

FLORA OF TSO MORIRI HIGH ALTITUDE WETLAND

A Pictorial Handbook



NMHS
National Mission on
Himalayan Studies

G. B. Pant National Institute of Himalayan Environment (NIHE)

Sikkim Regional Centre, Pangthang, Gangtok

(An Autonomous Institute of Ministry of Environment, Forest and Climate Change, Govt. of India)



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Cover Photo: Front Cover: *Halerpestes tricuspis*, *Taraxacum leucanthum*, *Ptilotrichum canescens*. Inner Cover: *Christolea crassifolia*, *Pedicularis longiflora* var *tubiformis*, *Pedicularis rhinanthoides*. Back Cover: *Nepeta coerulescens*, *Dracocephalum heterophyllum*, *Oxytropis tatarica*, *Potentilla saundersiana*

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तन्मय कुमार
TANMAY KUMAR



सत्यमेव जयते



MESSAGE



सचिव
भारत सरकार
पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय
SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST
AND CLIMATE CHANGE

The high-altitude wetlands of the Indian Himalayan Region are among the country's most ecologically significant and fragile ecosystems. These wetlands serve as important reservoirs of freshwater, support unique and specialized biodiversity, regulate hydrological processes, and provide essential ecosystem services to mountain communities. At the same time, their ecological integrity is increasingly threatened by changing hydrological regimes, habitat disturbance, and growing anthropogenic pressures. Their conservation and sustainable management therefore remain important priorities for the Government of India.

The Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, has been giving sustained attention to the conservation of Himalayan ecosystems through various policy, research, and programme-based interventions. Recognizing the ecological significance and vulnerability of high-altitude wetlands, the Ministry has supported initiatives aimed at improving scientific understanding, strengthening biodiversity documentation, monitoring ecosystem health, and developing appropriate approaches for their conservation and sustainable management.

The G.B. Pant National Institute of Himalayan Environment (GBPNIHE) has made significant contributions in advancing scientific knowledge on Himalayan ecosystems through long-term research, field-based assessments, biodiversity documentation, capacity building, and knowledge generation. Its work on high-altitude wetlands has been particularly valuable in establishing scientific baselines and improving our understanding of their ecological dynamics, biodiversity, ecosystem services, and emerging threats. Such efforts provide an important foundation for evidence-based conservation planning and management.

The present publication on the flora of Tso Moriri, a globally recognized high-altitude wetland and Ramsar Site in the Trans-Himalayan region of Ladakh, is a noteworthy contribution in this direction. The systematic documentation of its plant diversity, ecological characteristics, distribution, and ethnobotanical significance will provide valuable baseline information for future research, biodiversity monitoring, conservation planning, and sustainable management of this fragile ecosystem. It is heartening to note that this publication has emerged from High-Altitude Wetland project supported by MoEF&CC under National Mission on Himalayan Studies (NMHS).

I commend the scientists and researchers of GBPNIHE for their dedicated field efforts and commitment to documenting the biological wealth of the Himalayan region. I am confident that this publication will contribute to greater scientific understanding and awareness of high-altitude wetlands and encourage further research and conservation action.

The Ministry remains committed to promoting science-based, participatory, and sustainable approaches for conserving the unique natural heritage of the Himalaya. I extend my best wishes to the authors and the Institute for their continued efforts toward safeguarding these invaluable ecosystems for present and future generations and hope that this would be useful for the policymakers and implementers alike.

(Tanmay Kumar)

Place : New Delhi
Dated : September 3, 2026

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NAMEETA PRASAD



सत्यमेव जयते



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भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Joint Secretary
Government of India
Ministry of Environment, Forest &
Climate Change

Message

The documentation of floral diversity in ecologically fragile landscapes is of paramount importance, particularly in high-altitude wetland (HAW) regions such as Tso Moriri, situated in the Trans-Himalayan cold desert of Ladakh. This region represents one of India's most unique biogeographic zones, characterized by extreme climatic conditions and a highly specialized assemblage of flora adapted to its harsh environment.

The High-Altitude Wetland project supported under National Mission on Himalayan Studies (NMHS) has enabled systematic field investigations and scientific documentation of selected high-altitude wetlands, including Tso Moriri. The present flora is a valuable outcome of these efforts and represents an important contribution toward documenting the plant diversity of this remote and fragile ecosystem. The G.B. Pant National Institute of Himalayan Environment has been making commendable contributions to the field of Himalayan ecology and biodiversity conservation. The present work by the Sikkim Regional Centre of the Institute is a significant effort toward systematically documenting the plant diversity of this remote and environmentally sensitive ecosystem. Such studies not only enhance our understanding of species composition, distribution, and ecological adaptations but also provide essential baseline information for biodiversity conservation, ecological monitoring, and habitat management.

High-altitude wetlands are increasingly experiencing pressures from changing environmental conditions, tourism, and anthropogenic activities. In this context, the scientific baseline generated through the present study is particularly valuable for biodiversity monitoring, ecological assessment, evidence-based conservation planning and sustainable habitat management. The documentation of species composition, distribution, habitat characteristics and ethnobotanical significance further enhances its relevance for researchers, forest managers, policymakers, conservation practitioners and local communities. Such publications are essential for promoting the science based informed decision making for sustainable management of natural resources and safeguarding Himalayan biodiversity.

I appreciate the dedication and extensive field efforts of the scientists and researchers of the Sikkim Regional Centre of Institute in compiling this valuable document. I am confident that this publication will serve as a valuable reference for future research, biodiversity monitoring, conservation planning and sustainable management of high-altitude wetlands.

I extend my best wishes to the authors and GBPNIHE for their continued efforts toward advancing scientific knowledge and contributing to the long-term conservation of the fragile and invaluable ecosystems of the Himalaya.

नमिता

(NAMEETA PRASAD)



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गोविन्द बल्लभ पंत राष्ट्रीय हिमालय
पर्यावरण संस्थान

Director In-charge
Govind Ballabh Pant National
Institute of Himalayan Environment

Foreword

It gives me immense pleasure to present this comprehensive flora of Tso Moriri High-Altitude Wetland, a unique and fragile ecosystem situated within the Trans-Himalayan cold desert of Ladakh. This work represents a valuable contribution to our understanding of the rich yet vulnerable plant diversity of one of India's most ecologically significant alpine landscapes.

The Trans-Himalayan region is characterized by extreme climatic conditions, low precipitation, high solar radiation, and pronounced temperature fluctuations. Despite these environmental constraints, it supports a specialized assemblage of plant species that have evolved remarkable adaptations to survive under severe ecological stress. The Tso Moriri landscape harbours notable botanical diversity, including rare and regionally significant species that contribute substantially to ecosystem functioning, stability, and resilience.

This flora goes beyond documenting taxonomic diversity by providing valuable information on the distribution, habitat preferences, flowering periods, and ethnobotanical significance of the recorded species. Such systematic documentation is particularly important in the context of rapid environmental change, as high-altitude ecosystems are highly sensitive to climate variability, habitat disturbance, and increasing anthropogenic pressures.

I commend the authors for their meticulous field surveys, scientific observations, and dedicated efforts in compiling this important body of knowledge. The present work will provide a valuable baseline for future botanical and ecological research and will support conservation planning and sustainable management of the fragile high-altitude ecosystems of the Himalayan region. I am confident that this publication will serve as a useful reference for researchers, students, botanists, forest managers, conservation practitioners, and policymakers.

I sincerely appreciate the tremendous efforts of Dr. Rajesh Joshi, Scientist-F & Regional Head and his team of scientists and researchers at Sikkim Regional Centre in bringing out this important publication as part of the High-Altitude Wetland Project. Their contribution towards documenting and promoting the conservation of Himalayan biodiversity is highly commendable.

Place: Kosi-Katarmal, Almora

Dated: September 3, 2026

Dr. I.D. Bhatt

गोविन्द बल्लभ पंत राष्ट्रीय हिमालय पर्यावरण संस्थान
(पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार का एक स्वायत्त संस्थान)

Govind Ballabh Pant National Institute of Himalayan Environment (NIHE)
(An Autonomous Institute of Ministry of Environment, Forest & Climate Change, Govt. of India)



Preface

High-Altitude Wetlands (HAWs), generally occurring above 3,000 m, are among the most ecologically important and fragile ecosystems of the Indian Himalayan Region (IHR). They play vital roles in climate regulation, biodiversity conservation, freshwater supply, and supporting local livelihoods and tourism. However, these ecosystems are increasingly threatened by climate change, anthropogenic pressures, and inadequate management. Recognizing the need for systematic research and effective conservation, the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, through the National Mission on Himalayan Studies (NMHS), supported the project entitled “Multidimensional Assessment of Ecological Dynamics and Ecosystem Health of Selected High-Altitude Wetlands of the Indian Himalayan Region (IHR) for Effective Conservation and Management Planning,” implemented by the Sikkim Regional Centre of the G.B. Pant National Institute of Himalayan Environment (NIHE).

This volume is an outcome of the project and focuses on the flora of Tso Moriri, a prominent high-altitude lake in the Trans-Himalayan region of Ladakh. Located at approximately 4,600 m above sea level (32°54'N, 78°18'E), Tso Moriri is one of India's largest high-altitude lakes and a designated Ramsar Site. Its cold-desert environment is characterized by extreme temperatures, strong winds, intense ultraviolet radiation, and limited moisture. Despite these harsh conditions, the region supports diverse and highly adapted plant communities.

The unique ecological setting and biological richness of Tso Moriri have long attracted the attention of ecologists, botanists, and naturalists. However, systematic documentation of its plant diversity remains particularly important in view of the rapid environmental changes occurring across high-altitude ecosystems. The present work represents the outcome of extensive field surveys, botanical collections, ecological observations, and a review of relevant literature undertaken during 2024 and 2025. It provides taxonomic accounts of 72 plant species belonging to 26 families and 58 genera, together with information on their distribution, habitat characteristics, flowering periods, and known uses. The flora is intended not merely as a taxonomic inventory, but also as a baseline reference for understanding the botanical diversity and ecological significance of the Tso Moriri landscape.

We hope that this volume will serve as a valuable reference for students, researchers, botanists, ecologists, conservation practitioners, forest managers, and all others interested in the biodiversity and ecology of the Trans-Himalayan region. More importantly, we hope that this documentation will contribute to a deeper appreciation of the unique botanical wealth of Tso Moriri and strengthen efforts toward the conservation and sustainable management of its fragile alpine ecosystems.

(Authors)





Executive Summary

High-altitude wetlands are among the most ecologically significant yet vulnerable ecosystems of the Indian Himalayan Region. Predominantly occurring above 3,000 m, they function as natural freshwater reservoirs, regulate hydrological processes, facilitate groundwater recharge, store carbon, stabilize soils, and support highly specialized biological communities. Despite harsh environmental conditions and generally low productivity, these wetlands provide critical habitats for rare, endemic, threatened, and migratory species. They also sustain mountain communities through water security, livestock grazing, fisheries, medicinal resources, and nature-based tourism. Among these ecosystems, Tso Moriri, located at approximately 4,600 m above sea level in the Changthang region of Ladakh, is one of the most important high-altitude wetlands of the Trans-Himalaya. Covering approximately 148.8 km², it is one of India's largest high-altitude lakes and the country's highest Ramsar Site. Its lake margins, streams, moist depressions, and surrounding landscapes support specialized plant communities adapted to prolonged freezing, low precipitation, intense solar and ultraviolet radiation, strong winds, drought, short growing seasons, and nutrient-poor soils. These extreme conditions have driven distinctive adaptations such as cushion- and mat-forming growth, dense pubescence, reduced leaf surfaces, succulence, and extensive below-ground structures.

Pictorial Flora of Tso Moriri High-Altitude Wetland presents a comprehensive, field-oriented account of the vascular plant diversity of this important wetland landscape. Based on extensive field surveys and supported by established taxonomic databases, floristic literature, checklists, and published research, the book documents 72 vascular plant species recorded from the Tso Moriri region. Each species is presented through a standardized pictorial profile covering its accepted name, synonyms, common or local names where available, geographical distribution, habitat, diagnostic morphological characteristics, flowering period, documented uses, ecological significance, and IUCN conservation status. A key strength of the book is its integration of scientific accuracy with practical visual identification. Photographs and concise diagnostic information translate complex botanical and taxonomic knowledge into accessible field profiles. The systematic arrangement of species by family and alphabetical order enhances its usefulness as a reference and identification guide for researchers, students, field biologists, conservation practitioners, eco-tourists, protected-area personnel, and other stakeholders, including those without advanced botanical training.

The documented flora also highlights the ecological and socio-cultural importance of vegetation in this cold-desert environment. Families such as Asteraceae, Amaranthaceae, Fabaceae, Poaceae, Cyperaceae, and Brassicaceae are prominently represented. Although plant biomass is generally low, these communities contribute to primary productivity, nutrient cycling, soil stabilization, and habitat formation. Wetland-associated vegetation along lake margins and other moist habitats additionally contributes to hydrological stability and provides food, shelter, and resources for other components of the ecosystem. The book further recognizes the close relationship between biodiversity and local livelihoods. Several documented species have medicinal, forage, aromatic, cultural, or other traditional uses. Grasses, sedges, *Caragana versicolor*, and other alpine plants contribute to livestock grazing resources, while medicinal and culturally important species form part of local knowledge systems. Conservation of Tso Moriri's biodiversity must therefore be considered alongside pastoral livelihoods and traditional ecological knowledge. The ecological integrity of Tso Moriri and comparable Himalayan wetlands is increasingly challenged by climate change and anthropogenic pressures. Changes in temperature, glacial dynamics, and hydrological regimes, together with overgrazing, infrastructure development, and increasing tourism, may alter plant community composition, degrade habitats, promote opportunistic species, and reduce ecosystem resilience. In this context, systematic documentation of species occurrence and distribution provides an essential baseline for detecting ecological change and developing evidence-based conservation strategies.

This publication forms part of the project “Multidimensional Assessment of Ecological Dynamics and Ecosystem Health of Selected High Altitude Wetlands of the Indian Himalayan Region for Effective Conservation and Management Planning,” supported by the National Mission on Himalayan Studies (NMHS), Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India. Tso Moriri is one of five focal wetland systems under the project, and this volume is the first in a planned series of pictorial floras of high-altitude wetlands of the Indian Himalayan Region. By addressing the often-overlooked floral diversity of wetland and riparian habitats, this book fills an important gap in biodiversity documentation. More than a species catalogue, it provides a scientifically validated baseline for biodiversity assessment, ecological monitoring, conservation planning, environmental education, and sustainable wetland management. By bridging taxonomy, field ecology, conservation science, and local knowledge, the volume serves both as a practical field guide and as an enduring scientific record of the fragile botanical heritage of Tso Moriri.



