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Livestock Grazing in the Great Himalayan National Park Conservation Area--A Landscape Level Assessment

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ABSTRACT

This study, part of a multidisciplinary research project undertaken in the Great Himalayan National Park Conservation Area (GHNPCA), Himachal Pradesh, India, assesses the overall status of biodiversity in the GHNPCA in relation to livestock grazing using a landscape approach. The GHNPCA is comprised of the Great Himalayan National Park (GHNP), Tirthan and Sainj Wildlife Sanctuaries, and an Ecodevelopment Zone, covering an area of 1,171 km^2. We use a hierarchical approach to create a systematic understanding of the physical, biological, and social components of the landscape with respect to dependent livestock and the grazing practices of migratory pastoralists. The study reveals that the landscape harbours a rich floral and faunal diversity including several endangered species. We identify and map 161 alpine and sub-alpine pastures (*Thatches*) and different migratory routes adopted by shepherds. Compared to adjoining areas, the overall grazing pressure in the GHNPCA is quite low and its impact is localised and insignificant at the level of overall landscape. The study also reveals that there is a disproportionate distribution of forests, alpine pastures, and permanent snow cover among four administrative constituents of the landscape. The study calls for a more careful delineation of Protected Area boundaries in this high altitude landscape based on physical characteristics and the presence of representative natural resources. We recommend that livestock grazing in the region be practised on sound principles of spatio-temporal use of grazing resources instead of overburdening particular parts of the landscape at any given point or time. This requires the appropriate distribution of livestock pressure across different migratory routes, camping sites, sub-watersheds and the landscape.

Introduction

Conservation policies have increasingly focused on the maintenance of healthy, productive, and diverse ecosystems as a pre-condition for the continued well-being of human societies and the land itself. The word "conservation" implies the sustainable use of resources, and the conservation of biological diversity requires maintaining the variety and variability of life and associated ecological processes. It also requires addressing issues at various biological levels, including genetic, species, population, community, ecosystem, and landscape (Marcot 1989 and 1992; Noss 1990; Hunter 1990 and 1991; Williams and Marcot 1991; Walker 1992; Salwasser 1995; Darden and Marcot 1995; Naveh 1995). A network of protected areas (PAs) has been recognized as a means of effective conservation. Such a network, comprising National Parks (NPs) and Wildlife Sanctuaries (WLS), exists in India (Rodgers and Panwar 1988). The present Wildlife (Protection) Act of 1972 (Anon. 1972) prohibits human settlements, cattle camps, and livestock grazing inside NPs, and, since 1991, allows regulated grazing in WLS, although in practice livestock grazing occurs in several protected areas (Mathur, 1991). Kothari et al. (1989) reviewed the management of Indian PAs and reported that about 80% of Indian PAs have cattle grazing, and about 25% have more than 50 head of cattle per square km.

In addition, seasonal and migratory pastoralism is commonly practiced in several parts of northern and western India. It is particularly important as a source of revenue in the case of the high altitude ranges of the Himalaya. Many herding communities continue a long-standing tradition of

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moving up to alpine pastures for the summer and descending to lower reaches in the winter. Livestock utilize various grazing resources across altitudinal gradients and thus often come into contact with wild animals. It has been well documented that while grazing has a detrimental effect on communities with little history of grazing, some level of grazing is necessary to maintain communities with a long history of grazing (Naveh and Whittaker 1980; Andren et al. 1997). Recognizing the significance of the ecological connections between habitat, livestock, wildlife, and humans, the present study attempts to provide insight on livestock grazing and its relationship with ecology, socio-economics, and conservation of the Great Himalayan National Park Conservation Area (GHNPCA), and in particular, to assess the overall status of biodiversity in relation to livestock grazing on a landscape basis.

