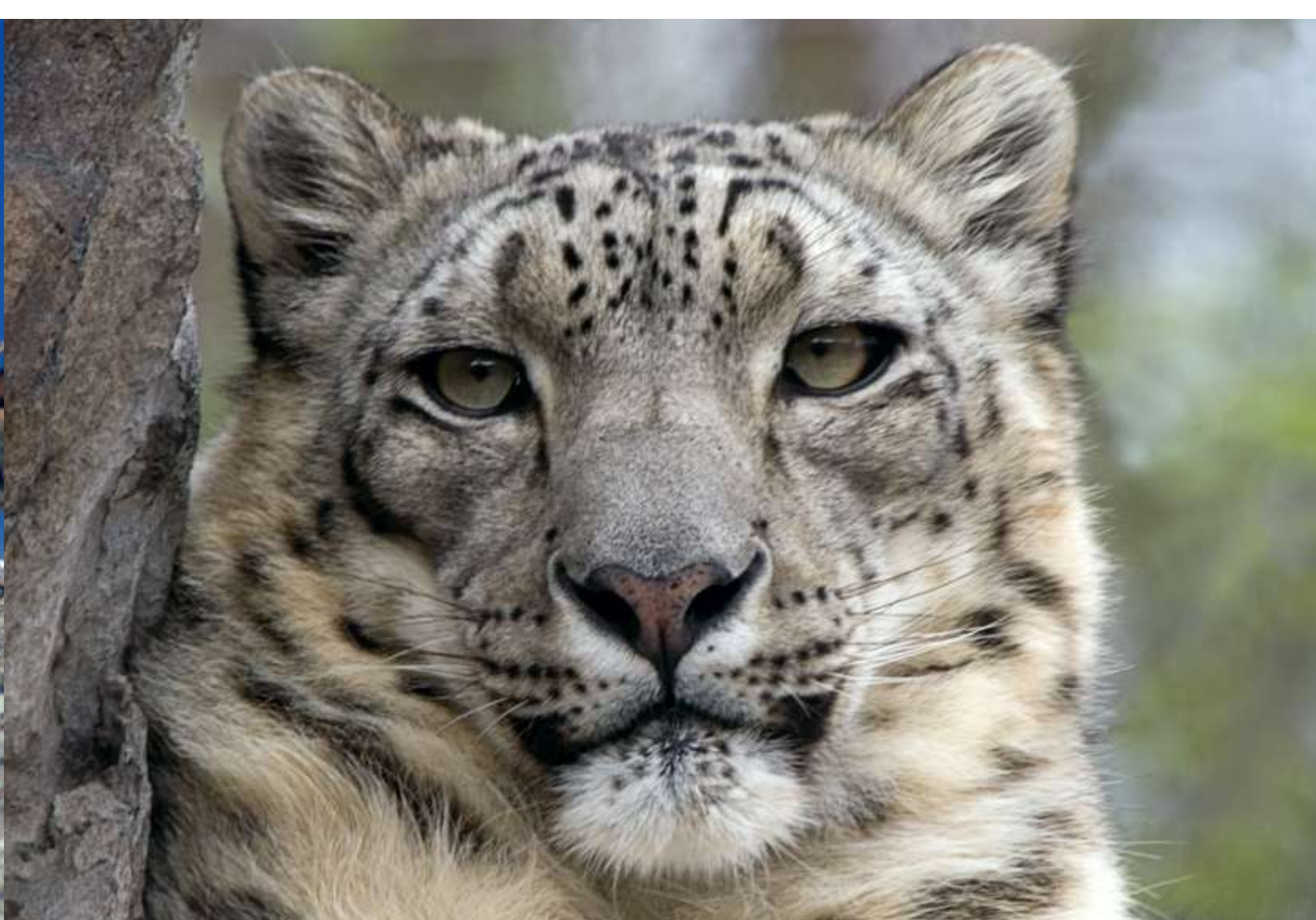


Avian Fauna

Ladakh and Tibetan Plateau - 300 > Species

Sikkim - 27 Bird Species

- 4 globally threatened
- 3 restricted range species
- 93 biome restricted species



Medicinal plants -
300 plants are used in Tibetan
Medicine System



NORTH-WEST HIMALAYA (Jammu & Kashmir and Himachal Pradesh)