Abbreviations

cm: Centimeter

E: East

ERA5: European Centre for Medium-Range Weather Forecasts Reanalysis Fifth Generation

Fig: Figure

ft: feet

GBIF: Global Biodiversity Information Facility

ha: hectare

HAWs: High Altitude Wetlands

HQs: Headquarters

IHR: Indian Himalayan Region

IUCN: International Union for Conservation of Nature

km: Kilometer

km²: Square Kilometer

LC: Least concern

m: meter

mm: millimeter

MoEF&CC: Ministry of Environment, Forest and Climate Change

N: North

NA: Not Available

NE: Not Evaluated

NIHE: National Institute of Himalayan Environment

NMHS: National Mission on Himalayan Studies

No.: Number

°C: Degree Celsius

Pen: Peninsula

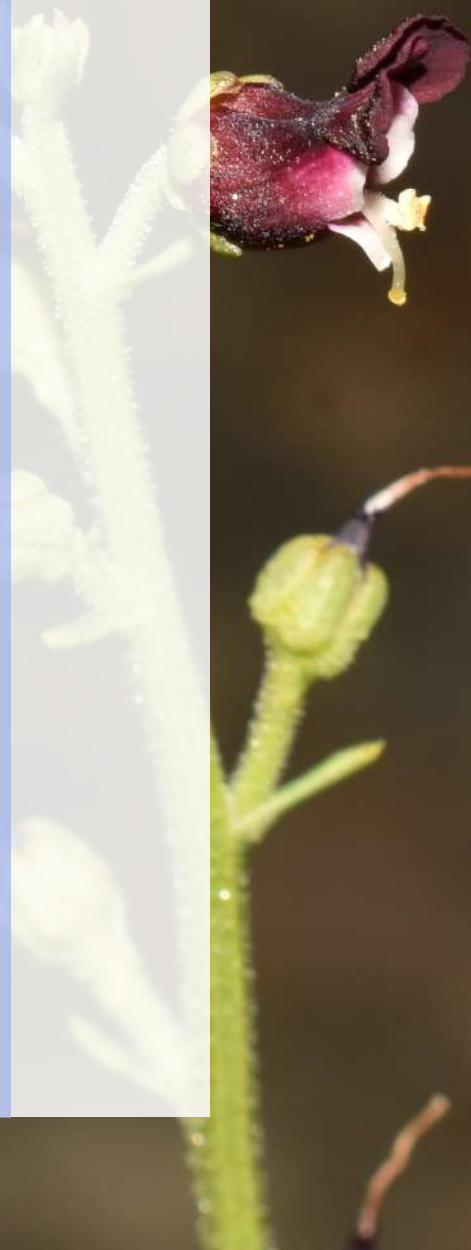
POWO: Plant of the World Online

R&D: Research and Development



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Introduction

High-Altitude Wetlands of the Indian Himalayan Region

High-Altitude Wetlands (HAWs) are unique and fragile ecosystems occurring predominantly in mountainous regions at elevations above 3,000 m. They provide a wide range of critical ecological, social, and cultural benefits. Ecologically, these wetlands function as natural reservoirs that regulate hydrological cycles, store freshwater, facilitate groundwater recharge, sequester carbon, and support diverse assemblages of specialized flora and fauna, including several endemic, rare, and threatened species. They also provide important breeding, staging, and migratory habitats for waterbirds and other wildlife.

Beyond their ecological significance, HAWs provide essential services to mountain communities by supporting drinking-water supplies, irrigation, livestock grazing, fisheries, and tourism. Many high-altitude wetlands also possess profound cultural and spiritual significance for indigenous and local communities and are closely associated with sacred landscapes, traditional practices, rituals, and folklore. For instance, Tsomgo Lake in Sikkim is revered as a sacred lake and is an important tourism destination; Gurudongmar Lake is considered sacred by both Buddhist and Sikh; Tso Moriri supports globally significant populations of migratory waterbirds; and Chandra Taal provides habitat for diverse alpine flora and fauna.

As transitional zones between terrestrial and aquatic ecosystems, wetlands exhibit considerable ecological diversity. In accordance with the broad definition of wetlands, HAWs may include areas of marsh, fen, peatland, or open water, whether natural or artificial, permanent or temporary, and with water that may be static or flowing, fresh, brackish, or saline. Despite the wide range of ecosystem services they provide, these fragile ecosystems are increasingly exposed to pollution, habitat degradation, biodiversity loss, unregulated construction, increasing tourism pressure, and other anthropogenic disturbances.

The Indian Himalayan Region (IHR) is a vital repository of high-altitude wetlands that are fundamental to regional ecological stability, water security, and biodiversity conservation. The IHR encompasses the Union Territories of Jammu and Kashmir and Ladakh, as well as the states of Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, and other northeastern Himalayan states. The wetlands distributed across this region represent a wide range of ecological and biogeographic conditions and support highly specialized biological communities.

High-Altitude Wetlands of Ladakh

Ladakh, the northernmost Union Territory of India, is particularly rich in high-altitude lakes and wetlands. According to the *National Wetland Atlas of India*, Ladakh harbours approximately 968 lakes covering about 103,603 ha. Prominent wetlands include Pangong Tso, Tso Kar, and Tso Moriri. Many wetlands in the region are closed-basin systems without surface outlets and consequently exhibit varying degrees of salinity or brackishness.

Situated at approximately 4,600 m above sea level (32°54'N, 78°18'E), Tso Moriri is located in the Changthang region of Ladakh, approximately 215 km southeast of Leh (Fig. 1). Surrounded by lofty mountains, the lake is approximately 29 km long and up to 8 km wide, with a surface area of about 148.8 km². Tso Moriri is one of the largest high-altitude lakes in India and the highest Ramsar Site in the country. The lake and its surrounding wetlands support a diverse range of sensitive flora and fauna and are particularly important for migratory waterbirds.



The extreme climatic conditions of Ladakh have resulted in the evolution of highly specialized plant communities. The regional flora is adapted to a combination of severe abiotic stresses, including freezing temperatures, desiccation, intense solar radiation, short growing seasons, and edaphic constraints such as low organic matter and limited nutrient availability. Consequently, the vegetation is predominantly composed of stress-tolerant and slow-growing life forms, including hemicryptophytes, chamaephytes, geophytes, and therophytes. Plants exhibit a range of morphological and anatomical adaptations, including cushion- and mat-forming growth habits, dense indumentum, reduced leaf surfaces, succulence, and extensive below-ground biomass. These adaptations facilitate microclimatic buffering, minimize water loss, and improve resource acquisition under highly limiting environmental conditions.

The plant diversity of Ladakh also has considerable ethnobotanical significance. Of approximately 700 plant species reported from the region, around 285 are documented as being used in the Tibetan system of medicine (Gujja et al., 2003). The wetlands and associated habitats of Ladakh are also important for wildlife, supporting more than 90 bird species and approximately 12 mammal species (Sharma et al., 2020).

Among the most significant wetland-dependent species are the endangered Black-necked Crane (*Grus nigricollis*) and the Bar-headed Goose (*Anser indicus*), for which Tso Moriri and Tso Kar provide important breeding and staging habitats. The alpine meadows surrounding Tso Moriri further support a diverse mammalian assemblage, including marmots, pikas, voles, and the Tibetan wild ass (*Equus kiang*). These meadows also constitute important grazing grounds for livestock managed by transhumant pastoral communities. Pashmina goats and yaks, in particular, are traditionally reared by local pastoralists and utilize the alpine pastures surrounding the wetland.

Thus, Tso Moriri represents a remarkable interface between aquatic, terrestrial, and pastoral ecosystems, where biodiversity, ecosystem services, traditional livelihoods, and cultural values are closely interconnected. Its exceptional ecological significance, coupled with increasing environmental pressures, underscores the need for systematic documentation, long-term monitoring, scientific research, and effective conservation and sustainable management of its biological resources.

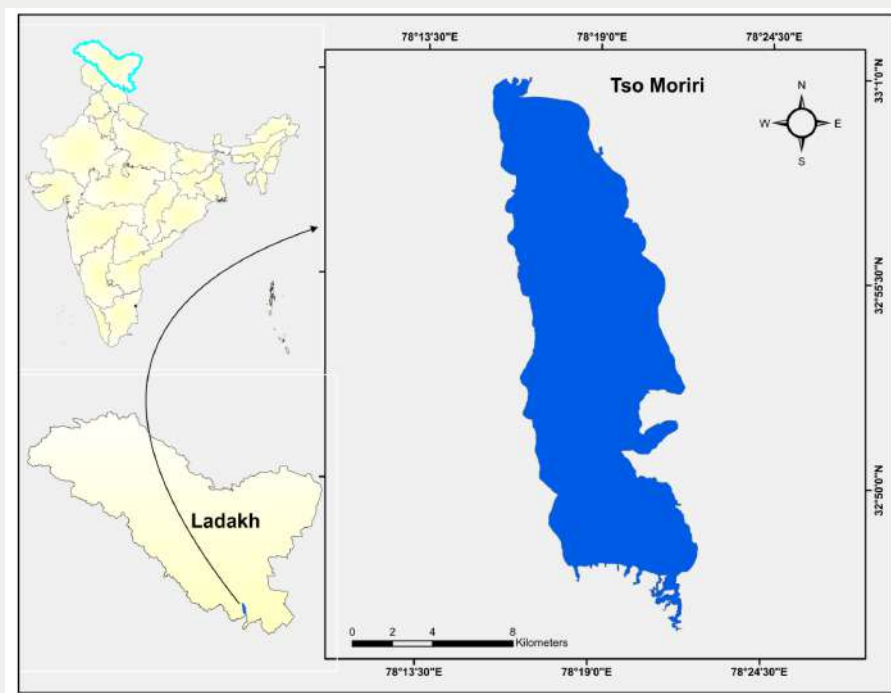


Figure 1: Location map of Tso Moriri in Ladakh

Climate and Environmental Characteristics

The high-altitude ecosystems of the Trans-Himalayan region represent some of the most climatically rigorous and ecologically specialized environments on Earth. The cold-desert landscape surrounding Tso Moriri, situated within the Changthang Plateau of Ladakh, constitutes a distinctive biogeographic unit characterized by low atmospheric pressure, pronounced diurnal temperature fluctuations, high wind velocities, intense ultraviolet radiation, and limited precipitation. These extreme environmental conditions exert strong selective pressures on the region's biological communities and play a fundamental role in shaping vegetation structure, species composition, and ecosystem processes.

The climate of Tso Moriri is characterized by a prolonged, frigid winter extending from October to April and a short, relatively mild summer from May to September. Based on climatic records for the 20-year period from 1994 to 2024, the mean annual precipitation and temperature were approximately 333 mm and 9.1°C, respectively (Fig. 2 and 3). During this period, precipitation exhibited an overall declining trend, whereas temperature showed a gradual increasing trend. These changes indicate a shift toward warmer and potentially drier conditions, which may have important implications for the hydrological regime, vegetation dynamics, and ecological functioning of the Tso Moriri wetland ecosystem.

The combination of low moisture availability, thermal extremes, strong winds, and intense solar radiation creates a highly demanding environment for plant growth and survival. Consequently, the flora of Tso Moriri exhibits a range of specialized morphological, physiological, and phenological adaptations that enable plants to withstand prolonged cold, water stress, and a short growing season. Understanding these climatic characteristics and their temporal trends is therefore essential for assessing the ecological dynamics and vulnerability of this high-altitude wetland under a changing climate.

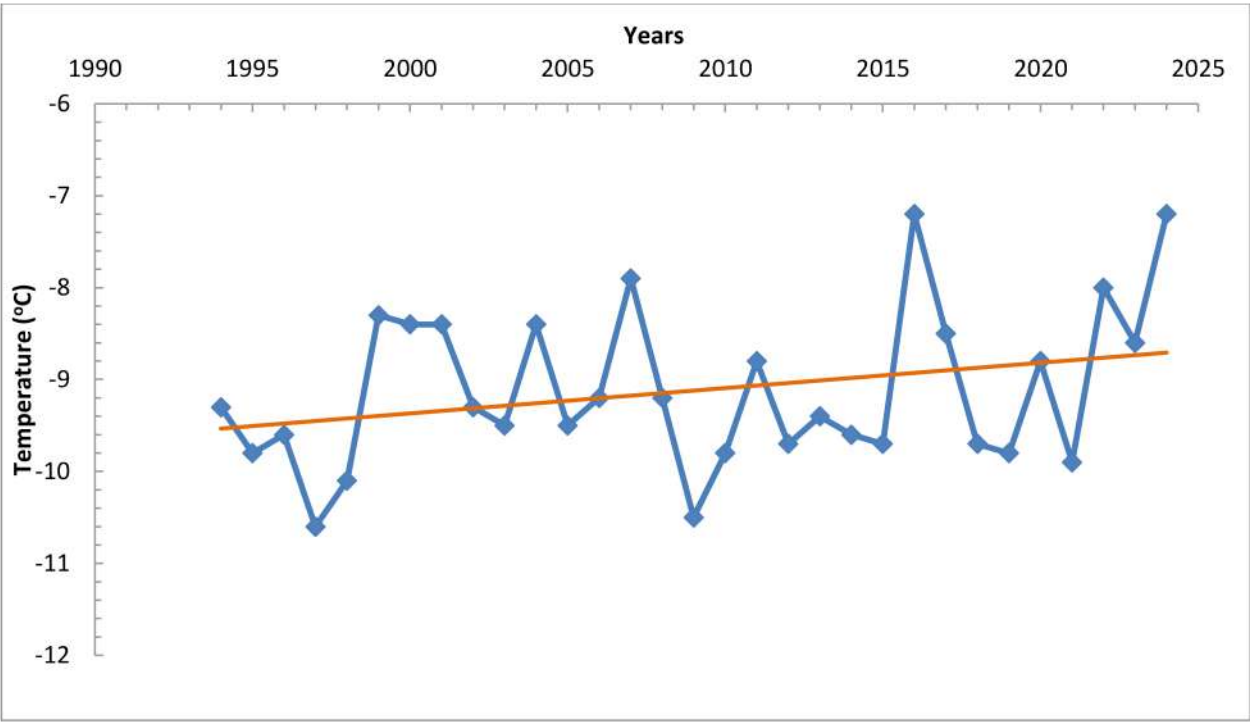


Figure 2 : Average annual temperature of Tso-Moriri (1994–2024)(Source: ERA5).

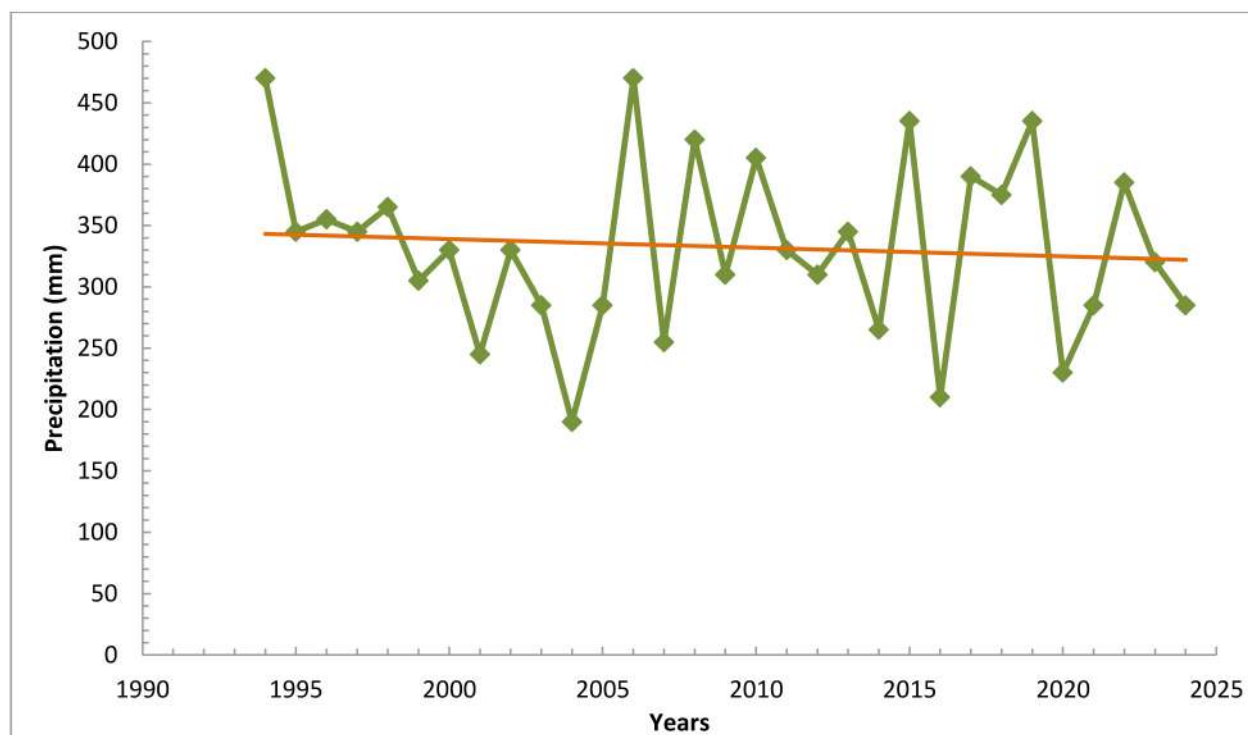


Figure 3 : Average annual precipitation of Tso-Moriri (1994–2024) (Source: ERA5).

