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Editorial: Mountainous forest ecosystems: challenges and management implications

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Editorial on the Research Topic
Mountainous forest ecosystems: challenges and management implications

Mountains have a rich natural and human history and are dynamic landscapes. Mountains provide the perfect environment for biodiversity to flourish due to their varied topography and isolated biogeography. In fact, mountainous regions are home to half of the 34 global diversity hotspots and one-third of the terrestrial biodiversity (Gebrehiwot et al., 2019). However, mountains are more vulnerable to environmental deterioration brought on by increasing weather extremes that disrupt hillslope stability, and raise the risk of landslides, which could have serious negative effects on soil fertility, water quality, sediment deposition, and human habitation as well as fatalities and property destruction (Karpouzoglou et al., 2020). An explicit investigation of patterns in species richness and knowledge of the factors influencing these patterns are essential for the conservation and management of biodiversity. In order to address issues related to biodiversity conservation and sustainable development, we have gathered 15 research articles in the present Research Topic that illustrate the ecology and management of mountain forest ecosystems.

Any area's floristic composition contains important data regarding the diversity and distribution of plants (Wani and Pant, 2023a). Additionally, it results in the accurate identification of plant species, aiding in their scientific and methodical conservation (Wani and Pant, 2023b). The floristic composition, biological spectrum, and phytogeographical components of Pakistan's western boundary along the Bin Dara were evaluated by Manan et al.. Understanding community structure, organization, and their response to changes in other environmental factors requires phyto-ecological studies. Magray et al. examined the relationships between the soil and phytosociological characteristics of *Phytolacca acinosa* communities. Understanding the patterns and processes of biodiversity depends on the analysis of species richness along a broad geographic gradient (Costa et al., 2023). Because of their sharp ecological gradients, mountain forest ecosystems are hotspots for biodiversity. Elevational gradient, slope, and aspect provide a singular opportunity to investigate how different plant species react to shifting environmental factors. Wani et al. concluded that

floristic diversity should be studied not only with reference to elevational gradients but also with regards to aspects and habitats in their research article after analyzing the species diversity and distribution patterns with respect to altitude, aspect, and habitat types in the Kashmir Himalayas. Thakur et al. developed a species richness map by stacking the ranges of 51 tree species along an elevational gradient in the Western Himalaya using stacked species distribution models (SSDMs). For revealing the environmental gradient change law of plant diversity, it is crucial to comprehend the vertical distribution of undergrowth herbaceous plants in high altitude mountain areas (Chitale et al., 2014). However, it is still unclear how diversity and environmental factors interact as well as the species composition of herbaceous plants across various altitude gradients. Han et al. examined the variations in the vertical distribution of the understory herbs and the factors that influenced them on sunny and shady slopes at Sejila Mountain in southeast Tibet, which is located at an elevation of 2,000–3,300 m. High-altitude regions like the Himalaya, where numerous gradients coexist on a relatively small spatial scale, serve as the best natural laboratories for studying the ecological responses of plants. Along an altitudinal gradient in the Kashmir Himalaya, Mangral et al. examined the impact of soil physico-chemical and eco-physiological properties on the broadleaf evergreen woody shrub *Rhododendron anthopogon* D. Don. According to the study, *R. anthopogon* has enough soil physico-chemical plasticity and eco-physiological adaptability, which should be favorable for its survival in future climates, giving it an adaptive advantage and soon extending its range. By examining the abundance, composition, diversity and functional indices, and metabolic footprint of soil nematodes along an altitudinal gradient in the Trikuta mountain range of the Pir-Panjal to Shivalik Himalaya, Choudhary et al. in their Research Topic were able to decipher the elevational patterns of soil nematode community structure and trophic diversity.

The livelihoods of indigenous communities are being impacted by the fragile and perilous mountain ecosystems that are being threatened by a variety of anthropogenic disturbances and climate change (Nyaupane, 2022; Ridwan et al., 2023). Changes in land use and land cover (LULC) are among the major environmental issues facing the world today and present a grave threat to humankind. As evidenced by the numerous development initiatives undertaken in nearly every region of the world, LULC change is a key consideration in the majority of public initiatives (Haregeweyn et al., 2015). Using Landsat and Sentinel imageries for the years 1999, 2010, and 2020, Prashanth et al. estimated the soil loss in relation to long-term LULC change in the Dehar watershed, Himachal Himalaya, North India. In order to identify the pattern and contributing factors of deforestation in the Honam-Jeongmaek mountain range, Dhakal et al. examined the changes in land cover, the characteristics of the forest, and models of the forest decline over the past two decades. The composition, structure, and function of ecosystems can be affected in a variety of ways by forest fire, a natural ecological disturbance agent, at both the landscape and regional scales (Bargali et al., 2022). The main causes of forest fires, which have a negative impact on species diversity, nutrient dynamics, and regeneration potential as well as emit greenhouse gases that contribute to global climate warming, are, however, anthropogenic activities like dependence on non-timber forest products and the expansion of agricultural areas (Ray et al., 2019). Using Landsat 5, 7, and 8 satellite imagery to create fire frequency maps. Bargali et al. investigated the effects of forest fires on tree diversity and their regeneration in three forests in Uttarakhand, India. One of the key factors affecting the redistribution of species worldwide is climate change (Wani et al., 2022, 2023a). *Olea europaea* subsp. *cuspidata*, a wild olive subspecies, was the subject of Khan and Verma's global geographic occurrence data compilation and projection of potential distribution models in present and future climate scenarios. For the first time, Dhyani et al. reported a climatically sensitive tree ring chronology of the *Rhododendron arboreum*, a broadleaf tree from the Himalayan region, covering the period from 1732 to 2017 CE. They found that the climate during the monsoon season restricts the growth of this tree in this region.

Current global trends emphasize the value of protecting biodiversity and providing ecosystem services (Wani et al., 2023b). The value of forest ecosystem services is crucial for promoting the preservation of forest resources and sustainable development. The provisioning and supporting services offered by the forest ecosystem in Northeast China's Jilin Songhuajiang Sanhu National Nature Reserve were assessed by Liu et al.. In the Gori valley, Western Himalaya, Bisht et al. studied the dry matter dynamics and carbon flux along riverine forests. They came to the conclusion that riverine forests play a crucial role in acting as a significant sink for atmospheric carbon dioxide. It is crucial to comprehend how mountainous ecosystems work and how they should be managed. Setting conservation priorities requires specialized research on the evaluation and monitoring of biodiversity and the provision of ecosystem services in light of the dynamic nature of such ecosystems. In order to plan for the conservation and management of species, habitats, and communities in the Kashmir Himalayas of India, Wani et al. evaluated the Conservation Priority Index (CPI) of each. They also suggested a practical method for managing protected areas and preserving biodiversity.

Author contributions

SP: Conceptualization, Supervision, Writing—review & editing. JB: Writing—review & editing. ZW: Conceptualization, Writing—original draft, Writing—review & editing. KS: Writing—review & editing. VN: Writing—review & editing.

Conflict of interest

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