Floristic elements

- sub-Tropical
- Temperate
- sub-Alpine
- Alpine

Jammu & Kashmir-

- 3,054 plant species

Himachal Pradesh-

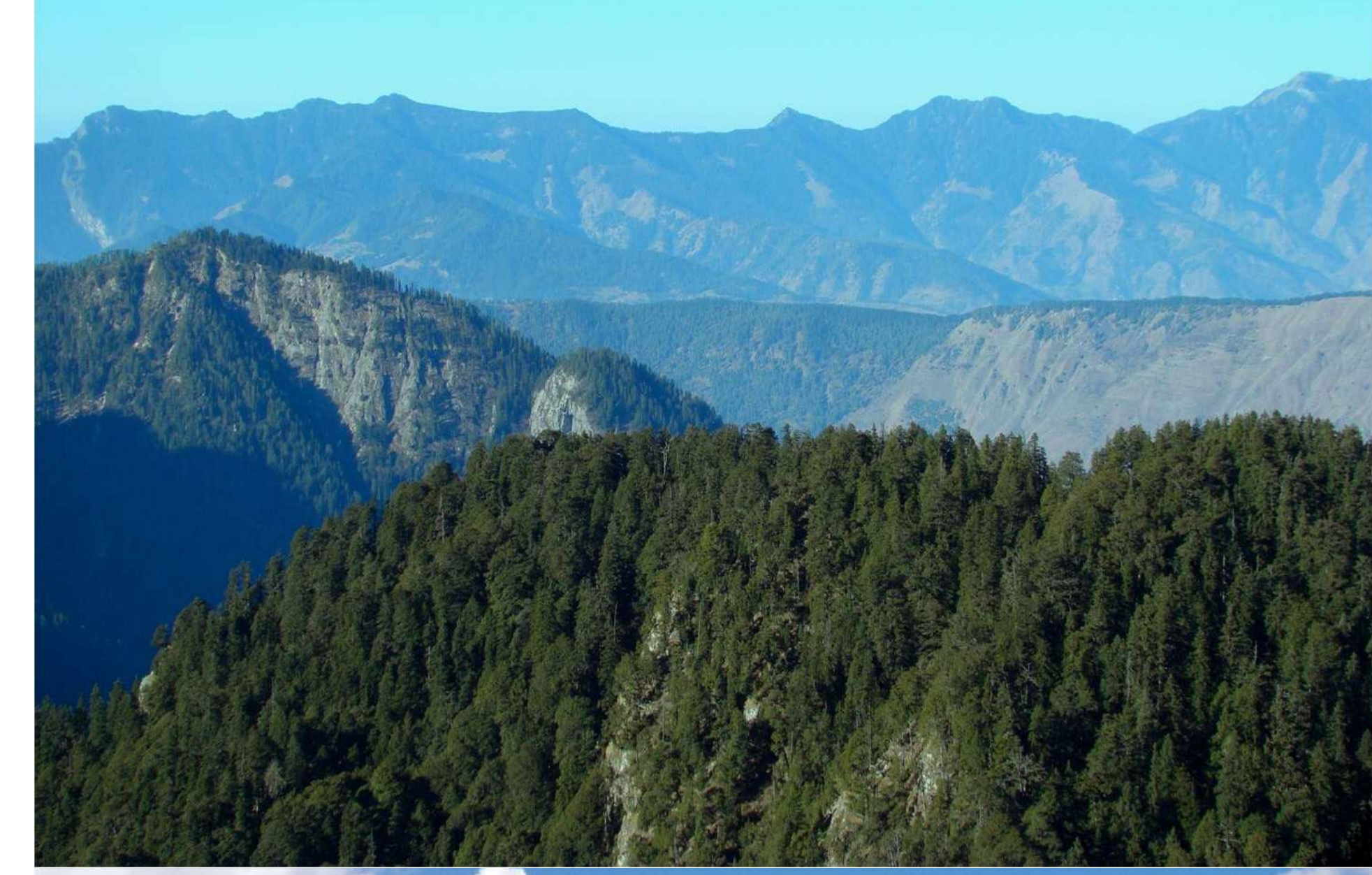
- 4,000 plant species

20% plants species endemic to the Himalaya