Floristic and Ecological Significance

Floristically, the Tso Moriri region exhibits strong affinities with Central Asian, Tibetan, and Himalayan floristic elements, reflecting its location within the Irano-Turanian phytogeographic realm. Several plant families, notably Asteraceae, Amaranthaceae, Fabaceae, Poaceae, Cyperaceae, and Brassicaceae, are well represented in the region (Fig. 4), reflecting their broad ecological amplitude and remarkable adaptive capacity under alpine and cold-desert conditions. The coexistence of widespread taxa and regionally restricted species further highlights the biogeographic significance of Tso Moriri as a transitional zone between major floristic regions and as an area of evolutionary importance.

Despite the relatively low vegetation biomass characteristic of the Trans-Himalayan cold desert, the flora of the Tso Moriri basin plays a vital role in maintaining ecosystem functioning. Plant communities contribute to soil stabilization, nutrient cycling, carbon fixation, and primary productivity, thereby supporting higher trophic levels, including herbivorous mammals and avifauna. Vegetation associated with wetland margins, marshes, and stream channels is particularly important for stabilizing soils, regulating moisture retention, and providing habitat and food resources for diverse wildlife. These wetland-associated plant communities consequently form important biodiversity-rich areas within the otherwise arid landscape.

The flora of Tso Moriri also has considerable ethnobotanical significance. Several documented species are traditionally utilized by local pastoral communities for medicinal, forage, and cultural purposes (Fig. 5). These practices represent a long-standing relationship between local communities and their alpine environment and demonstrate the importance of plant resources in supporting traditional livelihoods and cultural practices. The integration of such indigenous and traditional knowledge with contemporary scientific approaches can provide valuable insights for developing locally appropriate conservation strategies.

Overall, the floristic diversity, ecological functions, and ethnobotanical values of the Tso Moriri basin underscore its importance as a biologically and culturally significant high-altitude landscape. Documenting and understanding these interconnected values are essential for developing effective conservation, biodiversity monitoring, and sustainable management strategies for this fragile Trans-Himalayan ecosystem.

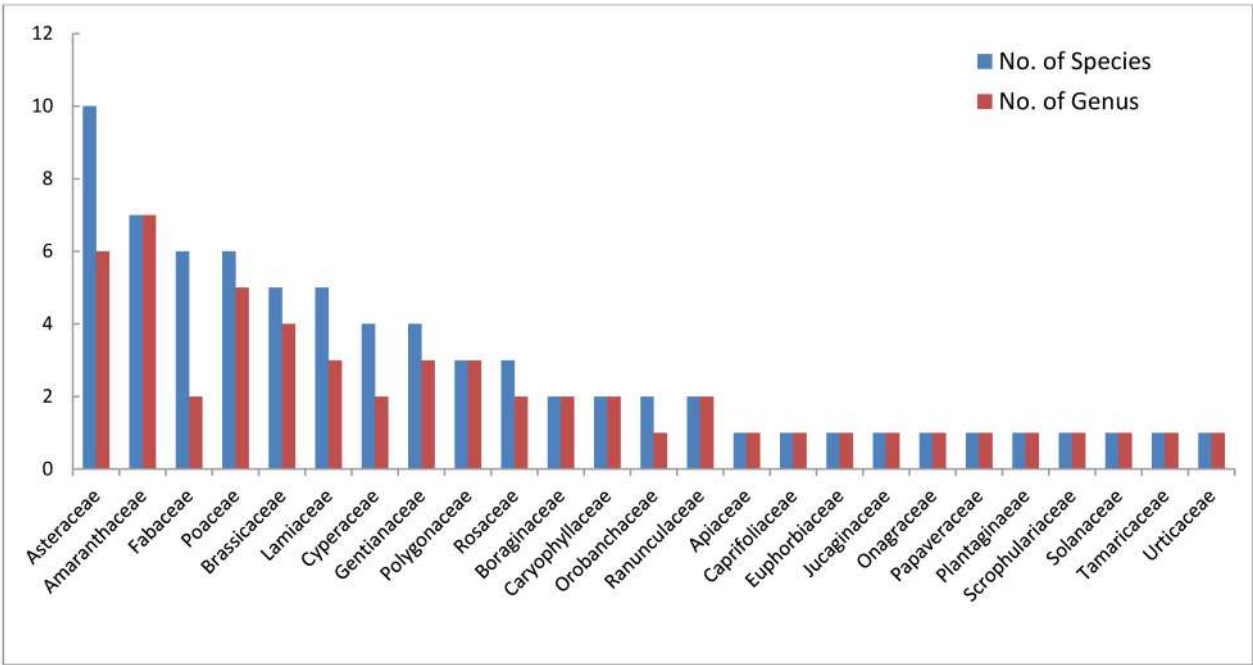


Figure 4 : Number of representative species in each family at Tso Moriri

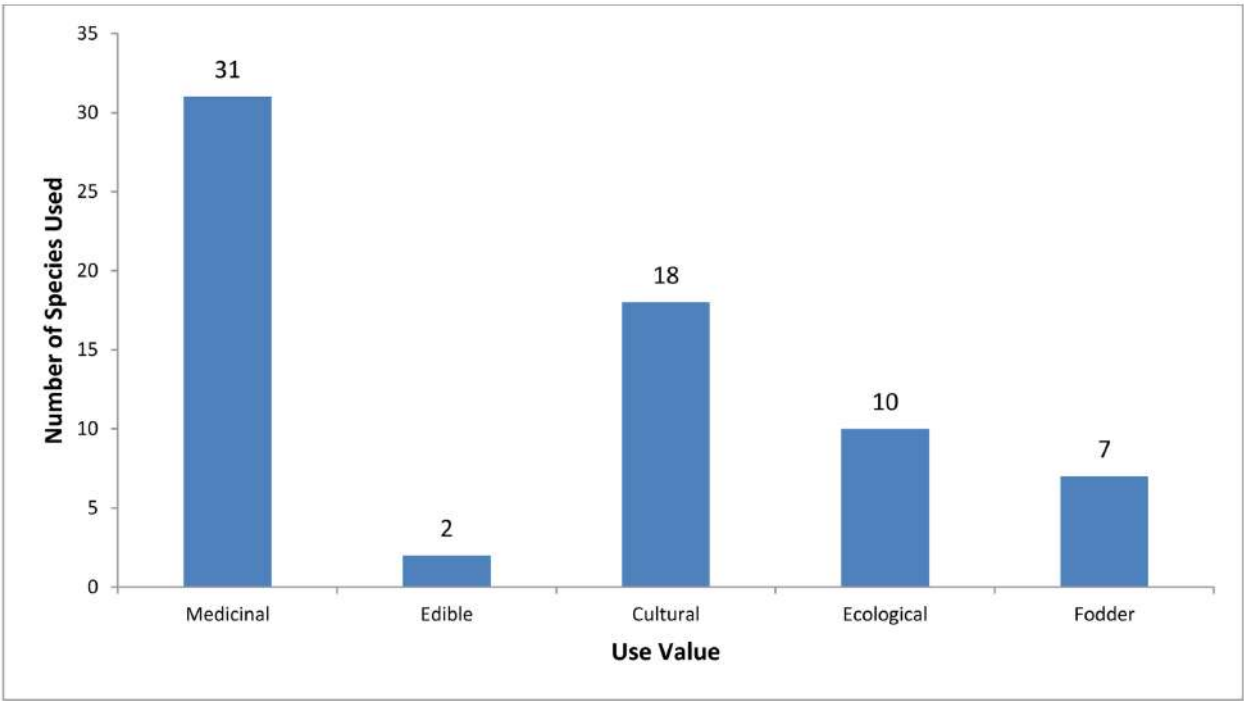


Figure 5 : Traditional or reported use of plant species of Tso Moriri

Scope and Significance of the Flora

In recent decades, the ecological integrity of high-altitude ecosystems such as Tso Moriri has increasingly been challenged by climate change, reflected in alterations in temperature regimes, glacial dynamics, and hydrological cycles. These pressures are further compounded by anthropogenic activities, including overgrazing, infrastructure development, and increasing tourism. Such disturbances can alter species composition, facilitate the establishment of opportunistic or invasive taxa, and contribute to habitat degradation, thereby affecting the ecological stability and resilience of these fragile ecosystems.

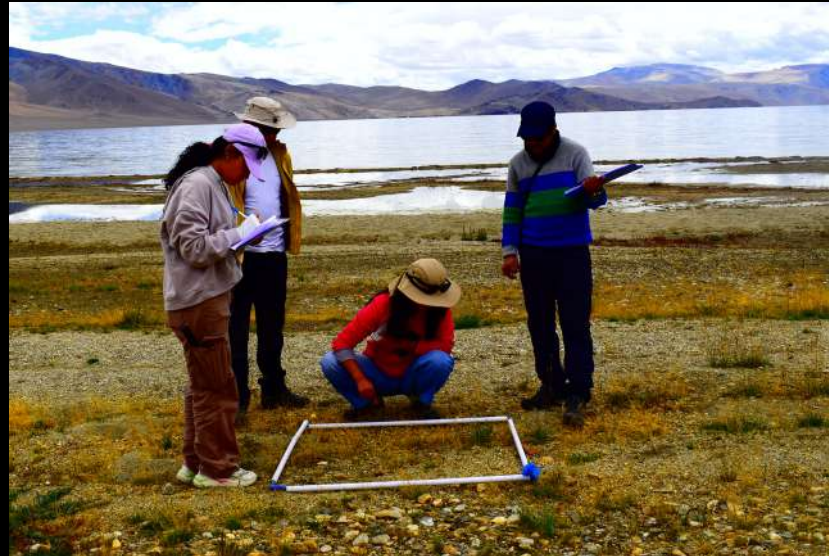
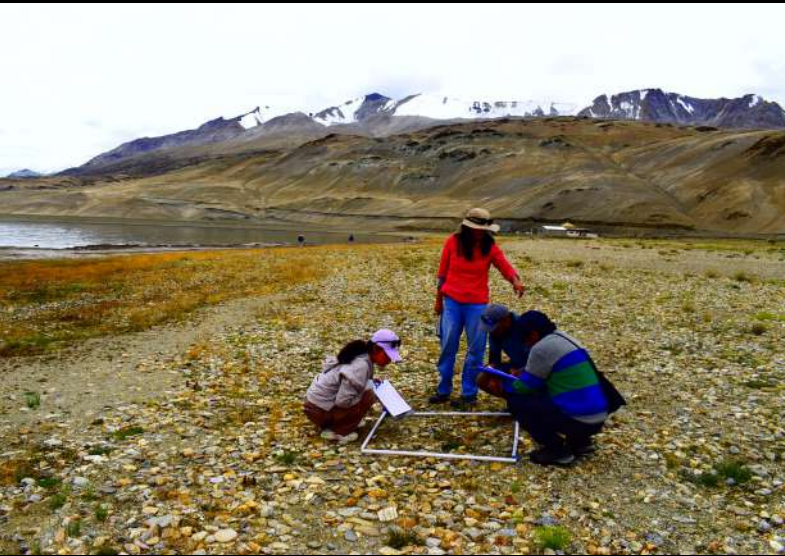
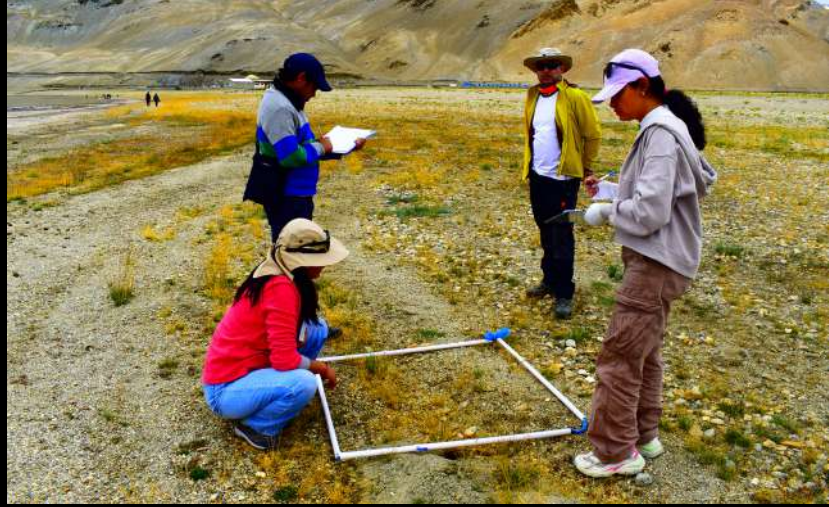
The present work aims to provide a systematic and comprehensive account of the vascular plant diversity of the Tso Moriri region. The flora documents 72 plant species recorded through extensive field surveys and supported by relevant literature. For each species, information is provided on the accepted name, synonyms, common name(s), wherever available, distribution, habitat characteristics, taxonomic description, flowering period, documented uses, and IUCN conservation status. Standardized approaches were followed for field documentation, species identification, taxonomic verification, and data compilation to ensure consistency and scientific rigor. The species are arranged alphabetically by family, with the species within each family also presented in alphabetical order. For systematic identification, correct nomenclature, synonyms, distribution, description, uses and IUCN status of plants, online and printed database such as POWO, GBIF, IUCN, efloras, checklists, flora of Ladakh, and other published literatures were thoroughly consulted.

Beyond serving as a taxonomic inventory, this flora is intended to provide a baseline dataset for biodiversity assessment, ecological monitoring, and conservation planning in high-altitude wetland ecosystems. The information presented herein also contributes to a broader understanding of plant adaptations, community composition, ecological relationships, and biogeographic patterns under extreme environmental conditions.

Given the high sensitivity of alpine and Trans-Himalayan ecosystems to environmental change, systematic documentation of their biological diversity is essential for developing evidence-based conservation and sustainable management strategies. Continued monitoring of species composition and distribution will be particularly important for detecting ecological changes and assessing the impacts of climate variability and anthropogenic pressures.

In this context, the flora of Tso Moriri represents more than a catalogue of plant species. It provides an important scientific foundation for understanding the floristic composition, ecological significance, and biological resilience of this cold-desert wetland landscape, while reinforcing the need for its long-term conservation, monitoring, and ecological stewardship.

ENUMERATION



AMARANTHACEAE



Chenopodium karoii (Murr.) Aellen

Common Name: Prostrate Axyris

Distribution: India (Himalaya), China, Nepal, Bhutan, Kirgizstan, Tadzhikistan, Mongolia, Russia.

Habit & Habitat: Annual herb, growing in high elevation valleys, rocky slopes, dry grassland and open woodlands.

Description: Plants 2-14 cm tall. Stems and branches prostrate or ascending, densely stellate-pubescent. Leaf blades broadly elliptic, ovate, or suborbicular, 0.5-1.5 × 0.4-0.9 cm, hairy; margins entire; apex rounded. Male flowers in sub-capitate inflorescences, abaxially densely hairy; stamens 3 or 5, exserted. Female flowers with 3 membranous, hairy perianth segments; ovary ovoid, compressed; style short; stigmas 2, slender. Utricle globose or obovoid.

Flowering: July -August

Uses : NA

IUCN Status: Not Evaluated (NE)

AMARANTHACEAE



Corispermum tibeticum Iljin

Common Name: Tibetan bugseed

Ladakhi Name: Lug-Mig



Synonym: *Corispermum ladakhianum* Grey-Wilson & Wadhwa

Distribution: India (Western Himalaya), China, Tadjikistan.

Habit & Habitat: Annual herb. Sandy places and riversides in high altitude areas.