The study area

The present study was undertaken in the GHNPCA in Himachal Pradesh. The area is comprised of three PAs: the Great Himalayan National Park (GHNP), Tirthan Wildlife Sanctuary, Sainj Wildlife Sanctuary, and an Ecodevelopment Zone (EZ), encompassing a total area of 1,171 km^2 recognized here as a single landscape (Fig. 1). The GHNPCA represents the biogeographic zone 2A North-West Himalaya. It lies in the Kullu district of Himachal Pradesh and is located at the junction of two great faunal realms: Palaearctic to the north and Oriental to the south (MacKinnon et al. 1986). The Conservation Area is comprised of the catchments of Tirthan, Sainj, Jiwa, and Parvati rivers, which together form the upper catchment of the Beas River, one of the major perennial rivers in the region.

Local inhabitants in the GHNPCA are transhumant pastoralists who have reared livestock since time immemorial. Local people, conservationists, and wildlife managers assert that: 1) the livestock population and herd size have increased substantially over time, 2) that grazing practices are harmful to wildlife and are leading to large-scale degradation, and 3) that unregulated grazing in forests and alpine pastures is not compatible with long-term conservation objectives. This view is supported by several studies (Samant 1992; Rikhari et al. 1992; Rawat and Uniyal 1993; Sundriyal 1995; and Pandey and Wells 1997).

In 1984 the Government issued a notification of intent to the area known as the Great Himalayan National Park (GHNP). This notification was partly based on the assumed relations between grazing and biodiversity conservation mentioned above. The legal provisions of the Wildlife (Protection) Act of 1972 require the extinguishing of all rights of local people, thus, the elimination of any type of re-