Medicinal plants - 643

Sacred Groves - > 5,000

Wild edibles - 169



Jammu & Kashmir-

- 814 animal species

Himachal Pradesh-

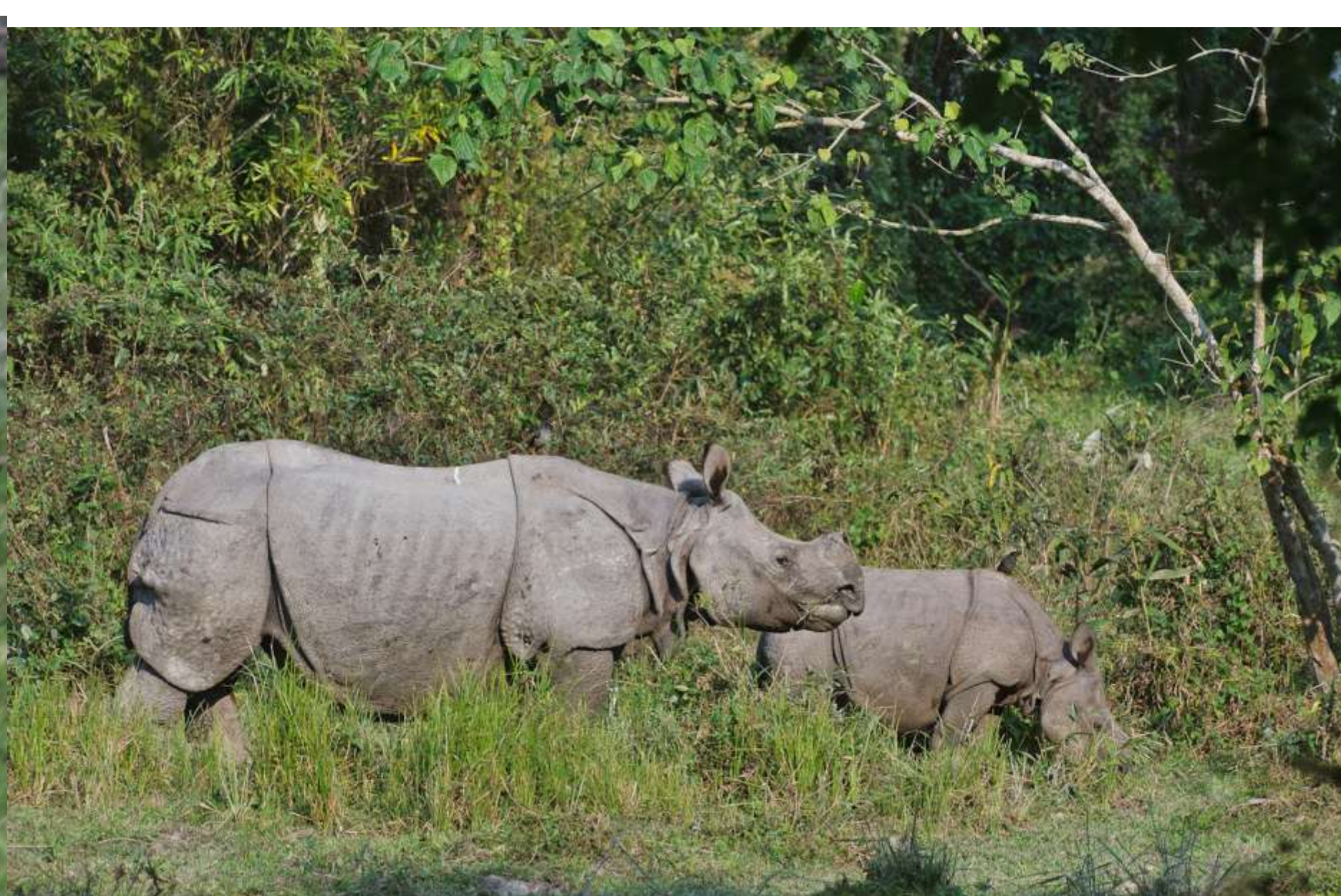
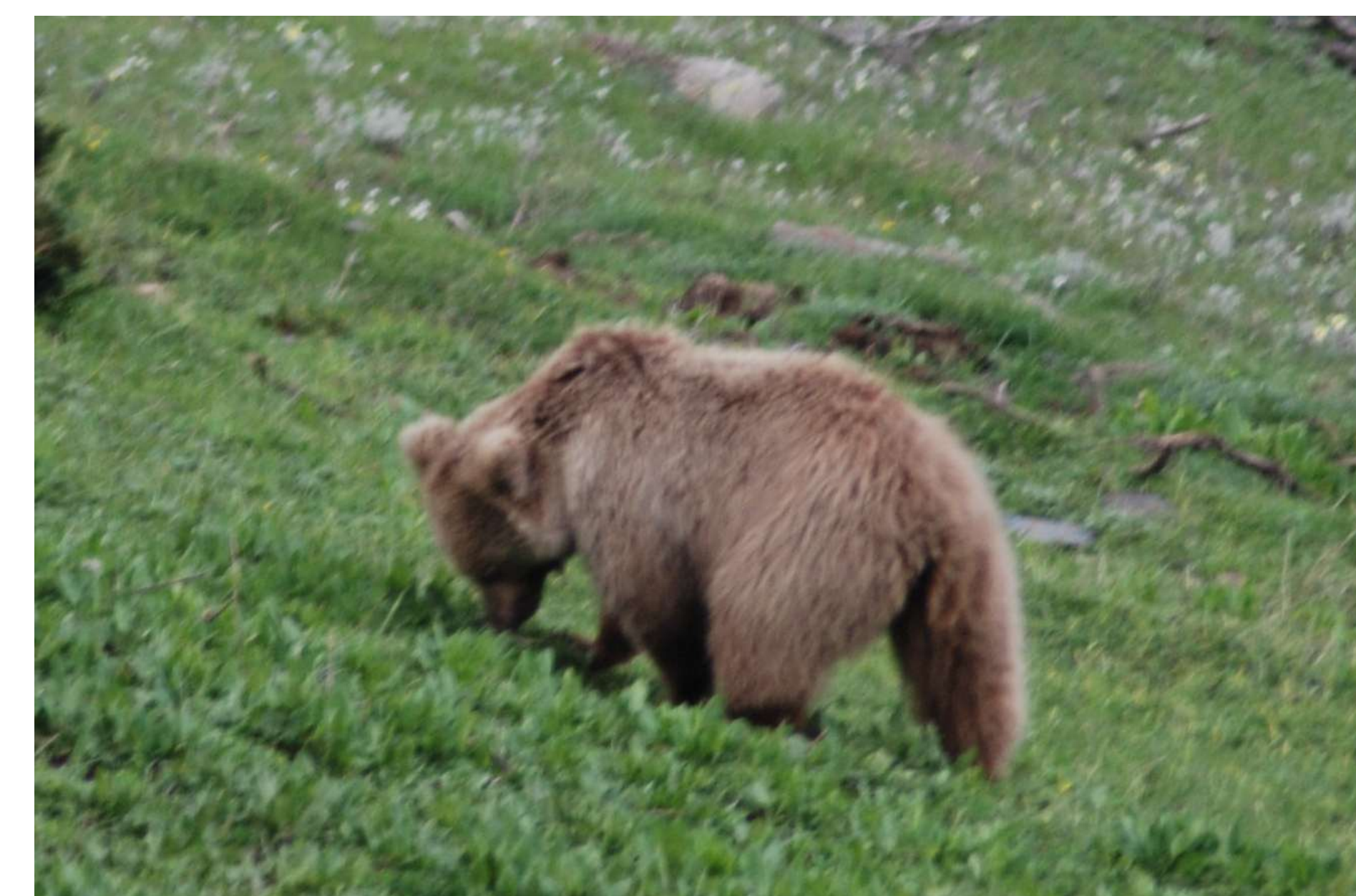
- 1,262 animal species