Description: 5-20 cm tall, stem branching from base, lower branches prostrate, upper ones spreading. Leaves linear 2-3.5 cm, base narrow, apex pointed. Flowers are borne in elongated spike like inflorescence. Tepal 1, nearly rounded, irregularly finely toothed. Fruit 3-4 x 2-2.5 mm, broadly triangular, thin, papery, winged.

Flowering: July-September

Uses : NA

IUCN Status: Not Evaluated (NE)

AMARANTHACEAE



Dysphania botrys (L.) Mosyakin & Clemants

Common Name: Jerusalem-Oak Goosefoot

Ladakhi Name: Sagani

Synonym: *Chenopodium botrys* L.

Distribution: India (Himalaya), Central and South West Asia, Southern Europe, Nepal, Bhutan, China, Naturalized in warm temperate regions.

Habit & Habitat: Annual herb. Valleys, river terraces, around houses and roadsides.

Description: 20-50 cm tall, strong odor, covered in glandular hairs. Stem erect, mostly branched from base. Leaf oblong, pinnately parted 2-4 x 1-2 cm. Inflorescence is elongate, main axis up to 5 cm wide, at branch-ends, composed of mostly leafless dense dichasial cymes.

Flowering: July-August

Uses : Traditionally used for asthma, cough, wounds, fever, pain, liver, respiratory, urinary, and gastric complaints, as an antiseptic and for wound healing. Contains essential oils, antimicrobial, anti cancerous properties.

Ecological Importance: It is pioneer species, helping in early stages of vegetation succession.

IUCN Status: Not Evaluated (NE)

AMARANTHACEAE



Halogeton glomeratus (M.Bieb.) Ledeb.

Common Name: Salt Lover

Ladakhi Name: Phyang



Synonym: *Anabasis glomerata* M.Bieb.

Distribution: India (Western Himalaya), Afghanistan, China, Mongolia, Russia, Kazakhstan, Kirgizstan, Tadzhikistan, Ukraine, Uzbekistan.

Habit & Habitat: Succulent annual herb. Thrives in a saline soil.

Description: Hardy plant, producing usually prostrate to spreading stems with several curving branches upto 25 cm. It has a deep taproot system. Branches are lined with narrow, fleshy leaves each upto 2 cm long ending in stiff bristle. Inflorescence in axillary glomerulus, tiny bisexual or female flowers. Flowers inconspicuous green or white, perianth persistent often thickened or winged in fruit.

Flowering: June-September.

Ecological Importance: It has a salt tolerance (halophyte behavior) potential to adaptation to saline and degraded soils.

IUCN Status: Not Evaluated (NE)

AMARANTHACEAE



Krascheninnikovia ceratoides (L.) Gueldenst.

Common Name: Gray Winterfat

Ladakhi Name: Gausan



Synonym: *Axyris ceratoides* L.

Distribution: India (Western Himalaya), Afghanistan, China, Mongolia, Nepal, Pakistan, Russia, Tadzhikistan, Ukraine, Uzbekistan, Central and Western Asia, Eastern and Southern Europe.

Habit & Habitat: Perennial shrub. Rocky slopes and hillsides.

Description: Low-growing to cushion-forming, woody stems branched from the base. Young branches densely covered with whitish to grayish hairs giving silvery appearance. Leaves alternate, linear-lanceolate, 5-20 mm long, margin entire, slightly revolute, densely hairy, leathery. Flowers solitary or in small axillary clusters, inconspicuous. Perianth of 5 tepals united at the base. Prominent reddish-purple, thread-like stigmas emerging from the woolly perianth.

Flowering: June-August.

Ecological Importance: It is valuable forage shrub especially in winter for sheep, yak, goats, and wild herbivores. It has rich in nutrients and palatable even in dry seasons.

IUCN Status: Not Evaluated (NE)

AMARANTHACEAE



Microgynoecium tibeticum Hook.f.

Common Name: Tibetan Goosefoot

Distribution: India (Himalaya), China, Kazakhstan, Kirgizstan, Nepal, Tadzhikistan.

Habit & Habitat: Annual herb, occurring across cold high altitude environment.

Description: Stem reddish, branched from base, sometimes erect, 8-25 cm long. Leaves are thick and fleshy, 6-12 x 5-7 mm, ovate-spathulate (spoon-shaped), pointed or blunt at the apex, cuneate at the base, margins entire, sometimes minutely 3-lobed, petioles 4-15 mm long. Tiny punctate glandular dots (appearing as small white or translucent spots) present on both surfaces, more evident abaxially. Flowers unisexual, occurring in leaf axils. Filament of stamens protrude from perianth.

Flowering: June-September

Ecological Importance: Host plant for butterfly larvae. It is stress tolerance plant of extreme cold, drought, UV radiation.

IUCN Status: Not Evaluated (NE)

AMARANTHACEAE



Oxybasis glauca (L.) S.Fuentes, Uotila & Borsch

Common Name: Oak-Leaf Goosefoot

Synonym: *Chenopodium glaucum* L.

Distribution: India (Western Himalaya), Australia, All of Europe and Asia except South East Asia.

Habit & Habitat: Annual herb. Stony alpine slopes and grasslands.

Description: Plant upto 70 cm, branched from the base forming cushion-like habit. Stems prostrate to ascending, rarely straight. Leaves 6 x 2 cm, petiolate, oblong or lanceolate, more lobate than dentate with 2-5 lobes, green on upper surface, gray or whitish below, reddish-purple on the margin, leathery. Flowers in tiny axillary spikes or panicles. Tepals 3 or 4, light green.

Flowering: May-October.

Uses : Edible as vegetable, tea substitute, seed can be used as quinoa substitute.

Ecological Importance: Used for phyto-remediation to remove mercury from soil.

IUCN Status: Not Evaluated (NE)

APIACEAE



Heracleum pinnatum (Maxim.) C.B. Clarke

Common Name: Pinnate-Leaved Hogweed

Ladakhi Name: Spru

Distribution: India (Western Himalaya), Afghanistan, Pakistan.

Habit & Habitat: Perennial herb. Dry stony ground with semi-desert environment, often near streams with sparse vegetation.

Description: Slender, aromatic plant upto 40 cm. Leaves are upto 25 cm long, pinnately compound with upto 4 pairs spaced widely. Leaflets toothed 2-3 cm long, lower leaflets shortly stalked, uppermost stalkless, 3 lobed. Inflorescence an umbel of white flowers. Fruit 8 mm, winged, with 3 ribs.

Flowering: June-August.

Uses : Used in Himalayan traditional medicine (Sowa-Rigpa) for ailments like fever, digestive issues, and as a blood purifier.

Ecological Importance: It supports pollination networks.

IUCN Status: Not Evaluated (NE)

ASTERACEAE



Ajania tibetica (Hook.f. & Thomson) Tzvelev

Common Name: Shrubby Ajania

Ladakhi Name: Burtse/Khamchu

Synonym: *Tanacetum tibeticum* Hook.f. & Thomson

Distribution: India (Western Himalaya), Tadjikistan, China.

Habit & Habitat: Perennial sub-shrub, occurring on stony slopes above 3000 m.

Description: Plants upto 70 cm tall; roots thick and woody. Stem branched from the base, covered with gray, appressed hairs. Lower stem leaves wither at flowering; middle leaves 2-3 cm long, wingless petioles; leaf blades rounded-triangular, both surfaces gray-green, covered with appressed hairs, divided twice into three segments, the terminal segment linear. Upper leaves subsessile, 3-5 lobed. Inflorescence a compound, terminal, flat-topped panicle; flowerheads 20-60, yellow.

Flowering: July-September.

Uses : Rich in essential oil containing high amount of lavandulol and other bioactive compounds. High potential for antibacterial, antioxidant and anticancer properties.

IUCN Status: Not Evaluated (NE)

ASTERACEAE



Artemisia hedinii Ostenf.

Ladakhi Name: Sangzi Nabo

Distribution: India (Himalaya), Mongolia, Nepal, Bhutan, China, Mongolia, Tadjikistan, Pakistan.

Habit & Habitat: Herb or undershrub, adapted to cold, arid, high-altitude grassy marshlands, rocky slopes, waysides, forest margins, from subalpine to alpine biomes.

Description: Strongly aromatic. Stem erect, branched, 30-80 cm tall, covered with fine wooly hairs; older stems woody at the base. Leaves alternate, deeply dissected; lower leaves 2-3 pinnate with narrow, linear lobes, upper leaves smaller, sessile, less divided. Both surfaces covered with soft silvery-white hairs. Inflorescence composed of numerous small capitula, axillary or terminal panicles or racemes. Flower heads globose to ovoid, 2-4 mm across. Fruit a dry achene.

Flowering: July -September

Uses : Known to have anti-inflammatory, antipyretic, detoxifying, and hemostatic properties.

IUCN Status: Not Evaluated (NE)

ASTERACEAE



Artemisia macrocephala Jacquem. ex Besser

Common Name: Large-flowered Wormwood

Ladakhi Name: Khampa



Distribution: India (Western Himalaya), Afganistan, Pakistan, Tajakistan, China, Mongolia, Kazakhstan.

Habit & Habitat: Annual herb, distributed from cold dry subalpine to alpine habitats.

Description: Plants 20-30 cm tall, densely whitish-gray hairs. Stem solitary or branching from the base. Leaves alternate, highly dissected; lobes narrow, linear to lanceolate. Basal leaves 2-3 pinnatisect, upper leaves sessile, less divided. Leaves strongly aromatic when crushed. Inflorescence a terminal panicle of large, drooping capitula. Capitula 6-12 mm across.

Flowering: July -September

Uses : Traditionally used in treatment of digestive disorders, fever, cold and cough, also used as purifying incense smoke.

IUCN Status: Not Evaluated (NE)

ASTERACEAE



Artemisia stracheyi Hook.f. & Thomson ex C.B. Clarke

Ladakhi Name: Rumonla

Synonym: *Artemisia Stracheyi* (Hook.f. & Thomson ex C.B. Clarke) Ghafoor

Distribution: India (Western Himalaya), China.

Habit & Habitat: Perennial herb, growing on hills, floodlands, lakesides, rocky slopes, meadows, shrublands at elevation of 4300-5200 m.

Description: Aromatic herb, 20-60 cm tall, with compact tufted growth; stems erect, grayish to whitish due to dense tomentose hairs. Leaves petiolate, alternate, 2-3-pinnatisect, and silvery-white tomentose. Inflorescence a terminal panicle. Capitula globose, 2-4 mm across.

Flowering: July-September

Uses : NA

IUCN Status: Not Evaluated (NE)

ASTERACEAE



Artemisia salsoloides Wild.

Common Name: Saltwort Wormwood

Ladakhi Name: Amango



Distribution: India (Western Himalaya), Russia, Kazakhstan, Ukraine, Caucasus.

Habit & Habitat: Shrublet, occurring on dry alpine, gravelly slopes, and sandy plains of cold deserts.

Description: Perennial, aromatic, glabrous, basally woody, usually 20-60 cm tall. Several stems arising from the base. Leaves alternate, nearly sessile, glabrous, glaucous, 2-3-pinnatisect into linear oblong, 8-12 x 1-2 mm. Inflorescence in short terminal or axillary clusters. Capitula subsessile or on short peduncles.

Flowering: July-September

Uses : Used as a deworming agent and to reduce fever. Also, employed to treat cold-related ailment in high altitude regions. Possesses antiseptic and wound-healing properties. In addition, used as incense.

IUCN Status: Not Evaluated (NE).

ASTERACEAE



Askellia flexuosa (Ledeb.) W.A. Weber

Common Name: Tangled Hawksbeard

Ladakhi Name: Remang

Synonym: *Crepis flexuosa* (Ledeb.) Bernh.

Distribution: India (Western Himalaya), Nepal, Pakistan, China, Mongolia, Kazakhstan, Iran.

Habit & Habitat: Small perennial herb growing primarily in stream banks, lake margins, marshes and floodplains, sandy areas, gravel and loess areas, and sparsely covered mountain slopes, rocky outcrops, alpine meadows; 800-5100 m.

Description: Upto 30 cm tall, often forming a rounded tuft about 1 ft across, with a tangle of slender, rigid, nearly leafless branches terminating in a small yellow flower heads. Basal and lower stem leaves are extremely variable in shape-oblongate, ovate, elliptic, lanceolate, or more rarely linear -measuring $2-8 \times 0.2-2$ cm; shallowly pinnatifid to pinnatisect, or more rarely undivided, with margins entire to sinuate-dentate. Middle and upper stem leaves are similar to the lower stem leaves but are sessile or shortly petiolate. Capitula contain 9-13 florets.

Flowering: June-August

Uses : The species is traditionally used for the ailment such as inflammation of the gallbladder, jaundice, headache, nausea in western Himalaya.

IUCN Status: Not Evaluated (NE)

ASTERACEAE



Lactuca tartarica L.

Common Name: Blue lettuce

Ladakhi Name: Khalask



Distribution: India (Western Himalaya), Afghanistan, Pakistan, China, Mongolia, Russia, Kazakhstan, Kirgizstan, Tadjikistan, Russia, Ukraine, Uzbekistan, Middle East, Eastern Europe.

Habit & Habitat: Perennial herb. Riverbanks, lake sides, meadows, consolidated sand dunes, and gravelly places.

Description: Plant with milky sap, 20-100 cm tall. Stem erect, hairless, leaves alternate, narrowly lance-shaped, 5-18 cm long, lower leaves with triangular backward-pointing lobes and sharply dentate. Upper stem leaves smaller and less lobed and dentate. Flower purplish blue to deepblue, 2 cm wide.

Flowering: June-September

Uses : Used in traditional medicine for pain, insomnia, anxiety and digestive issues.

Ecological Importance: It supports pollinators such as bees and butterflies.

IUCN Status: Least Concern (LC)

ASTERACEAE



Senecio dubitabilis C.Jeffrey & Y.L.Chen

Common Name: Dark Rayless Ragwort



Synonym: *Senecio dubius* Ledeb.

Distribution: India (Western Himalaya), Belarus, China, Tadjikistan, Mongolia, Russia, European Russia, Uzbekistan.

Habit & Habitat: Annual herb, occurring in sandy and rocky places and along field margins.

Description: Plants 5-30 cm tall, branching from the base or middle, sparsely hairy. Leaves sessile, spatulate, 3-7 x 0.3-2 cm; lower leaves tapering into a petioloid base; middle leaves often expanded at the base into denticulate auricles, pinnately and shortly lobulate with a few denticulate lobes; upper leaves smaller, lanceolate to linear. Capitula discoid, few to many, arranged in terminal corymbs. Ray floret absent; corolla yellow, 6-6.5 mm long.

Flowering: May-September.

Uses : NA

IUCN Status: Not Evaluated (NE)

ASTERACEAE



Taraxacum officinale (Hook.f. & Thomson) Poljakov ex Tzvelev

Common Name: Dandelion

Ladakhi Name: Han

Synonym: *Crepis taraxacum* (L.) Stokes

Distribution: Native to all of Europe and Siberia. Exotic in India (Naturalised). Usually occupy temperate biome.

Habit & Habitat: Perennial herb, occurring on stony slopes above 3000 m.

Description: Plants upto 40 cm tall, with only basal leaves, Leaves deeply lobed, pinnatisect; lobes triangular or deltoid, margins often spotted or tan-bordered. Flower heads 3-7 cm wide, yellow.

Flowering: June-August.

Uses : It is used in herbal medicine to treat infections, bile and liver disorders, and as a diuretic. Dandelion is employed as a mild laxative, to stimulate appetite, and to improve digestion. Its milky latex has also been used as a mosquito repellent and as a folk remedy to treat warts.

IUCN Status: Least Concern (LC)

ASTERACEAE



Taraxacum leucanthum (Ledeb.) Ledeb.

Common Name: Dandelion (White)

Ladakhi Name: Khorkhorma

Distribution: India (Afghanistan to Siberia and Mongolia).

Habit & Habitat: Perennial herb occurring in wet depressions in steppes, on sandy gravels along mountain rivers.

