

Diminishing forest area in the Western Himalaya: apprehensions for the loss of vital biodiversity

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The Western Himalayan Region (WHR) is one of the best studied ecoregions of India known for its rich biodiversity. It supports over 4500 species of angiosperms, over 20 species of gymnosperms, 350 species of pteridophytes, 1063 species of birds and nearly 33% of Indian mammals¹. Threats to biodiversity are high in the region, as much of the local populace is dependent on these forests for its day-to-day needs. In recent years, the stresses on forests of the WHR have become more intense due to unsustainable developmental activities as well as an increased frequency of natural disasters. Beside the tangible benefits such as biomass products that are extracted by the local populace, these forests provide numerous critical ecosystem services such as supporting biodiversity, providing habitat for wildlife and regulation of various hydro-geological cycles.

A recent report of the Forest Survey of India² indicates significant loss of forest cover (1115 km²) between 2011 and 2015 in the WHR (Jammu & Kashmir, Himachal Pradesh, Uttarakhand) at altitudes more than 3000 m amsl (Figure 1). This significant loss of forest area is alarming for the biodiversity that exists at these high elevations. The removal or

destruction of significant areas of forest cover has resulted in a degraded environment with reduced biodiversity^{3,4}, and may likely lead to the extinction of many species⁴. These high-altitude forests include numerous ecologically and economically significant species of plants and animals. Prominent plant species in this zone include *Aconitum* sp., *Rehmanodi*, *Picrorhiza kurrooa*, *Nardostachys grandiflora*, *Innula racemosa*, *Angelica glauca*, *Rhododendron anthopogon*, *Betula utilis*, *Meconopsis aculeata*, *Heracleum lanatum*, *Podophyllum hexandrum* and *Saussurea obvallata*. In addition, Himalayan musk deer, brown bear, Asiatic black bear, blue sheep, Himalayan thar, red fox, snow leopard, Tibetan wild ass and markhor are the charismatic faunal species present in the subalpine and alpine zones of the WHR. This unique wild biodiversity can be adversely impacted by even a small decline in forest cover in the following ways:

- The remaining forests get fragmented and are subject to new disturbance regimes, invasive species, diseases, increased nutrient loads, and changes in physical edge effects, including changes in wind, temperature, light

and humidity. The capacity of individual species to migrate and colonize in a narrow range depends on the characteristics of both species and landscapes. Landscape fragmentation, which results in less connectivity of habitat to allow natural migration, limits the adaptive capacity of species and the viability of ecosystems⁵.

- Essential ecological processes will be interrupted by shrinkage of habitat due to forest cover loss. In such conditions, these small forest patches will be more easily accessible to human incursions. This may lead to a variety of extractive activities within the forest interior. Intensive hunting, for example, by depleting populations of certain animals, can inhibit plant reproduction, since many seeds can neither be dispersed nor flowers be pollinated without faunal associates.
- The loss of forest land area will reduce the probability of maintaining effective reproductive units of plant and animal populations. For example, the snow leopard is known to feed on a shrub, *Myricaria germanica* during its peak breeding months in February–March⁶, and shortage of feed due