Globally threatened Angulates - 19 species

Fauna

- Mammals - 75 species
 - Birds – 358
- Amphibians - 14
 - Reptiles – 68
 - Fishes - 44
 - Insects - 255



WEST HIMALAYA

Major river systems, i.e., Ganga, and Yamuna originate from this region and are source of water, food and hydropower for over 10 million people inhabiting up-streams and several millions more down-streams of northern Indo-Gangetic plains



Floristic elements

- sub-Tropical
- Temperate
- sub-Alpine
- Alpine

Species Number

Angiosperm - 4000
Gymnosperm – 48
Pteridophytae – 360
Bryophyte - 751

Lichen – 435
Algae - 500 species
Fungi - 700



Faunal Diversity (Species)

Mammal – 102
Birds – 521
Amphibian – 19
Reptile – 70
Fish – 124



Insects – 1263
Mollusca – 56
Annelid - 57



• Biodiversity is at the centre of many religions and culture inter-linking and regulating resource management.

CENTRAL HIMALAYA



• India's only population of Southern Kiang (*Equus kiang polygodon*)

Species in the world above 5000 m amsl



• *Rhododendron nivale* - only shrub



• *Scutigera sikkimensis* - only amphibian



Species

Floristic Group

Ferns

Lichens

Orchids

Primulas

Rhododendrons

Bamboo

Faunal Groups

Amphibians

Birds

Butterflies

Fishes

Mammals

Reptiles

Central Himalaya % of India

480 48

506 22

527 57

58 57

38 42

25 18

50 19

574 45

689 50

48 7

125 31

88 17

• Fossil - *Poorvi botapa*, which bears a close resemblance to primitive wild maize



Largest producer of large cardamom in India.

EAST HIMALAYA



Being junction of two Global Biodiversity Hotspots, i.e., Himalaya and Indo Burma, the region harbours biological elements from both the Palearctic and Indomalayan realms

Faunal species –
 10 globally threatened
 13 restricted range species

Realm-	Indomalayan	Palaerctic
Mammals -	940	903
Birds –	2000	1528
Reptiles –	1396	774
Amphibians –	882	395
Endemic		
Mammals -	544	472
Birds –	758	188
Reptiles –	1094	438
Amphibians –	11	255



Only region on earth known to harbour all three species of goral (*Nemorhaedus*)

- Chinese goral *N. caudatus*
- Red goral *N. baileyi*
- Himalayan goral *N. goral*

Nearly 50 % of the total flowering plant species of India.

Highest number of orchids - 580 species

- 12 endangered
- 16 vulnerable
- 31 near threatened

•26 major and 110 minor tribal communities



CONSERVATION IN THE HIMALAYAN REGION

- Himalayan Landscape encompasses great diversity of landforms



Trans Himalaya

Himalaya

Siwalik & Foothills

The initial conservation efforts in the country took off from this region only with the establishment of the Corbett National Park (1935).



Unique Species

From left to right
Brahma kamal in Alpines
Rare Orchid in Sub-Tropical
Pitcher Plant in NE region