Description: Small to medium-sized plant. Leaves glabrous, usually in a basal rosette, linear to linear-oblongate, 5-9 x 0.7-1.1 cm, shallowly to deeply lobed; lobes 2-3 on each side, broadly triangular. Midrib prominent, greenish to purplish; petiole narrowly winged. Flower stalk arising directly from the root. Floret numerous; outer ones white, cucullate at the apex, inner florets distally white and yellowish at the base.

Flowering: June-August.

Uses : NA

IUCN Status: Not Evaluated (NE)

BORAGINACEAE



Eritrichium nanum (L.) Gaudin

Common Name: King of Alps

Ladakhi Name: Changser

Synonym: *Myosotis nana* L.

Distribution: India (Western Himalaya), Austria, France, Italy, NW. Balkan Pen., Romania, Switzerland.

Habit & Habitat: Perennial herb. Thrives exclusively in well-drained, acidic rock crevices and exposed siliceous ridges of the alpine zone, where it relies on intense UV light, constant air movement, and long dry winter dormancy under snow to survive.

Description: Cushion forming tufts, rarely exceeding 5 cm high, leaves in compact rosettes, tiny 5-10 mm long, covered in dense appressed silver hairs. Inflorescence appears in short compact cymes. Flower with a slender tube expanding into flat circle, blue in colour with yellow throat. Fruit a nutlet, winged with a toothed margin.

Flowering: June-July.

Ecological Importance: Used for ornamental purposes due to its bright blue flowers and cushion form especially for rock gardens.

IUCN Status: Not Evaluated (NE)

BORAGINACEAE



Microula tibetica Benth.

Common Name: Tibetan microula

Ladakhi Name: Lugu



Distribution: India (Himalaya), China, Nepal, Bhutan.

Habit & Habitat: Biennial herb. Lakeshore marshes, disturbed slopes and roadsides, rocky areas, meadows at 3500-5300 m.

Description: Very small herb about 1 cm tall. Stem crowded at base of leaf rosette. Leaves spatulate, prostrate, hairy underneath, upper surface less hairy, margin sub-entire or undulate. Leaves dotted with red anthocyanin pigments. Flowers are crowded at base of rosette forming head-like cluster. Corolla tubular at base, with upper part free. Lobes orbicular, corolla white with yellow at neck. Corolla tubular at the base, with upper part free.

Flowering: July-September.

Ecological Importance: Flowers attract bees and other insects, supporting alpine pollination networks.

IUCN Status: Not Evaluated (NE)

BRASSICACEAE



(Photo Source: efloraofindia.com)

Aphragmus oxycarpus (Hook.f. & Thomson) Jafri

Common Name: Ladakh Rock-Cress

Ladakhi Name: Chhuru

Synonym: *Braya oxycarpa* Hook.f. & Thomson.

Distribution: India (Himalaya), Nepal, Bhutan, China, Afghanistan, Mongolia, Kazakhstan, Tadzhikistan, Pakistan.

Habit & Habitat: Perennial herb. Distributed wide from subtropical to alpine biomes.

Description: Suberect, 5-10 cm tall, lightly caespitose, branched mostly from the base; stems and leaves covered with stellate hairs. Leaves linear, sessile, 5-15 x 1-2.5 mm. Inflorescence a raceme, 10-20 white-flowered. Flowers about 4 mm across. Fruit filiform.

Flowering: June-July

Uses : Powder of dried above ground part of plant is used to regulate urine flow.

IUCN Status: Not Evaluated (NE)

BRASSICACEAE



Arabidopsis thaliana (L.) Heynh.

Common Name: Thale Cress

Ladakhi Name: Byi-la-phug

Synonym: *Arabis muralis* Salisb.

Distribution: India (Himalaya), Nepal, Bhutan, China, Afghanistan, Pakistan, Mongolia, Kazakhstan, Tadjikistan, Pakistan, Russia, Japan, Iran, Middle East, All of Europe, Northern and Eastern Africa

Habit & Habitat: Annual herb, distributed widely from subtropical to alpine biomes.

Description: Erect, up to 20 cm tall, usually branched from base. Basal leaves form rosette, ovate-oblong, 1.5-5 x 0.5-1 cm, nearly sessile, margins slightly toothed or entire. Upper leaves short, distant, oblong or linear, sessile. Flower raceme 15-30 flowered, 2-3 mm across, white or pale pink; flower stalk thread-like upward-pointing. Fruits up to 2 cm long, linear, cylindrical.

Flowering: June-September

Uses : *Arabidopsis thaliana* is a premier model organism in plant biology, widely used in research due to its small genome, short 6-week life cycle, ease of transformation, and compact size. It serves as a key reference for studying genetics, development, molecular biology, and stress responses, with findings often applied to improve agricultural crops.

IUCN Status: Not evaluated (NE)

BRASSICACEAE



Christolea crassifolia Cambess.

Common Name: Afghani Christolea

Ladakhi Name: Sanak



Distribution: India (Western Himalaya), China, Afghanistan, Nepal, Pakistan, Tadzhikistan.

Habit & Habitat: Perennial herb. Open alpine slopes, gravely plains, moraine deposits and dry steppe like terrain.

Description: Stems 15-40 cm long, highly branched, decumbent, densely villous to almost glabrous. Thick leaves variable in size, shape, and hairiness, 1-5 cm x .5-2 cm, usually 3-5 teeth toward the apex. Flowers white to mauve; petals 4. Fruit stalk about 10 mm long; fruit an erect siliqua.

Flowering: June-July

Ecological Importance: Host plant for butterfly larvae. It survives harsh desert conditions; stabilize soil, and fragile ecosystems, with minor local uses mainly as fodder.

IUCN Status: Not Evaluated (NE)

BRASSICACEAE



Lepidium capitatum Hook.f. & Thomson

Common Name: Himalayan Peppergrass

Ladakhi Name: Sangsto

Distribution: India (Himalaya), China, Nepal, Bhutan.

Habit & Habitat: Annual or biennial herb. Mountain slopes and disturbed areas at 2700-5000 m.

Description: Plant upto 35 cm tall, densely covered in a club shaped trichomes. Stem prostrate or suberect, basal and lower leaves oblong-spatulate or lanceolate usually shiny, pinnatifid, margin entire or serrated. Upper leaves subsessile. Raceme capitates, sepals white. Fruit broadly ovate, winged with apical notch, maroon-colored.

Flowering: June-September.

Uses : Traditionally used for its contraceptive properties.

IUCN Status: Not Evaluated (NE)

BRASSICACEAE



Ptilotrichum canescens (DC.) C.A.Mey.

Common Name: : Himalayan Alyssum

Synonym: *Alyssum canescens* DC.

Distribution: India (Western Himalaya), China, Mongolia, Kazakhstan.

Habit & Habitat: Small perennial herb, growing primarily in dry temperate and alpine biomes at an elevation of 1000–5000 m.

Description: Suberect, 5-10 cm tall, lightly caespitose, branched mostly from the base; stems and leaves covered in stellate hairs. Leaves linear, sessile, 5-15 x 1-2.5 mm. Inflorescence raceme, 10-20 white-flowered. Flowers about 4 mm across. Fruit filiform.

Flowering: May -September

Uses : NA

IUCN Status: Not Evaluated (NE)



CAPRIFOLIACEAE



Lonicera spinosa (Decne.) Jacquem. ex Walp.

Common Name: : Spiney Honeysuckle

Ladakhi Name: Lamora



Distribution: India (Himalaya), Afghanistan, China, Nepal, Bhutan.

Habit & Habitat: Shrub. Scrub and scree slopes, often mixed with *Caragana versicolor* plants at 1700-4600 m.

Description: Dwarf shrub upto 2 ft tall, deciduous, often with leafless branches with spines, Bark splitting. Leaves opposite, linear to oblong, margin inward-rolled, hairless. Fragrant flowers axillary on young branches. Flowers in pairs, corolla purplish red turning white, tubular funnel-shaped.

Flowering: June-July.

Uses : NA

IUCN Status: Not Evaluated (NE)

CARYOPHYLLACEAE



Silene caespitella F.N. Williams

Common Name: Clustered Campion



Distribution: India (Western Himalaya), Belarus, China, Tadzhikistan, Mongolia, Russia, European Russia, Uzbekistan.

Habit & Habitat: Perennial herb, occurring in alpine meadows.

Description: Plants upto 60 cm tall; stems clumped, erect, green and softly hairy throughout. Leaves green on both surfaces, linear 4-7 x 2-5 mm; margins ciliate; hairs confined to the veins, the rest glabrous. Flowers upto 20, arranged in 3-5 irregular clusters, sharply nodding, becoming erect at maturity. Sepal cup narrow-cylindrical to campanulate (bell-shaped), becoming broader as capsule swells. Petals protruding 1-2 mm beyond the sepals, greenish or white, shallowly 2-lobed.

Flowering: June-July.

Uses : NA

IUCN Status: Not Evaluated (NE)

CAPRIFOLIACEAE



Stellaria depressa Em. Schmid

Common Name: Creeping Chickweed

Ladakhi Name: Khalta

Distribution: India (Western Himalaya), Mongolia, China.

Habit & Habitat: Perennial herb, occurring in open habitats of alpine grasslands, meadows and slopes.

Description: Plants about 12 cm tall, shiny and glabrous; stems usually prostrate. Leaves ovate-lanceolate, 3-7 mm long, glabrous, one-veined; margins cartilaginous. Flowers 2-7 in cymes, pedicels 3-4 mm long. Sepals 5, with whitish-green margins. Petals shorter than sepals, white, 2-cleft.

Flowering: June-September.

Uses : Traditionally used to treat skin irritation, bruises and aching bone.

IUCN Status: Not Evaluated (NE)

CYPERACEAE



Blysmus compressus (L.) Panz. ex Link

Common Name: Flat Sedge

Ladakhi Name: Chos

Distribution: India, China, Mongolia, Nepal, Bhutan, Pakistan, Afghanistan, all the way upto Europe, All of Europe except Ireland and Portugal, Morocco.

Habit & Habitat: Small perennial sedge growing in open marshes, fens and damp grasslands.

Description: Culms 9-30 cm, 3 angled. Cauline leaves usually shorter than culm; sheaths rust to brown colored; leaf blades linear, flat, 1-3.5 mm wide. Inflorescences consisting of 3-12 spikelets arranged in a simple alternate spike. Spikelets ovoid to narrowly ovoid, 5-7 mm long, 5-8-flowered. Perianth bristles 6, retrorsely scabrous. Stamens 3; anthers oblong, ca. 2 mm. Stigmas 2, as long as nutlet.

Flowering: July -September

Uses : Minor uses in diuretic effect- increasing urine flow and relieving mild urinary issues, digestive support in some traditions for mild stomach discomfort, anti-inflammatory, and wound care.

Ecological Importance: It is small wetland sedge helping stabilize soil, indicating healthy moist habitats, and supporting biodiversity

IUCN Status: Least Concern (LC)

CYPERACEAE



Carex melanantha C.A.Mey.

Common Name: Black-spiked sedge

Ladakhi Name: Pug-tsa



Distribution: India (Himalaya), Bhutan, China, Nepal, Pakistan, Afghanistan, Tajikistan, Uzbekistan, Iran, Kyrgyzstan, Kazakhstan, Mongolia, Russia.

Habit & Habitat: Sedge, found in alpine meadows and sandy slopes.

Description: Rhizome creeping. Culms 8-30 cm tall, firm triangular, clothed at the base with brownish sheaths. Leaves shorter than or subequal to the culm; leaf blades linear, 3-6 mm wide. Spikes 3-6, arranged in a capitate inflorescence.

Flowering: June-August

Ecological Importance: Used for soil stabilization and sediment trapping in wetlands.

IUCN Status: Not Evaluated (NE)

CYPERACEAE



Carex moorcroftii Falc. ex Boott

Common Name: Moorcroft's sedge



Synonym: *Carex melanantha* C. A. Meyer var. *moorcroftii* (Falconer ex Boott) Kükenthal.

Distribution: India (Western Himalaya), China, Mongolia.

Habit & Habitat: Sedge, occurring in alpine meadows, thickets, grasslands, lakesides, plateaus.

Description: Rhizome creeping. Culm 7-20 cm tall, firm, triangular, clothed at base with brownish sheaths disintegrating into fibers. Leaves shorter than or subequal to the culm; leaf blades linear, 2-4 mm wide, margin scabrous. Spikes 4 or 5, arranged in a capitate inflorescence; the lowest spike $\pm$ distant, densely many-flowered. Terminal spikes male, lateral ones female.

Flowering: July-September

Ecological Importance: Used for soil stabilization and sediment trapping in wetlands. Provides grazing material for livestock yaks, sheep, and goats.

IUCN Status: Not Evaluated (NE)

CYPERACEAE



Carex microglochin Wahlenb.

Common Name: Bristle Sedge

Distribution: India (Himalaya), Afghanistan, Nepal, Bhutan, China, Mongolia, Russia, Uzbekistan, Central and South West Asia, Northern and South Eastern Europe, North to USA, Andean region.

Habit & Habitat: Perennial sedge. Lake margins, wet grassy places along riverbanks, alpine meadows.

Description: 5-20 cm tall, Rhizome slender, elongated, Culms densely or loosely tufted, sub teret. Leaves shorter than culm, involute, needlelike, smooth. Inflorescence one spiked, terminal, bisexual. Male part shorter than female. Utricles pale brown, suberect first, reflexed at maturity. Rachilla hard, pointed at apex.

Flowering: May-August

Ecological Importance: Provides stabilization of soils in wetlands and bogs. Fodder for wildlife and livestock (yak, and sheep).

IUCN Status: Least Concern (LC)

EUPHORBIACEAE



Euphorbia tibetica Boiss.

Common Name: Tibetan Spurge

Ladakhi Name: Tingling



Distribution: India (Western Himalaya), China, Kirgizstan, Pakistan, Tadzhikistan.

Habit & Habitat: Perennial herb. Dry fields preferring rocky, well-drained slopes and steppes.

Description: Plant usually erect or ascending, upto 30 cm tall (commonly 10-15 cm), Stem densely clustered. Leaves alternate, almost stalkless, variable in shape and size, ovate to oblong-lanceolate, margin entire or rarely dentate. Inflorescence cyathia, central female flower surrounded by male flower, cyathia are broadly bell shaped. On the outer edge of cyathia there are 4 maroon glands which looks like flower petal.

Flowering: June-September.

Uses any: Traditionally used in Ladakhi medicine for issues like snake bites, body swelling, boils, bone fractures, dental caries, diabetes, eczema, hypertension, and paralysis. Due to laxative and purgative properties, it is used for skin diseases and infection.

Ecological Importance: It represents stress-adapted alpine flora.

IUCN Status: Not Evaluated (NE)

FABACEAE



Astragalus strictus Benth.

Ladakhi Name: Serpang

Distribution: India (Himalaya), China, Nepal, Bhutan.

Habit & Habitat: Perennial herb growing in alpine steppe grassland and stony slopes.

Description: Plant upto 30 cm tall, covered in appressed hairs. Leaves 4-7 cm, leaflets in 8-12 pairs, narrow elliptic to elliptic, 4-10 x 1-4.5 mm, hairy, lower face more than upper face. Inflorescence raceme, globular cluster of upto 20 flowers, calyx 3-4 mm, densely covered in appressed hair, petal pale pink to purple. Legume with stipe around 2 mm, and beak 0.5-1 mm, one locular, valves loosely covered in hairs.

Flowering: April to September

Uses any: Swainsonine extract from the plant has been effective bovine viral diarrhea virus (BVDV). Strict concentration regulation is needed as the compound is poisonous. Traditionally the plant has been used for immune boosting and tonic properties.

IUCN Status: Not Evaluated (NE)



FABACEAE



Caragana versicolor Benth.

Common Name: Ladakh Pea-Shrub

Ladakhi Name: Tama



Distribution: India (Western Himalaya), China, Nepal, Pakistan, Afghanistan.