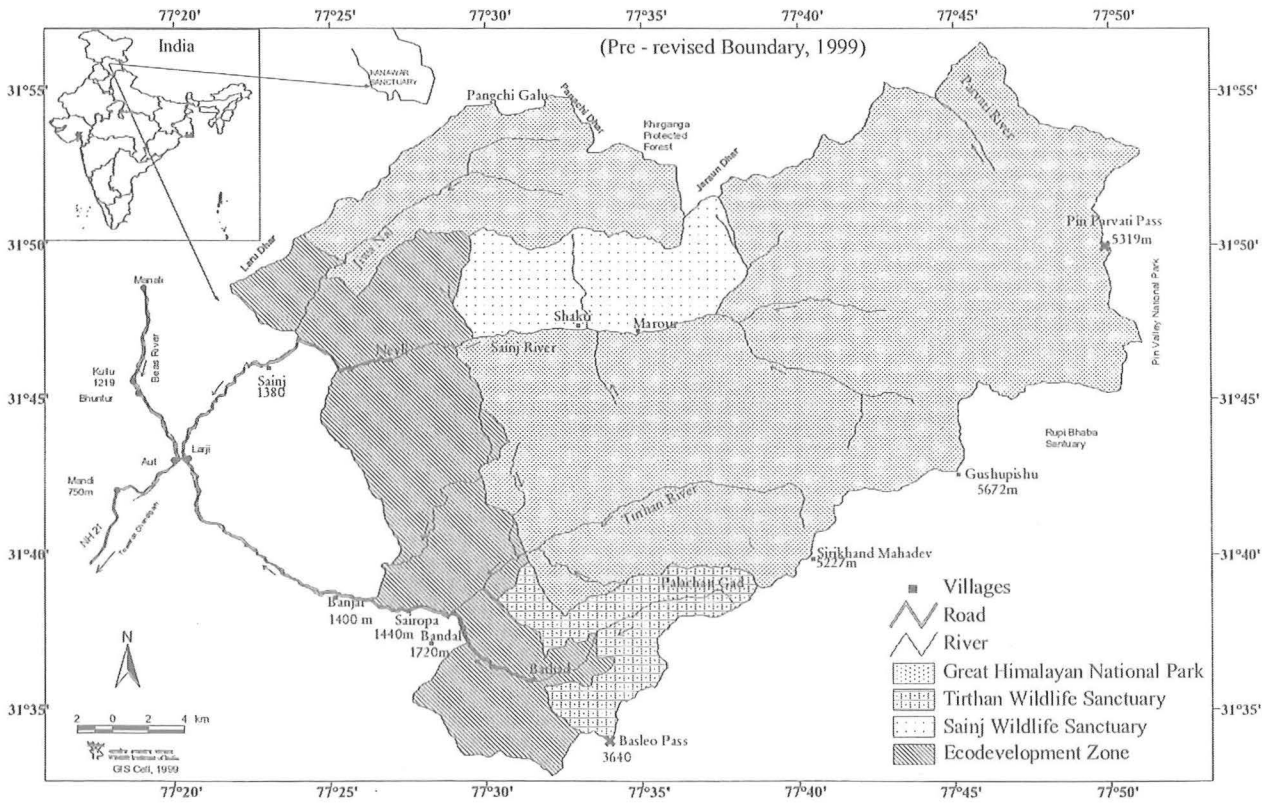

Figure 1. Study Area - Great Himalayan National Park Conservation Area (GHNPCA), Himachal Pradesh

source use in the National Park. This was ultimately achieved in 1999, as a result of the final notification of the Great Himalayan National Park.

The present study assesses various issues of livestock grazing on a regional landscape basis (Noss 1983). Using a hierarchical approach we assess the grazing practices of migratory pastoralists at the stand, species, ecosystem, and landscape levels so as to obtain a systematic understanding of the physical, biological, and social dimensions of the landscape. The study combines modern techniques such as remote sensing and GIS with traditional field assessments: secondary information, questionnaires, interviews (with villagers, pastoralists, and PA officials), field estimates, inventories, and ground quantification of various habitat variables.

The landscape—environment and pastoralism

The vertical and horizontal complexity of the landscape leads to a high degree of spatial heterogeneity. The area's varied land forms, particularly in relation to altitude, slope, aspect, and past management practices, have created a landscape characterized by a rich diversity of ecosystems, habitats, and floral and faunal species. A distinctive feature of the landscape is the marked altitudinal gradient from 1,300 to 6,110 meters. The landscape includes varied temperate forests, sub-alpine, and alpine pastures. More than 1,500 species representing different plant and animal taxonomic groups have been described, so far, for the landscape.

A landscape level analysis indicates that different types of forests, grass patches, and alpine pastures cover 62% of the total landscape, while nearly one-third of the landscape is not available for human use (rivers, water bodies, permanent snow or rocky slopes, cliffs, and moraine). Interestingly, more than 87% of the area of the EZ lies below 3,200 m elevation, while close to 84% of the National Park and Sanctuary area lies above the 3,200 m mark. Consequently, the EZ harbours the bulk of the forest and has limited alpine pasture areas (only 3.62%), yet it supports the majority of resident livestock. The bulk of the alpine meadows of the region are in the protected areas, 73.3% in the GHNP alone.

The entire human population residing in the GHNPCA can use less than six per cent of the total landscape for agriculture and horticulture purposes. The landscape experiences harsh climatic conditions. During the long winter inclement weather conditions constrain outdoor activities, and use of natural resources is hampered. These constraints have led to an increased dependence on the natural resources of forests, pastures, and livestock-rearing for sustenance and economy. Like many other mountainous landscapes, people have used and managed the GHNPCA for well over 2000 years. The area's resources have supported people and their livestock throughout this period (Tucker 1997; Kaul 1998). People, their livestock, and the environment have thus co-evolved in this dynamic landscape. They are tied together within one complex fabric.

The study revealed that the practices of seasonal transhumant pastoralists have remained largely unaffected since colonization despite several changes brought in during different ruling regimes, new technologies, and overall development. For example, the caste system has influenced the social structure, work distribution, and resource use. The bulk of the population is comprised of two distinct caste groups, Thakurs/Rajputs and Brahmins (higher status of society) and Schedule Castes (less powerful section of the society). Rajputs are the primary land owners followed by Brahmins. Most Schedule Caste members get seasonal agricultural employment in upper castes' fields, in private house construction and porter work or an occasional public works project, such as road maintenance. Weaving baskets, for instance, is exclusively the task of the schedule caste families. This specialization results in heavy dependence of the poorest villagers on certain plant species in the forest such as bamboo. Schedule Caste families also depend heavily on collecting medicinal plants from the forest.