From left to right
Snow leopard & Marmot in high altitudes

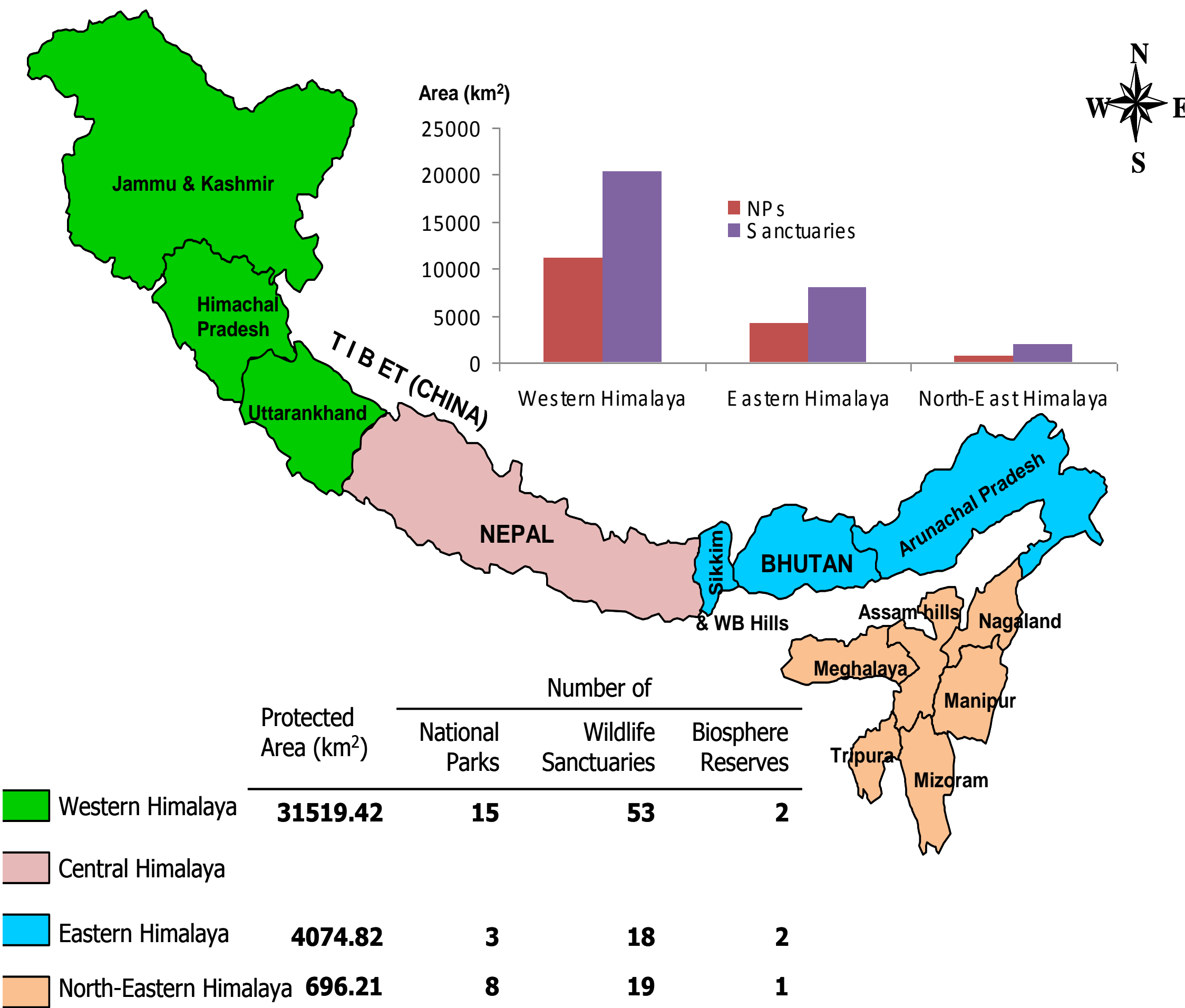


Cultural Diversity

From left to right
Traditional Woman in Western Himalaya

Sacred Grove in Central Himalaya

Tribal Man in North-East Himalaya



Terrestrial Flagship Species

Tiger

Rhino

Elephant

Common Species

ECOSYSTEM SERVICES OF HIMALAYA



- Regulating the climate in Indian subcontinent

- Biodiversity is source of many ecosystem goods, such as food, firewood, timber, medicine and genetic resources.