Habit & Habitat: Thorny shrub, found on open scree slopes and dry sandy valleys.

Description: Spiny, dense branched bush upto 80 cm tall, stunted growth with cushion like appearance. Leaves digitate, 4-foliolate, leaflet narrowly lanceolate or linear 5-7 x 1-1.5 mm. Solitary yellow or orange flushed flowers appear along the stem. Pod about 3 cm hairless.

Flowering: May-July

Ecological Importance: *Caragana versicolor* plays an important role in soil stabilization, nitrogen fixation, and as a forage resource in cold-arid pastoral systems.

IUCN Status: Not Evaluated (NE)

FABACEAE



Oxytropis densa Benth. ex Bunge

Common Name: Dense Locoweed

Distribution: India (Western Himalaya), China, Pakistan.

Habit & Habitat: Perennial herb. Dry alpine meadows, rocky slopes, gravel beds.

Description: Herb 2-7 cm tall, stem almost absent with leaves and flowers arising from multiheaded caudex at base. Plant form cushion like structure on ground. Leaves 1-3 cm densely packed 9-19 leaflets. Leaflet blade ovate 1.5-4 x 1-2 mm, hairy surfaces, base rounded, apex rounded to acute. Inflorescence raceme of 2-10 flowers, flower stalk 2-7 mm with dense soft hairs, calyx campanulate, corolla purple to bluish purple. Legume shortly stipitate, oblong cylindric, inflated, one locular.

Flowering: June-July.

Uses : It is utilized in Tibetan and Mongolian medicine to treat various conditions, including inflammation, cold, swelling, and blood-related issues.

IUCN Status: Not Evaluated (NE)

FABACEAE



Oxytropis hypoglottoids (Baker) Ali Common Name: Hypoglottis Locoweed



Distribution: India (Ladakh), Pakistan, Russia.

Habit & Habitat: Perennial herb. Grows on mountain slopes, along roadsides, and in open, gravelly, or rocky soil.

Description: Stem elongated, sparsely hairy, branched. Stipules leaf like, jointed at base, Leaf imparipinnately compound, sparsely hairy, petiole 5-19 mm long, rachis 3-7.5 cm long. Leaflet opposite to subopposite, elliptic, entire. Inflorescence pedunculate raceme, peduncle 2.5-12.5 cm long, pedicel 5-5.5 mm, hairy. Flowers are deep purple-violet blue.

Flowering: July.

Uses : Traditionally used to treat inflammation, cold, swelling, and bleeding.

IUCN Status: Not Evaluated (NE)

FABACEAE



Oxytropis chiliophylla Royle ex Benth.



Distribution: India (Himalaya), Bhutan, China, Mongolia, Nepal, Pakistan, Tadzhikistan.

Habit & Habitat: Perennial herb. Hillsides, valley slopes, gravelly river terraces, hillsides in *Stipa* grasslands, ice terraces, high-elevation grasslands.

Description: Plant upto 15 cm tall, stemless. Leaves upto 7 cm, leaflet verticillate in whorl of 13-27, lanceolate ovate to narrowly elliptic. Inflorescence compact raceme or lax, 3-6 flowered, peduncle densely villous and with glands, bract triangular villous. Calyx cylindrical, villous with glands, corolla purple to pink or bluish purple or violet or yellow to white. Legume sessile or sub-sessile, deeply grooved underneath, tuberculous glands present.

Flowering: May-August.

Uses : Due to its strong fragrance, the fresh plants are kept in home as a freshener, and used as a flavouring agent and as a dye by the local inhabitants. Used in traditional medicine for the treatment of wounds, swelling, fever and joint pain.

IUCN Status: Not Evaluated (NE)

FABACEAE



Oxytropis tatarica Hook.f. & Thomson ex Bunge

Common Name: Tatory Locoweed

Ladakhi Name: Zingula



Distribution: India (Western Himalaya), Afghanistan, Nepal, Pakistan.

Habit & Habitat: Perennial herb. Dry rocky areas in cold deserts, often growing in dry, hard soil.

Description: Root thick and woody, stem absent. Leaves stipulate, densely hairy. Leaves imparipinnate, leaflets sessile, opposite, 3-7 mm long, oblong to oblanceolate, entire, tip pointy, covered in dense pilose hairs. Floral stalk upto 10 cm, bracts upto 3.5 mm, sessile. Calyx densely pilose. Corolla blue rarely yellow or purple, keel tipped with purple. Legume inflated, round covered in spreading hairs.

Flowering: June-September.

Uses : NA

IUCN Status: Not Evaluated (NE)

GENTIANACEAE



Comastoma falcatum (Turcz.) Toyok.

Common Name: Falcate comastoma

Ladakhi Name: Spangyan Snonpo



Synonym: *Gentiana falcata* Turcz.

Distribution: India (Western Himalaya), China, Mongolia, Kazakhstan, Kirgizstan, Nepal, Tadzhikistan.

Habit & Habitat: Annual herb. Riverbanks, grasslands and alpine meadows from 2100-5300 m.

Description: 4-25 cm long, stem ascending to erect, somewhat angular. Leaves are mostly basal, oblong to spatulate, 0.5-1.5 × 0.3-0.6 cm, base cuneate, apex rounded, stem leaves sessile. Flowers solitary terminal on upto 20 cm long stalk. Pedicel tinged purple, corolla tubed at base and free at upper part. Corolla 6-10 mm long, blue, dark blue, or blue-purple, with blackish veins.

Flowering: July-September

Uses : Often used as ornamental plants in garden and pots.

IUCN Status: Not Evaluated (NE)

GENTIANACEAE



Gentiana leucomelaena Boiss.

Common Name: Blue-Dotted Gentian

Ladakhi Name: Bhoti



Distribution: India (Himalaya), Bhutan, China, Kazakhstan, Kirgizstan, Mongolia, Nepal, Pakistan, Russia, Tadzhikistan, Uzbekistan.

Habit & Habitat: Annual herb. Along streams, bog meadows, meadows, alpine meadows, scrub.

Description: 2-10 cm tall, stem prostrate to ascending, branched from base, hairless. Basal leaf blade ovate-elliptic to ovate-orbicular, basal leaves dry off at flowering. Stems leaves 3-5 pairs, shorter than internodes. Flowers few terminal solitary. Calyx bell-shaped, lobes triangular. Corolla pale blue to white, campanulate, dark blue dots at throat.

Flowering: May-October.

Uses : Uses for digestive disorders and appetite stimulation.

IUCN Status: Not Evaluated (NE)

GENTIANACEAE



(Photo Source: POWO)

Gentianopsis paludosa (Hook.f.) Ma

Common Name: Swamp Gentian

Ladakhi Name: Jiadi/Jihedou

Synonym: *Gentianella paludosa* (Hook.f.) Harry Sm.

Distribution: India (Himalaya), Bhutan, China, Nepal, Pakistan.

Habit & Habitat: Annual herb. Thrives in moist, alpine environments like mountain stream banks, wet meadows, bogs, and moist slopes, often in sandy soils.

Description: 3.5-10 cm tall, stem ascending to erect. Basal leaves 3-5 pairs, spoon-shaped 0.4-3 x 2-9 mm, stemsleaves 1-4 pairs stalkless. Flowering stalk erect, sepal tube upto 3.5 cm equal to corolla, sepals have membranous margin. Petals blue or yellowish white, broadly tubular, lobes oblong.

Flowering: July-October.

Uses : It has potential source of bioactive photochemical. Traditionally used for digestive disorders and appetite stimulation.

IUCN Status: Not Evaluated (NE)

GENTIANACEAE



Lomatogonium brachyantherum (C.B. Clarke) Fernald

Common Name: Dwarf felwort



Distribution: India (Himalaya), Afghanistan, Pakistan, China, Nepal, Bhutan.

Habit & Habitat: Annual herb. Beside streams, bogs, meadows around lakes, and alpine meadows at 3200-5300 m.

Description: 2-15 m tall. Stem angular and spreading on the ground, branched at base, hairless. Basal and lower leaves short petiolate, spatulate to spatulate-oblong, margin rough, middle and upper leaves sessile. Flowers terminal solitary, pentamerous, flowering stalk, angular, glabrous, upto 3 cm long. Corolla blue to bluish-purple 5-8 mm across. Fruit capsule, ellipsoid.

Flowering: August-September.

Ecological Importance: Its presences indicate high-altitude ecosystem health and supports alpine pollination networks.

IUCN Status: Not Evaluated (NE)

JUNCAGINACEAE



Triglochin palustris L.

Common Name: Marsh Arrowgrass



Distribution: India (Himalaya), Argentina, Chile, Morocco and Algeria, All of Europe, USA, Canada, Greenland, All of Asia excluding South East.

Habit & Habitat: Perennial herb occurring in wet depressions in steppes and on sandy gravels along mountain rivers.

Description: Plants with fibrous strand of leaves at base; leaves erect from sheath, shorter than the flowering stalk, 20 cm x 1 mm. Flowering stalk slender, erect with a laxly arranged raceme; flowers on short pedicels, 2-4 mm long. Perianth segments purplish-green. Fruit closely appressed to the stalk, clavate, weakly ridged, separating into three mericarps at maturity from base upward.

Flowering: May-September.

Ecological Importance: Good fodder plant for cattle, sheep, yak and goats.

IUCN Status: Least concern (LC)

LAMIACEAE



Dracocephalum heterophyllum Benth.

Common Name: White Dragonhead

Ladakhi Name: Zinkzer



Distribution: India (Himalaya), Afghanistan, China, Mongolia, Kirgizstan and Nepal.

Habit & Habitat: Herb around dry rocky places and mountain meadows from 1100-5000 m elevation.

Description: Aromatic perennial herb. Stem 10-15 cm, densely hairy. Leaf stalk upto 6 cm in lower leaves, leaf ovate, upper surface slightly hairy, base cordate, margin serrate. Inflorescence verticillaster, with 4-8 flowers. Flowers white tinged with mauve or pink. Flower spikes are often larger than rest of the plant.

Flowering: June to August.

Uses : Traditionally used as medicine in Himalayan region against eye irritation, redness, conjunctivitis and respiratory related ailments. Anti-microbial, anti-diabetic, anti-arthritis and anti-inflammatory properties are reported.

IUCN Status: Not Evaluated (NE)

LAMIACEAE



Elsholtzia eriostachya (Benth.) Benth.

Common Name: Fuzzy Himalayan Mint

Ladakhi Name: Betso

Distribution: India (Himalaya), Nepal, Bhutan, China.

Habit & Habitat: Annual Herb. Hilly grasslands.

Description: Aromatic herb, 15-37 cm tall, stem angular, densely hairy. Leaf 0.8-4 x 0.4-1.5 cm, finely hairy, ovate to ovate-oblong, margin serrulate. Inflorescence spike cylindrical upto 1 cm long, terminal verticillaster. Flowers densely packed, corolla yellow tube, funnelform. Nutlets brown.

Flowering: July-September

Uses : Powdered plant materials used as incense traditionally. Used to treat cold and cough. Contains antibacterial properties.

Ecological Importance: It is nectar-rich flowers and attracts bees and other pollinators.

IUCN Status: Not Evaluated (NE)

LAMIACEAE



Nepeta coerulescens Maxim.

Common Name: Pale-Blue Catmint

Ladakhi Name: Khora



Distribution: India (Himalaya), China, Nepal, Bhutan.

Habit & Habitat: Perennial herb. Grassy slopes, stony, alluvial fans, ravine sides, thickets, grassy riverbanks at 3300-4800 m

Description: Upto 40 cm tall, mostly unbranched, quadrangular. Petioles of lower leaves longer than upper ones. Stem leaves lanceolate-oblong, densely hairy, upper surface olive green, lower surface greenish, margin crenate-serrate. Inflorescence verticillaster on apical node, in ovoid spike 3-5 cm. Corolla blue, 1-1.2 cm, lower part tubular, upper part divided into three lobes middle lobe semicircular, inversely cordate, lateral ones reflexed.

Flowering: July-August.

Uses : Known to have antimicrobial, anti-inflammatory and anti-oxidant properties.

IUCN Status: Not Evaluated (NE)

LAMIACEAE



Nepeta discolor Royle ex Benth.

Common Name: Two-colored Catmint

Ladakhi Name: Shamalolo

Distribution: India (Western Himalaya), Afghanistan, China, Nepal, Pakistan.

Habit & Habitat: Perennial herb. Grassy or gravelly slopes, thickets.

Description: Low spreading herb, stem ascending to erect, upto 30 cm tall. Leaves short petiolate, covered in fine pubescence, upper surface green lower surface gray, margin rounded to saw-toothed. Spike ovoid or cylindric 3-5.5 cm long. Flower stalk short, calyx 8 mm, tube about 4 mm. Corolla pale lilac, violet or almost white, glabrous or slightly villous on the upper lip, 1-1.2 cm, tube curved.

Flowering: July-August.

Uses : Traditionally used in Himalayan folk medicine to cure cold, cough and fever.

IUCN Status: Not Evaluated (NE)

LAMIACEAE



Nepeta floccosa Benth.

Common Name: Wooly Catmint

Ladakhi Name: Samalolo/Shangukarma



Distribution: India (Western Himalaya), Afghanistan, China, Pakistan, Tadjikistan.

Habit & Habitat: Perennial herb. Stony alpine slopes and grasslands.

Description: Stem upto 35 cm, purplish at the base, few-branched, erect with dense floccose tomentose hairs. Basal leaves clustered, upper leaves distant, sessile or short stalked. Leaves thick, rigid corrugate densely covered in tomentose hair, cordate or triangular cordate, margin crenulate. Verticillaster capitates upto 1 cm long, 6-8 flowered. Calyx violet tubular, sparsely hairy. Corolla bluish, densely puberulent, divided into three lips: upper middle and lower. Lobes of upper lip elliptic, lower and upper lip equal in size, middle lip slightly larger. Lower lip bearded inside margin crenate.

Flowering: June-July.

Uses : Traditionally used in fever and respiratory issue.

Ecological Importance: Used for aromatic herb and it supports pollinators and survives harsh conditions.

IUCN Status: Not Evaluated (NE)

ONAGRACEAE



Epilobium latifolium L.

Common Name: River Willow-herb

Ladakhi Name: Gangchhu Mentok



Synonym: *Chamaenerion latifolium* (L.) Sweet

Distribution: India (Western Himalaya), Pakistan, Afghanistan, Tadjikistan, China, Russia, Mongolia, Eastern Europe, North America, Greenland.

Habit & Habitat: Perennial herb. High-altitude, cold, and drought-prone environments, especially along glacial streams and moraines.

Description: Stem thick fleshy, 4-70 cm tall, simple or moderately branched, glabrous to sparsely pubescent, often reddish. Leaves simple alternate, broadly ovate to elliptic, margin entire, thick and fleshy. Inflorescence solitary or few flowered, terminal or axillary. Flowers large, showy, actinomorphic, pink to magenta-purple. Sepal and petal 4.

Flowering: July-August.

Uses : Used in Tibetan medicine and known to have coolant properties. It is used in the treatment of fevers and inflammations including wound healing and skin ailments.

IUCN Status: Least Concern (LC)

OROBANCHACEAE



Pedicularis longiflora var *tubiformis* (Klotzsch) Pennell

Common Name: Long Tube Lousewort

Ladakhi Name: Phakchang/Lughru-ser-po



Synonym: *Pedicularis tubiformis* Klotzsch

Distribution: India (Himalaya), Nepal, Bhutan, China.

Habit & Habitat: Annual herb. Alpine grasslands, bogs and meadows, lake sides grasslands along with other grasses and sedges.

Description: Distinguished by its cluster of golden yellow flowers at the top, often marked with dark brown or red markings, with long slender flower tube. Stems are many, erect or spreading 5-10 cm long. Leaves oblong, blunt in outline, 3-5 cm with many toothed lobes. Flower tube hairy below, sepal cup about 1 cm, parted into 2-3 lobes, upper lip curved into long beak, lower lip broader, shallowly 3-lobed.