Usually, only one or two people from the village take the livestock of the entire village to the pastures. The phwal, or shepherd, is generally from a large family that owns a large herd. Every household hands over their animals to the shepherd, and for a small fee the shepherd then takes care of the animals for the entire summer and monsoon. As a result of this arrangement, the fodder at lower altitudes is saved for the winter, and villagers are able to devote time to various household chores, rather than tend to their livestock.

Prior to notification, the landscape had a total pressure of an estimated 33,000 to 38,000 domestic animals. This includes the animals of residents of GHNPCA as well as those of migratory pastoralists from beyond the Conservation Area. Sheep and goats are the backbone of the local economy and are kept for fibre, meat, and manure. Cattle, present in much fewer numbers, are kept for manure, dairy, and ploughing. Pastoralism has remained the central focus of traditions, lifestyles, activities, economy, self-sufficiency, and sectoral linkages (pastures-forests-agriculture-household-market).

Traditional institutions of transhumance and reciprocity sustain certain practices of livestock grazing, which were developed as a response to the terrain and biological needs of the people and their livestock. The foundation of this traditional summer grazing system rests on a constant and mutual adjustment between herding and cultivation, which ties nomadic grazing to sedentary cultivation and provides insurance for pastoralists against climatic risks and uncer-

tainty at different elevations and seasons. Summer grazing ensures that the flocks leave the cultivated fields during the early summer, thereby ensuring minimal grazing pressure during the monsoons. This shifting of grazing pressure allows the cultivators to concentrate on agricultural activities and permits grass to regenerate on the south-facing grassy slopes in the forest areas near villages, locally referred to as *ghasnis*. The grass from these *ghasnis* is harvested with the onset of winter and stored for consumption during the winter when the higher pastures are covered with snow. Any increase in number of livestock is restricted by the amount of fodder that can be collected for winter stall-feeding. At the same time, the summer migration protects the flocks from heat and disease caused by wet conditions in the lower regions. The local pastoralists (*phwals*) skillfully distribute their time and the composition of their herds between the different pastures such that they can support two vital components of herding: lambing in the cool climate and shearing in the low country near villages. Additionally, proximity to villages ensures adequate labour to help with the shearing.

As in most Indian villages, access to the commons plays a critical role in the survival strategies of the poor. Each village sends its combined livestock herd to graze with two or three shepherds. A herd from a particular village will adopt a fixed route with a specified number of nights spent at places along the way. The route is detailed with as many as 10-12 stops and is planned to optimally use the combination of grasses and other herbs available in different pastures along the way. This involves knowing and exploiting the life cycle of different plants and their nutritional values. The collection of medicinal plants involves a similar set of skills. Baviskar (1998) has reported that rules about grazing are respected by all villagers. The entire system of coordinated grazing has worked so well that during a micro-planning study villagers reported that they could not remember an instance where a dispute needed to be settled by a third party. Rare cases of infringement are settled by local elected bodies (*Panchayats*), without involving the forest department.

Thus, pastoralism in GHNPCA is based on the sound principles of optimum seasonal use of natural resources, while ensuring the long-term sustainability of grazing resources. Pastoralists follow a well defined grazing route, using specific camping sites, as they undertake their summer migration to the higher reaches or alpine pastures. On the basis of these routes, four main types of grazing resources can be identified as used by migratory livestock: (a) village pastures and village surrounds (VS); (b) migratory routes through different temperate and sub-alpine forests (MR); (c) transitory forest camping sites (TFCS); and (d) alpine pastures (AP). We identified, listed, and mapped a total of 161 pastures (Mehra 2000). Out of these, 111 (68.9%) were located in the GHNP. Another 30 (18.6%) pastures were located in two other protected areas. The remaining 20 pastures (12.4%) of the total pastures visited by pastoralists in the GHNPCA were located in the Ecodevelopment Zone.