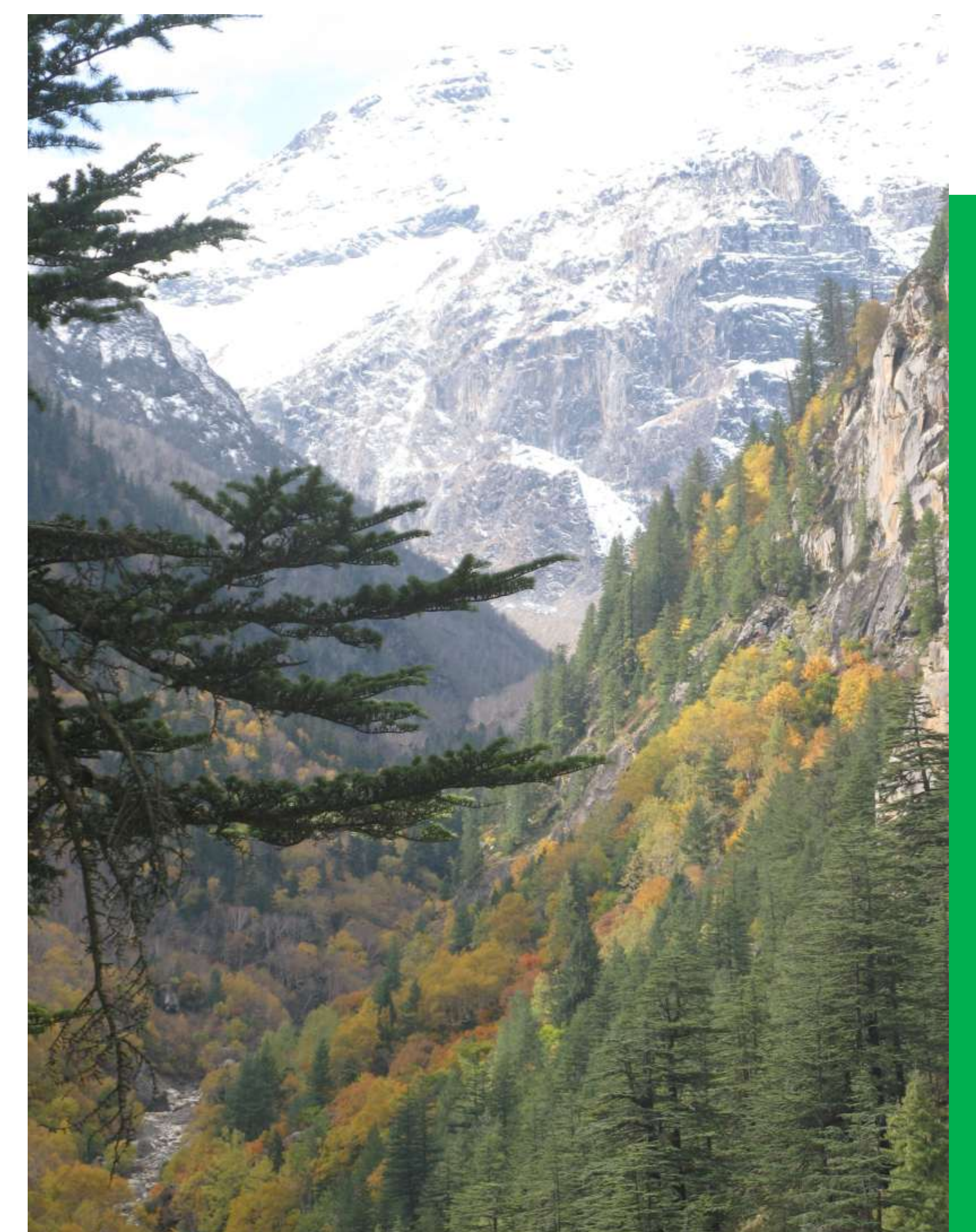


- Provisioning of Water to millions of people

- Forest diversity is the main source of livelihood of Himalayan people.



- The most notable Ecosystem Service is C-sequestration by forest ecosystems.