Flowering: June-August.

Uses : A decoction of plant parts is used as diuretic. The flowers are useful in treating heat disorders and inflammation of the liver and gall bladder, excessive seminal discharge and oedema.

IUCN Status: Not Evaluated (NE)

OROBANCHACEAE



Pedicularis rhinanthoides Schrenk ex Fisch. & C.A.Mey.

Common Name: Rattle Lousewort

Ladakhi Name: Larch-tsik



Distribution: India (Himalaya), Afghanistan, Pakistan, Nepal, Bhutan, China, Kazakhstan, Kirgizstan, Mongolia.

Habit & Habitat: Annual herb. Moist alpine meadow, boggy places along stream.

Description: Stems single to numerous, unbranched, erect, hairy and shiny. Basal leaves forming a tuft, leaf blade linear-oblong, pinnatisect into 9-12 pairs, glabrescent, dentate. Stem leaves few, shorter-petiole than basal ones. Flower tube is slender, upper lip is sickle-shaped, lower lip 3-lobed, Flowers have 4 short toothed hairy sepals.

Flowering: July-September.

Uses : NA

IUCN Status: Not Evaluated (NE)

PAPAVERACEAE



Hypecoum leptocarpum Hook.f. & Thomson

Common Name: Himalayan little poppy

Ladakhi Name: Meerang/Parpata



Distribution: India (Himalaya), Afghanistan, Bhutan, China, Mongolia, Nepal, Pakistan, Tadzhikistan.

Habit & Habitat: Annual herb. Hillsides and riverbanks of higher Himalaya.

Description: Slender 15 cm tall, leaves in circular arrangement in the stem, 2-3 pinnately cut compound leaves. Flowers are purplish-white, often yellow inside, 0.8-1.5 cm across. Sepal entire, outer two petals entire, keeled at tip, inner two deeply 3 lobed. Flowering stalks are slender, upto 35 cm long. Capsule narrowly linear, fragmented into many segments.

Flowering: June-October.

Uses : Root extract is used for stomach pain in Ladakh.

IUCN Status: Not Evaluated (NE)

PLANTAGINACEAE



Plantago depressa Willd.

Common Name: Depressed plantain

Ladakhi Name: Spang-tsi



Distribution: India (Himalaya), Afghanistan, Bhutan, China, Kazakhstan, Kirgizstan, Korea, Tadzhikistan, Pakistan, Nepal, Mongolia, Russia, Uzbekistan.

Habit & Habitat: Annual or perennial herb. Meadows, wet mountain slopes, riverbanks, wet places, fields, roadsides; near sea level to 4500 m.

Description: Stemless herb, upto 12 cm tall. Leaves are in basal rosettes, 5-10 cm long, elliptic to ovate, sparsely denticulate, hairy when young, later becoming glabrous and shiny; 5-7 nerved, narrowed into a short, distinct, sheathing petiole. Spikes nearly equalling the peduncle, narrow, dense above, with lax, distant flowers below. Sepals 2 mm long, slightly concave. Corolla tube equal to the calyx; lobes small, elliptic to ovate. Anthers slightly exserted. Capsule conically attenuated, nearly twice as long as the calyx.

Flowering: May-July.

Uses : It is used as a blood purifier, diuretic, antitussive, and for treating digestive issues like diarrhea.

IUCN Status: Not Evaluated (NE)

POACEAE



Arctopoa tibetica (Munro ex Stapf.) Prob.

Common Name: Orchard Grass



Distribution: India (Himalaya), China, Bhutan, Nepal, Mongolia, Kazakhstan, Tadjikistan and Central Russia.

Habit & Habitat: Perennial herb, found on mountain slopes, grasslands, riverside sands and pebbles.

Description: Plants growing in dense perennial tussocks, upto 140 cm tall. Vegetative shoots compressed. Leaf blades 10-45 cm x 2-14 mm, initially folded, glabrous, sheaths compressed and keeled. Flowerheads 1-5 cm long, green to purple-tinged, turning pale grey-brown at seed maturity. Spikelets 5-9 mm long, typically containing two to five florets. A rigid awn, about 1.5 mm long, present at the tip. Characteristic flattened stem base distinguishes it from many other grasses.

Flowering: July-August

Ecological Importance: highly palatable, primarily used as nutritious livestock forage and for erosion control.

IUCN Status: Not Evaluated (NE)

POACEAE



Bromus japonicus subsp. japonicus

Common Name: Japanese brome

Distribution: India (Western Himalaya), China, Nepal, Afghanistan, Pakistan, Mongolia, Russia, Japan, Kazakhstan, Kirgizstan, Korea, Uzbekistan, Tadzhikistan, Middle East, South and South East Europe.

Habit & Habitat: Annual herb, occurring in open disturbed habitats, as a weed in cultivated fields, grasslands and on open slopes.

Description: Plant growing in tufts or as solitary culms, 20-70 cm tall, with soft, fine hairs at nodes. Leaf sheaths softly pillose, 5-20 cm x 0.2-0.5 cm, both surfaces covered with velvety hairs. Ligules membranous, erose margins. Inflorescence a loose, nodding panicle, 10-20 cm. Spikelets laterally compressed, each spikelet containing 5-10 florets, green to purplish at maturity. Two unequal glumes present; lemma 7-12 mm long, prominently 7-9 nerved. Awn slender, twisted outward.

Flowering: May-June

Ecological Importance: Forage for cattle, rapid colonization helps soil stabilization.

IUCN Status: Not Evaluated (NE)

POACEAE



***Campeiestachys nutans* (Griseb.) B.R.Baum, J.L.Yang & C.Yen**

Common Name: Wild Rye

Ladakhi Name: Phyr-tsa



Synonym: *Elymus nutans* Griseb.

Distribution: India (Himalaya), China, Bhutan, Nepal, Afghanistan, Pakistan, Mongolia, Kazakhstan, Kirgizstan, Uzbekistan, Tadzhikistan.

Habit & Habitat: Perennial herb, found on mountain slopes, grasslands, riverside sands and pebbles.

Description: Culms erect or abruptly bent at base, upto 70 cm tall. Leaf sheaths with fine hairs at base; leaf blades flat, 6-8 x 0.3-0.5 cm, lower surface rough, upper surface pilose. Spikes pendulous, flexuous, and dense. Spikelets usually 2 per nodes, shortly pedicellate, green, turning purple on maturity. Lemma narrowly lanceolate; awn divergently scabrous.

Flowering: July-August

Ecological Importance: Rich nutritional value and good palatability for herbivorous ruminant animals.

IUCN Status: Not Evaluated (NE)

POACEAE



Elymus jacquemontii (Hook.f.) Tzvelev



Synonym: *Agropyron jacquemontii* Hook.f.

Distribution: India (Western Himalaya), Tadjikistan, China.

Habit & Habitat: Perennial herb. Between rocks in stony mountain slopes and in alluvial soils.

Description: Slender culms upto 20 cm, 2-3 noded. Leaf green to light green, glaucous, recurved. Lower surface without hairs, upper surface scabrous. Spikes 4-11 x 0.8-2 cm with 4-5 spikelets, rachis thin and smooth. Spikelet one per node, nearly sessile. Glumes 4.5-7 mm, 5 veined. Awn 5-6 cm long. Anthers yellow or purple.

Flowering: July-September

Ecological Importance: It is a good forage grass for sheep, goats, and yaks.

IUCN Status: Not Evaluated (NE)

POACEAE



Poa pratensis L.

Common Name: Smooth Meadow Grass

Distribution: India (Himalaya), all of Asia and Europe, USA, Canada, Greenland.

Habit & Habitat: Perennial herb, occurring in meadows and fields, moist valleys, and riparian areas.

Description: Loosely to densely clustered grass, upto 70 cm tall; erect or geniculate. Leaf blades flat, folded, or bristle-like, 3-40 cm x 0.8-4 mm, abruptly contracted to a blunt, hooded tip. Flower panicles lance-shaped, 6-15 cm long, erect or nodding, lax. Spikelets 2-5 flowered, ovate-oblong. Glumes unequal; lower glume 1.5-3.5 mm, 1-nerved; upper glume 2-4 mm, 3-nerved. Lemmas oblong in a side view, 2-4 mm long, blunt or pointed, fringed with hairs on the keel and marginal nerves, profusely woolly at base.

Flowering: July-August

Ecological Importance: Excellent grazing grass and good hay. Sometimes used in lawn and turf.

IUCN Status: Least Concern (LC)

POACEAE



Puccinellia himalaica Tzvelev

Distribution: India (Western Himalaya), Afghanistan, China, Nepal, Iran.

Habit & Habitat: Perennial herb. Open grassy places and marshy sandy areas around lake and river shores.

Description: Tuft forming grass, Culms upto 20 cm, leaf sheath smooth, ligule 0.7-1.8 mm. Leaf conduplicate or inrolled 3-4 cm x 0.7-2 mm, branches 2-5 per nodes, slender ascending. Spikelet 2.4-3.5 mm, pale green turning purple on maturity, florets 2-4, glumes with prominent midrib. Palea keels smooth or faintly scabrid above; anthers 0.5-0.7 mm long.

Flowering: June-July.

Ecological Importance: Forage grass for herbivores and also acts as good soil stabilizer.

IUCN Status: Not Evaluated (NE)

POLYGONACEAE



Knorringia sibirica (Laxm.) Tzvelev

Common Name: Smooth Meadow Grass



Common Name: Pamir Knotweed

Synonym: *Aconogonon sibiricum* (Laxm.) H.Hara

Distribution: India (Himalaya), Afghanistan, Nepal, Bhutan, China, Mongolia, Russia, Kazakhstan, Kirgizstan, Tadzhikistan.

Habit & Habitat: Perennial herb. Thrives in a saline soil and sandy areas at 3000 to 5000 m elevation.

Description: Densely branched rhizomatus herb, stem erect or ascending upto 10 cm long, leaves succulent, linear, 8-31 x 2-11 mm, margin revolute, auriculate at the base. Leaf stalk 2-5 mm. Inflorescence a compact terminal raceme. Flower 2.5 mm across, crimson to greenish white.

Flowering: July-August.

Uses : Used as greens.

Ecological Importance: It is hardy pioneer plant of dry areas that helps stabilize soil and supports ecosystem recovery.

IUCN Status: Not Evaluated (NE)

POLYGONACEAE



Koeingia islandica L.

Common Name: Iceland Knotweed



Synonym: *Polygonum islandicum* (L.) Hook.f.

Distribution: India (Western Himalaya), Afghanistan, China, Mongolia, Russia, Kazakhstan, Kirgizstan, Tadzhikistan, Northern Europe, Russia, Canada, Greenland, Island, Chile, Argentina.

Habit & Habitat: Dwarf annual herb. Alpine meadows, wet grasslands and valleys from 2000-4900 m.

Description: Dwarf, stem usually erect, reddish, 3-8 cm tall, hairless and shiny. Leaves alternate, opposite at terminal clusters, obovate or orbicular, glabrous leathery, punctulate, margin entire. Ocrea lax, brown and membranous. Flowers axillary fascicled. Perianth greenish 3-parted

Flowering: July-August.

Uses : Used as greens.

IUCN Status: Least Concern (LC).

POLYGONACEAE



Rheum spiciforme Ledeb. ex A.Spreng.

Common Name: Spiked Rhubarb

Ladakhi Name: Lachhu

Distribution: India (Himalaya), Afghanistan, Bhutan, China, Nepal, Pakistan, Tadzhikistan.

Habit & Habitat: Perennial herb, occurring on open slopes and rocky hillsides in well-drained soil under full sunlight.

Description: A short, stout, stemless herb. Basal leaves borne on reddish petioles; leaves purple-red beneath and dark green above, large, 10-20 x 8-15 cm. Both surfaces papillose or glabrous below; basal veins 5; leaf base rounded or subcordate; margins entire or slightly wavy. Flowers borne in 1-3 erect, cylindrical spikes, 5-30 cm tall. Flowers greenish, turning reddish, about 3 mm across.

Flowering: June-July.

Uses : Leaf and stem is eaten raw or cooked. Root is used as laxative.

IUCN Status: Not Evaluated (NE)

RANUNCULACEAE



Halerpestes tricuspis (Maxim.) Hand.-Mazz.

Common Name: Three-Finger Buttercup

Ladakhi Name: Sharchang/Chu-rug sbal-lag



Synonym: *Ranunculus tricuspis* Maxim.

Distribution: India (Himalaya), Bhutan, China, Mongolia, Nepal, Pakistan.

Habit & Habitat: Perennial herb (Runner). Thrives in moist, damp, and sometimes saline conditions, such as riverbanks, lake shores, and wet meadows.

Description: Stolons 7-35 cm, Basal leaves sheathed at base, shiny, hairless, thick, fleshy, variable in shape and division, rhombic to broadly wedge-shaped. Leaf margin 3-lobed. Flowers solitary terminal, or sometimes 2 in a monochasium, 1.2 cm across, yellow or white.

Flowering: July-October.

Uses : Aboveground parts are used in treating heat disorder of tendon and ligament.

IUCN Status: Not Evaluated (NE)

RANUNCULACEAE



Ranunculus longicaulis Ledeb. ex A.Spreng.

Common Name: Long-Stem Buttercup



Synonym: *Ranunculus pulchellus* var. *longicaulis* Trautv.

Distribution: India (Himalaya), Afghanistan, Bhutan, China, Kazakhstan, Kirgizstan, Mongolia, Nepal, Pakistan, Russia, Tadzhikistan, Uzbekistan.

Habit & Habitat: Perennial herb. Growing on moist to wet grounds along stream banks, in wet meadows, and at the margins of alpine wetlands.

Description: Stems 10-25 cm tall, usually glabrous. Basal leaves with undivided blades, ovate or narrowly elliptic, thick and leathery; stem leaves linear – lanceolate. Inflorescence solitary, terminal, borne on long, slender peduncles. Flowers yellow and glossy; petals 5, 4.5-6 mm long.

Flowering: May-August.

Uses : NA

IUCN Status: Not Evaluated (NE)

ROSACEAE



Potentilla multifida L.

Common Name: Feather-leaf Cinquefoil

Ladakhi Name: Ser-tok Nga-pa



Distribution: India (Himalaya), Afghanistan, Bhutan, China, Kazakhstan, Kirgizstan, Korea, Iran, Turkiye, Nepal, Mongolia, Russia.

Habit & Habitat: Perennial herb. Forest margins, meadows, grassy mountain slopes, alpine valleys, ravines, sandy river banks.

Description: Roots flat, slightly woody. Flowering stem ascending, upto 40 cm tall. Leaves usually clustered at base 2.5-17 cm long; lowersurface pilose, upper surface hairless; pinnate with 2-6 pairs of leaflets. Inflorescence cymose, elongated and lax after flowering. Flowers 1.2-1.5 cm across. Sepals triangular-ovate; petals, obovate, yellow, equaling sepals, apex shallowly notched.

Flowering: May-August.

Uses : Traditionally it used to treat digestive issues, tooth infections and cold and cough.

IUCN Status: Not Evaluated (NE)

ROSACEAE



Potentilla saundersiana Royle

Common Name: Hairy Feather-leaf Cinquefoil

Distribution: India (Himalaya), Bhutan, China, Nepal.

Habit & Habitat: Perennial herb. Alpine thickets and meadows, gravel fields.

Description: Roots stout and robust. Flowering stems ascending, rarely low and tufted, upto 20 cm tall. Basal leaves 2-5 cm, lower surface white and hairy; leaf blades palmately 3-7 foliolate; leaflets sessile, green above, densely white-tomentose below, margins with many incised-serrate teeth. Stem leaves usually entire, 3-5 foliolate. Inflorescence terminal, 1-to many-flowered. Flowers 1-1.4 cm across; sepals triangular, petals yellow, slightly longer than sepals, broadly obcordate (inverted heart-shaped).