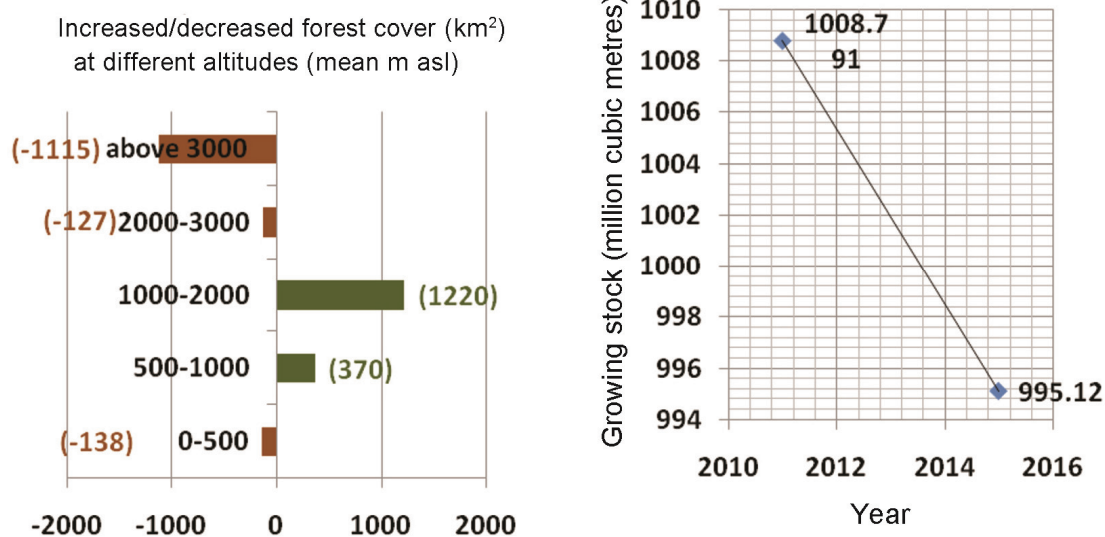


Figure 1. Increased/decreased forest cover and growing stock in the Western Himalaya (Source: FSI reports, 2011 and 2015).

to shrinkage of forest cover can affect its breeding cycle.

- One of the major problems with forest area loss is associated with pollination. Species which have fewer pollinators may suffer intensively as shrinking forest areas cannot support adequate pollinator population levels which are essential for forest health. Under these conditions, the species become inbred and lose their genetic variability and vigour.
- It has been predicted that more than 40% of the animal and plant species in Southeast Asia could be wiped out in the 21st century⁷. Most predictions of forest-related biodiversity loss are based on species–area models, with an underlying assumption that as the forest area declines, species diversity will also decline⁸.
- It needs to be noted that even small and isolated patches of forest that are

created due to loss of forest cover can often be critical for the protection, breeding or migration of some bird species.

- Loss of forest area can lead to an overuse of the remaining forests which will result in canopy opening and consequently significant changes in the forest floor habitat. This situation of open canopy and low density of forests can also affect species like the Asiatic black bear that prefers heavily forested areas as habitat⁹.

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COMMENTARY

***Chenopodium* species: from weeds to a healthy food grain ‘quinoa’**

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*Genus *Chenopodium* has about 250 species, which mostly grow as weeds throughout the world. In India, the most common species is *Chenopodium album* L., which grows as a weed in wheat fields in the north. Its foliage is used as a green vegetable, while the seed is used in the hilly regions for making gruel and mild alcoholic beverages. However, people of Andes, South America have domesticated and developed *Chenopodium quinoa* (popularly known as quinoa) as an excellent food-grain crop since the past several millennia. Quinoa received global attention in the wake of human intolerance to gluten in wheat resulting in celiac disease, and its demand has largely increased. The United Nations General Assembly declared 2013 as the International Year of Quinoa. The leading country in the world producing quinoa is Peru, followed by Bolivia. However, considering the demand and high market prices, a number of countries, including India have started growing quinoa. However, farmers in India are facing problem in marketing the crop, because there is no local consumption and exporting a farm product is problematic. India has a variety of food grains, including pearl millet, sorghum and several minor millets to tackle gluten intolerance and celiac disease.*

The genus *Chenopodium* belongs to the family Amaranthaceae, which includes former family Chenopodiaceae and contains about 165 genera and 2040 species¹. Amaranthaceae is a widespread cosmopolitan family and is spread from the tropics to cool temperate regions, whereas Chenopodiaceae had its centres

of diversity in dry temperate and warm temperate areas². Genus *Chenopodium* has a worldwide distribution and contains about 250 species³; 21 species have been reported in India⁴. The most widespread species in the Indian sub-continent is *Chenopodium album* L., a common weed in wheat fields in northern

India⁵, Bangladesh⁶ and Pakistan⁷, it is popularly known as bathua in Hindi. Other reported *Chenopodium* weed species in India include *C. ambrosioides*, *C. murale*, *C. opulifolium* and *C. botrys*⁸. *C. album* grows as a weed all over India and some names in other Indian languages include: *chakvit* (Konkani), *vastuccira*