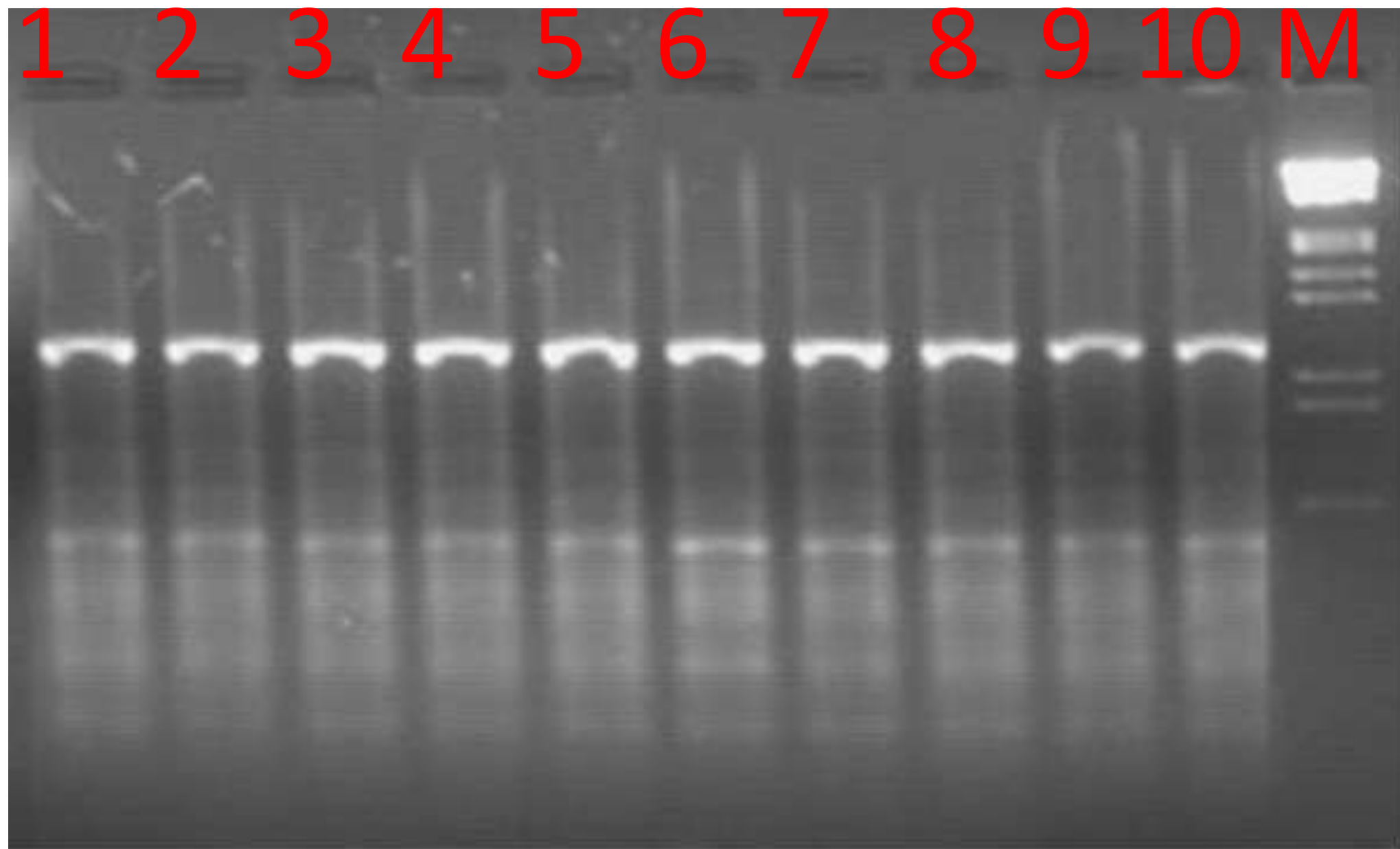


- The C-pool in forests (biomass + soil) of Indian Himalayan Region has been estimated at 531 M t.

The value of Himalayan forests with regards to C-sequestration has been estimated at Rs. 943 billion/yr (1994 estimates).

BIOTECHNOLOGICAL APPLICATIONS

- Biomolecules of commercial importance.



21226 bp

2027 bp

1375 bp

- Identification of elite plants based on active ingredients contents and molecular characterization.

- Analysis of genetic diversity of economically & ecologically important plants.

- Development of propagation and cultivation packages.

- Nursery development for mass multiplication and field trials.

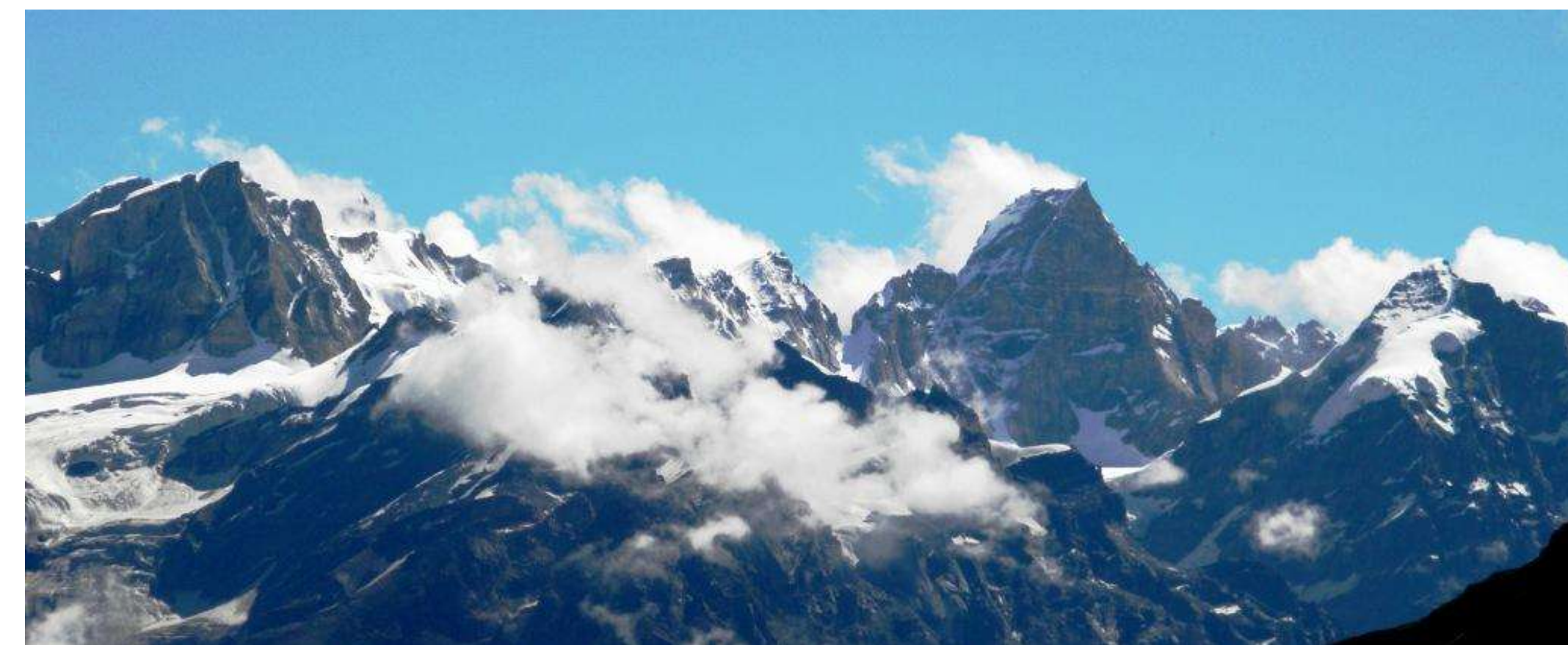


- Conservation of unique biodiversity elements (rare, threatened and high value plants).