Flowering: June-August.

Uses : Traditionally it is used to treat digestive issues, tooth infections and cold and cough.

Ecological Importance: It is hardy alpine plant that stabilizes soil and supports biodiversity.

IUCN Status: Not Evaluated (NE)



ROSACEAE



Sibbaldianthe bifurca (L.) Kurtto & T. Erikss.

Common Name: Forked-leaf Cinquefoil

Ladakhi Name: Trolo



Synonym: *Potentilla bifurca* L.

Distribution: India (Himalaya), Afghanistan, Bhutan, China, Kazakhstan, Kirgizstan, Korea, Iran, Turkiye, Nepal, Mongolia, Russia.

Habit & Habitat: Perennial herb. Grassy mountain slopes, sandy river banks, field and road sides, steppe meadows, semidry desert grassland.

Description: 5-20 cm tall, part of the stem subterranean, together with petiole and pedicel, densely or sparsely covered with rigid hairs. Leaves 3-8 cm including petiole, margin usually entire, rarely serrate. Leaf blade pinnate with 3-8 pairs of leaflets; leaflets opposite, rarely alternate, sessile, elliptic or obovate, with appressed, soft, fine hairs. Inflorescence terminal, solitary, or corymbose or cymose. Flowers 0.7-1.5 cm across; petals yellow, slightly longer than sepals.

Flowering: May-September.

Uses : Root extract is used for treatment of viral infections. It is recognized for treating diabetes, improving insulin resistance, addressing digestive issues like diarrhea, and managing bleeding disorders.

Ecological Importance: It stabilizes soil and supports biodiversity.

IUCN Status: Not Evaluated (NE)



SCROPHULARIACEAE



Scrophularia dentata Royle ex Benth.

Common Name: Hamchi



Distribution: India (Western Himalaya), Afghanistan, China, Pakistan.

Habit & Habitat: Perennial herb or sub-shrub, occurring in floodplains, grasslands and on mountain slopes.

Description: Plants 20-40 cm tall, much-branched from woody base, the whole plant generally black when dry. Stems angular or subterete, covered in short, soft hairs. Leaves oblong to ovate-oblong, 1.5-5 cm long; margins shallowly toothed, pinnately parted, or sometimes entire. Panicles terminal, lax, narrow, 5-20 cm long; cymes 1-3-flowered. Corolla purple-red, about 6 mm long; tube about 4 mm, lower lip about half as long as the upper. Stamens as long as corolla.

Flowering: May-October.

Uses : Traditionally used in treatment of exanthema and fever in Tibetan medicine.

IUCN Status: Not Evaluated (NE)

SOLANACEAE



Physochlaina praealata (Decne.) Miers

Common Name: Himalayan Green Funnel

Ladakhi Name: Langthang

Distribution: India (Western Himalaya), Nepal, China.

Habit & Habitat: Perennial herb. Found in dry stony areas and slopes in Himalaya, at altitudes of 3500 - 4600 m.

Description: Upto 1 m tall, branched, velvety. Leaves 7-11 x 5-9 cm, ovate or ovate-oblong, hairy, midribs distinct on underside. Inflorescence velvety corymb., flower stalk upto 2 cm long. Sepal cup tubular bell shaped, flower funnel shaped, yellow green, petals obtuse wavy. Style and stamen protrude out of floral tube.

Flowering: June-July.

Uses : It has sedative, antispasmodic, and anti-inflammatory effects. Overdose may cause anticholinergic toxicity.

IUCN Status: Not Evaluated (NE)

TAMARICACEAE



Myricaria bracteata Royle

Common Name: Kashmir False Tamarisk

Ladakhi Name: Umbu



Synonym: *Myricaria germanica* var. *bracteata* (Royle) Franch.

Distribution: India (Western Himalaya), Afghanistan, China, Mongolia, Kazakhstan, Pakistan, Russia, Tadjikistan, Uzbekistan.

Habit & Habitat: Shrub. River valleys and lake sides.

Description: Upto 3 m tall, much branched. Old branches are grey brown to purple brown. Leaves borne on young branches of current-years growth. Leaves ovate to linear-lanceolate, base slightly enlarged, margin often membranous. Inflorescence terminal raceme on current-years branches clustered into spike. Flower stalk 1 mm, Petals pink, reddish or purplish, base narrow, often incurved, persistent in fruit. Capsule narrowly conic, 8-10 mm.

Flowering: June-July.

Uses : Traditionally used in Siberia, China and Mongolia for infections, intoxications, liver issues, arthritis and pain.

Ecological Importance: It is used occasionally as fodder.

IUCN Status: Not Evaluated (NE)



URTICACEAE



Urtica hyperborea L.

Common Name: Northern Nettle

Ladakhi Name: Dzatsutt/Zozot



Distribution: India (Himalaya), China, Nepal, Bhutan.

Habit & Habitat: Perennial herb, occurring in alpine meadow, thickets and crevices.

Description: Tuft-forming, upto 50 cm tall; woody rhizome; stems pale, sparsely hairy, and densely armed with stinging hairs. Leaves green-blue when dry, ovate or cordate, 3-5-veined, veins impressed above and prominent below; margins toothed; both surfaces with stinging hairs. Inflorescence unisexual; male flowers in proximal axils, arranged in short spikes or clusters; female flowers with perianth fused at the base. Flower greenish-purple.

Flowering: June-July

Uses : Edible as vegetables and effect in the treatment of rheumatoid arthritis.

IUCN Status: Least concern (LC)

Summary

Wetland associated plants occupy a particularly important position in the ecosystem. Species occurring around lake margins, streams, marshes, wet meadows and other moist habitats contribute to soil stabilization, sediment retention, nutrient cycling and maintenance of wetland ecological functions. They also provide resources for herbivores, livestock and pollinators and indirectly support the wider food web. Present book provides a comprehensive floristic account of the Tso Moriri region of Ladakh, one of India's most important high-altitude wetland landscapes. The study documents 72 vascular plant species belonging to 25 families and provides species level information on taxonomy, synonymy, distribution, habitat, morphology, flowering period, traditional or reported uses, ecological importance and IUCN status. The resulting flora provides an accessible scientific reference for identification and understanding of the plant diversity of the Tso Moriri landscape. The flora further illustrates the importance of plants to local communities. A number of species are associated with traditional medicine, fodder, food, aromatic uses and cultural practices. This traditional association represents an important component of the cultural landscape and provides an opportunity for integrating local ecological knowledge into conservation planning.

At the same time, the ecological stability of Tso Moriri is increasingly vulnerable to climate variability and human pressures. The documented warming and declining precipitation trend, together with tourism, infrastructure development and grazing pressure, may influence wetland hydrology, habitat quality and plant-community composition. The principal contribution of this book is therefore the establishment of a baseline floristic inventory for Tso Moriri. The information presented can support future biodiversity assessments, ecological monitoring, conservation prioritization, environmental education and management planning. It should also provide a reference point for detecting future changes in species composition and distribution resulting from climate change and other environmental pressures.

The conservation of Tso Moriri should consequently be approached as an integrated landscape-level responsibility, linking biodiversity conservation with wetland protection, sustainable pastoralism, responsible tourism, climate adaptation and the knowledge and participation of local communities.

Epilogue

The floristic documentation of Tso Moriri provides an important baseline, but long-term conservation will require continuous ecological assessment and management. The following priorities are recommended as a way forward:

- This document is based on one season data, therefore long term monitoring is essential to capture the seasonal of annual variation across representative habitats, including lake margins, marshes, wet meadows, stream channels, alpine grasslands, rocky slopes and disturbed areas. Periodic surveys should document changes in species composition, abundance, distribution, regeneration and flowering phenology. The present 72-species inventory can serve as the baseline against which future changes are evaluated.
- The present study primarily documents the terrestrial and wetland-associated vascular flora of the Tso Moriri landscape; aquatic plant species were not specifically recorded or assessed. This represents an important gap in the ecological characterization of the wetland. Future assessments should therefore include systematic documentation of aquatic and submerged, floating and emergent macrophytes, along with their distribution, abundance and seasonal dynamics.
- Climate variables should be monitored alongside vegetation and wetland conditions. Temperature, precipitation, snow cover, water level, hydroperiod and soil moisture should be correlated with changes in plant communities and flowering periods.
- Pastoralism is an important component of the Tso Moriri landscape, but grazing intensity should remain within the ecological carrying capacity of alpine meadows. Seasonal grazing plans, rotational grazing and identification of sensitive regeneration areas can help balance pastoral livelihoods with vegetation conservation.
- Regular surveys should identify newly established or expanding opportunistic and non-native plant species, particularly in disturbed areas around settlements, roads, camps and tourism facilities. Early detection and appropriate management can help prevent their establishment in relatively undisturbed alpine habitats.
- Traditional knowledge associated with medicinal, forage, food and culturally important plants should be documented in consultation with local communities. Conservation programmes should recognize pastoral communities as partners in ecosystem stewardship and incorporate locally appropriate management practices. The documented ethnobotanical relationships demonstrate the value of this approach.

The future of Tso Moriri will depend on maintaining the ecological processes that sustain both its wetland and terrestrial components. The present flora establishes an important scientific foundation by documenting plant diversity and highlighting the ecological and cultural relationships associated with the landscape. The way forward is therefore to move from documentation to long-term monitoring, from monitoring to adaptive management, and from management to participatory conservation. An approach that combines scientific evidence, traditional knowledge, sustainable livelihoods and responsible tourism will provide the strongest basis for safeguarding the unique biodiversity and ecological integrity of Tso Moriri for future generations.

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Glossary of botanical terms

Actinomorphic: Regular or radially symmetrical may be bisected into similar halves in at least two planes

Appressed: Pressed closely but not fused

Aromatic: Plants that contains oil

Attenuated: it means to reduce, weaken, or make thin something.

Axillary: Borne in or arising from the axil, or a point between upper side of leaf and stem

Bristles: stiff hair

Caespitose: growing in small dense clumps or tufts

Campanulate: Bell shaped

Cauline: Borne on an aerial stem or caulis, as with leaves, flowers, or fruits (when applied to the latter two organs, usually referring to older stems)

Corolla: Group of petals that prominently appears colored and encircles the reproductive structure of a flower

Corymb: cluster of flower whose lower stalks are proportionally longer so that the flowers form a flat or slightly convex head.

Crenate: Having blunt or rounded teeth

Culm: In grasses, sedges, rushes, and some other monocotyledons, an aerial stem bearing the inflorescence, extending strictly from the base of the plant to the lowest involucre bract (or base of the inflorescence)

Cyme: A type of inflorescence in which the main axis and all lateral branches end in a flower

Deltoid: Shape of leaf which is triangular.

Dentate: Having a toothlike or serrated edge.

Digitate: Structure that have distinct parts arranged in finger-like manner.

Erect: rigidly upright or straight

Exserted: Parts of plant that are thrust out or protruding beyond their surrounding structures.

Filiform: Shaped like or resembling a thread or filament

Flexuose: the stems or leaves are bending back and forth at angles in opposite direction, often appearing in a zigzag form.

Florets: bell shaped disk flowers

Glabrous: lacking hairs or trichomes; surface smooth

Glaucous: Describing the external surface of a plant part that has a whitish covering, in some cases with a blueish cast. Often applied to plants with a wooly or arachnoid surface, but properly referring to pruinose surfaces, meaning those with a waxy bloom

Globose: globular in shape

Glomerules: Dense compact cluster of flowers

Inconspicuous: which is not visible clearly

Lanceolate: Long, wider in the middle, shaped like a lance tip

Ligule: A narrow star shaped part of a plant, especially a membranous scale on the inner side of the leaf sheath at its leaf sheath at its junction with the blade

Lobes: refer to the distinct, rounded or pointed projections or divisions that make up a part of a plant organ, such as a petal, sepal, or leaf

Monochasium: A type of cyme in which each flowering branch gives rise to one lateral

Oblong: It means the shape which is longer than its wide

Ovate: means egg shaped

Ovoid: Egg-shaped, with wider portion at base; 3-dimensional object, ovate in all sections through long-axis



Palea: The upper bract of the floret of a grass.

Panicle: A compound raceme; an indeterminate inflorescence in which the flowers are borne on branches of the main axis or on further branches of these

Peduncle: The stalk of an inflorescence

Pedunculate: Hanging

Perianth: Outer part of a flower, consisting of the calyx (sepals) and corolla (petals).

Pilose: covered with soft, weak, thin and clearly separated hairs, which are usually defined as long and sometimes ascending

Pinnate: having leaflets arranged on either side of the stem, typically in pairs opposite each other

Pinnatisect: pinnately divided almost to midrib but segments still confluent

Protrude: Extending out from the surface.

Punctuate: Plants that have dotted or marked surfaces on their leaves or stems.

Raceme: a flower cluster with the separate flowers attached by short equal stalks at equal distances along a central stem. The flowers at the base of the central stem develop first

Rachilla: the central axis or small rachis of a spikelet

Rosette: means a circular arrangement of leaves or of structures resembling leaves.

Scabrous: Rough to the touch

Serrulate: Leaf margin which is finely serrated or toothed

Sessile: attached directly by its base without a stalk or peduncle

Siliquae: Fruit of brassicaceae family.

Solitary: is the state of being alone

Spicate: Having the form of a spike, or ear; arranged in a spike or spikes

Spikelets: Arrangement of the inflorescence of plants, especially that of grasses.

Stalkless: Refers to plants or flowers that lack a stalk or stem.

Stellate: arranged like rays or radii; radiating from a common center

Stipe: a stalk that supports some other structure

Subcordate: Shape of leaf that is somewhat heart-shaped but not perfect.

Suberect: standing or growing in a nearly erect position

Suborbicular: Nearly circular in shape

Subsessile: Not completely sessile

Tomentose: Covered with dense, matted, woolly hairs

Tuft: cluster of small plants outgrowth, from the ground

Velvety: smooth or soft

Verticillaster: whorled arrangement of flowers

Villous: having long, soft hairs, often curved, but not matted



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ABOUT THE INSTITUTE

Govind Ballabh Pant National Institute of Himalayan Environment (NIHE) was established at Kosi-Katarmal, Almora, Uttarakhand in 1988 as an autonomous institute of Ministry of Environment, Forest & Climate Change (MoEF&CC), Govt. of India. The institute is identified as a focal agency to advance scientific knowledge, evolve integrated management strategies, demonstrate their efficacy for conservation of natural resources and ensure environmentally sound development in the entire Indian Himalayan Region (IHR). The Institute follows a multidisciplinary and holistic approach in all its Research and Development programmes with emphasis on interlinking natural and social sciences and particular attention is given to the conservation of fragile mountain ecosystems, indigenous knowledge systems and sustainable use of natural resources. Training, environmental education and awareness to different stakeholders are essential components of all the R&D programmes of the Institute. GBPNiHE functions in a decentralized manner with its HQs at Kosi-Kaarmal, Almora, Uttarakhand and six Regional Centres; viz. Ladakh Regional Centre (Leh), Garhwal Regional Centre (Srinagar-Garhwal), Himachal Pradesh Regional Centre (Mohal Kullu), Sikkim Regional Centre (Pangthang, Gangtok), North-East Regional Centre (Itanagar) and Mountain Division (MoEF&CC, New Delhi).



The Sikkim Regional Centre

Sikkim Regional Centre, established in 1989, has been taking up Research & Development activities in Eastern Himalayan States, including Sikkim, West Bengal Hills, Assam Hills, Meghalaya and Tripura. Sikkim Regional Centre of the Institute has been working on environmental and socioeconomic issues of these states. The key action areas of Sikkim Regional Centre include (i) Biodiversity safeguarding at ecosystem, species and genetic level, including ecosystem services, (ii) Natural resource use, management, and sustainability, (iii) Geo-environmental assessment of land hazards and mitigation strategies, (iv) Assessment of climate change impacts and vulnerability on critical ecosystems, (v) Enhance implementation of strategies through participatory planning and policy analysis.



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