Grazing resources: current status

The field assessments of the above four categories indicated high and unique levels of floral diversity (Mehra 2000). In the nine intensively studied alpine pastures, 192 flowering plant species were recorded and as many as 111 species were recorded from a single pasture, 'Patal'. In contrast to the common belief, biotic pressure including livestock grazing pressure was highly localized, confined to smaller areas, and thus insignificant at the landscape level. Grazing pressures were widely distributed at any given point in time. Compared to adjoining areas, the overall grazing pressure in the GHNPCA was quite low. This low pressure was consistent across various sub-watersheds, scattered village surrounds, several migratory routes, and numerous temperate, sub-alpine, and alpine pastures. Obviously this type of spatial and temporal use of grazing resources, despite a long history of transhumant pastoralism, has been compatible with high species diversity. In all, 1,174 floral and 377 faunal species have been listed so far (Mehra 1996; Gaston and Garson 1992; Gaston et al. 1993; Uniyal and Mathur 1998; Singh and Rawat 1999; Upreti 1999; Dutta 1999; Mehra 2000).

There is additional need to explore the treasure of species diversity especially in the case of lower plants, invertebrates, and micro-organisms. The present study has not yielded any evidence to suggest severe impairment of the natural system and its diversity. Moreover, the floral and faunal communities in the GHNPCA are well adapted to livestock grazing and to some extent are grazing dependent. In the present study, alpine, and sub-alpine pastures exhibited an interesting growth cycle, particularly in the flowering stage. In all, 123 observations on 85 herbaceous plants in the sub-alpine and alpine pastures made during March to late October revealed that these plants complete their growth within a short period of favorable conditions. The flowering phase of various plant species varied from a short period of ten to fifteen days to comparatively longer period of one to three months. A marked sequential replacement of flowering was observed. Peak flowering (45.7%) for sub-alpine pastures occurred in May and June, whereas in the alpine pastures, peak flowering (56.2%) was observed in July and August. Staggered flowering and the traditional spatial and temporal dispersal of sub-alpine and alpine pastures by migratory livestock thus provide favourable conditions for plant growth.

The ground cover composition (grass, herb, weed, dung, and rock) was studied across a disturbance gradient originating at the centre point of each studied camping site in seven TCFS. More or less similar trends of ground cover

composition (percentage values) were recorded in nine studied alpine pastures. The general pattern of drastic reduction in dung intensity outward from the centre point clearly indicated that the intense pressure of grazing was highly localized at camping sites. Otherwise, grazing pressure was uniformly distributed. The percentage values of grass and herb comparatively increased in all cases, moving away from the centre point. This again led to the conclusion that grazing pressure was localized and mainly occurred within a relatively small area around the centre point of the camping sites in sub-alpine and alpine pastures.

The percentage values of lopped, girdled, and dead trees were determined in six village surrounds (VS) as well as across the select migratory routes. Only 20% of the trees in the VS were lopped for fodder or fuel wood at any given time. It was also inferred that only three to four per cent were girdled for the ultimate purpose of expanding agriculture. Except in a few cases, the proportion of dead trees was negligible.

From the available literature, it is evident that certain plant communities are more 'resilient' than others. Likewise some communities may exhibit 'resistance' to grazing but may be sensitive to other natural or biotic factors (Rawat 1998). A recent study in the Mediterranean ecosystem by Verdu et al. (2000) concludes that the elimination of grazing has led to the loss of biodiversity, indicated by a decrease in grassland and grassland-bush mosaic areas. They also conclude that the controlled grazing activity of sheep and goats that maintained a diverse variegated landscape would favour the historical sustenance of the biodiversity of Mediterranean ecosystems. They therefore proposed a reintroduction of grazing by sheep and goats, based upon established guidelines and regulations.

Since the Colonial period, people have enjoyed extensive natural resource rights granted to them (Anderson 1886). Despite the absence of evidence to support the idea that grazing poses specific problems to the region, traditional resource rights, including those of migratory graziers, have been recently extinguished in the largest constituent of the GHNPCA, the Great Himalayan National Park, itself covering 754.6 km^2 or 64.4% of the landscape. These rights were extinguished in order to enable the final notification of the GHNP issued on 28 May, 1999.