MICROBIAL DIVERSITY

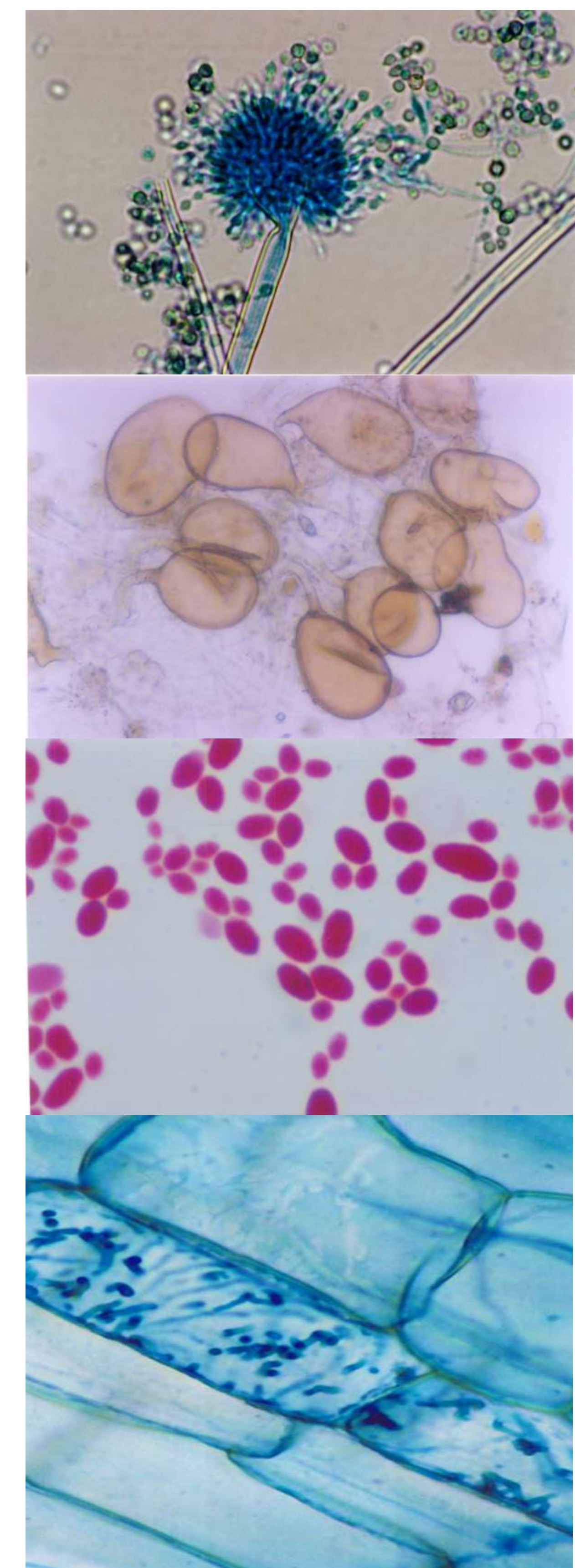
• Ecological Niche areas

- Low temperature (Cold desert, Glaciers)
- High temperature environment (Hot Springs)
- Rhizosphere, Agriculture & Forest Soil



- Fire - Shifting Cultivation & Forest
- Mountain Water Bodies

• Microbial communities



- Psychrophiles, psychrotrophs
- Archea, thermophiles, hyperthermophiles, thermotolerants
- Plant growth promoting microorganisms
- Biological indicators, bacteriophages, pathogens

• Applications

- Antagonism
- Antimicrobials
- Enzymes
- Bioinoculants
- Biodegradation
- Mineral solubilization



LARGE CARDAMOM IN THE SIKKIM HIMALAYA

- Sikkim is the largest producer of large cardamom (*Amomum subulatum*) in India.
 - The inhabitants of Sikkim 'The Lepchas' were believed to be the first to collect cardamom capsules from natural forests primarily for use as medicine and aromatic edible wild fruit.
- Cardamom has 12 local varieties and seven species of wild relatives readapted to different agroclimatic conditions of the Eastern Himalayan region.



- Large cardamom is a perennial understorey cash crop grown under Himalayan alder (*Alnus nepalensis*) or mix forest tree species in the hills.



- NTFPs from Agroforestry System

Ecologically, economically and socially sustainable land use practice supporting multiple functions and ecosystem services.

BIORESOURCE-BASED PRODUCTS

Cultivated and wild bioresources play vital role in the economy of the traditional communities, and is important source of livelihood for millions of people in forest fringes all across the Himalaya.

Out of over 18,000 recorded plant species, many of wild plant species are recognized to possess ethnobiological value, with marketability.

134 fibre yielding plants reported from the Indian Himalaya possessing ecological and economic potential.



The use of higher Himalayan bamboo has a long tradition among the Rudhiya community of western Himalayan region and a wide range of local products i.e., baskets, utensils, Porridge, mats, agricultural tools, etc. made by them which involves indigenous skill and cultural beliefs and constitutes an important basis for livelihood improvement of this community.