Pastoralism: future implications, discussion and conclusion

The exclusion of traditional multiple resource use in the GHNP and the subsequent active protection of natural resources may lead to an overall recovery of forests and pastures in the GHNP after a long history of gradual degradation. In the present case some degradation was observed as a consequence of such activities as lopping and girdling of trees for fuel wood, expansion of agriculture and uprooting of medicinal herbs. In the case of GHNPCA, landslides were observed in only a few places. While the case has been made in this paper that the adverse affects of livestock grazing particularly in camping sites were highly localized and gradually decreased moving away from the center point, the exclusion of livestock could still lead to some recovery or progressive succession in forests along the migratory routes and in alpine pastures. This way, the legal role of a National Park would be fulfilled. However, it is difficult to predict at this stage how this overall ecological recovery would affect individual plant and animal species or the overall diversity at the species level. Landscapes are not merely unique in structure, composition, and spatial pattern; they are also dynamic (Morris 1987; Weins 1994; Andren et al. 1997). The spatial heterogeneity of the landscape, as well as any change brought in them by natural or man-made processes, will influence the distribution, abundance, and dynamics of constituent species. Two theories explain plant diversity in similar environments (Naithani et al. 1992 and Rawat and Uniyal 1993). Since both were largely based on field observations and professional judgement rather than experimental study over a long period, it is difficult to forecast the likely situation of species diversity in the case of GHNP. Further, the restriction of access to 64.4% of the total area of GHNPCA, 68.9% pastures visited by migratory livestock, is likely to overburden the remaining area with displaced livestock pressure, which would ultimately accelerate the degradation processes of those remaining grazing resources. This could lead to the elimination of sheep and goat husbandry, creating unnecessary hardship for dependent communities. Increased conflicts and some setback to the newly initiated ecodevelopment strategy adopted by the PA management cannot be ruled out. And, as has been illustrated through various studies (Thompson 1975; Guha 1989; Peluso 1992; Neumann 1992; Hough 1993), restrictive exclusion policies here, too, could lead to retaliatory poaching, deliberate setting of fires within reserved forests, and high levels of timber harvesting.

Our observations indicate that livestock are an important resource for the primarily agro-pastoral communities of the region, and people of these villages may have no place other than the protected area to graze their livestock. Given this situation, it is important to assess through experimental studies whether livestock in a protected area are actually detrimental to the ecosystem. Only when this is demonstrated should grazing be prohibited. The study also points out that livestock and pastoralists tend to be blamed for environmental degradation or decline of biodiversity; however, research has illustrated that climatic and anthropogenic effects often have been confused in studies of land degradation (Ellis and Swift 1988; Ives and Messerli 1989; Binns 1990). Natural factors, market forces, other resource use, past management practices, faulty land

use, and other illegal activities (poaching, timber extraction, medicinal plant collection etc.) together are probably having a greater, compounding, and permanent influence on alpine pastures. This view has also been supported by comprehensive analysis of the origin and various dimensions of pastoralism by various research studies elsewhere in the Himalaya (Phillimore 1982; Casimir and Rao 1985; Brower 1991; Kaul 1998; Saberwal 1999).

It has been widely argued that livestock compete with wild herbivores by depleting resources and degrading mountain pastures (Schaller 1977; Shah 1988; Rikhari et al. 1992). Competition is defined as the use of a resource by an individual or a species in a manner that reduces its availability for other individuals or species. Competition may thus occur where the resource is scarce, non-renewable, or renewed at a rate lower than demand. Competition usually leads to niche partitioning in such a manner that most natural communities species may co-exist (Milinski and Parker 1993). Sympatric animals utilising similar resources may separate at the spatial level, at the level of use of habitats, and finally at the level of selection of plant species or plant parts (Dunbar 1978; Seegmiller and Ohmart 1981; Dodd and Smith 1988; Harris and Miller 1995). Recent research on spatio-temporal overlap in resource selection by livestock and Asiatic ibex (*Capra ibex sibirica*) in the Pin Valley of Himachal Pradesh suggests that ibex and livestock use habitat differently during the period of resource overlap. Thus, livestock did not interfere with ibex at the scale of resource selection (Bhatnagar et al., 2000). This confirms the study by Harris and Miller (1995), that showed although sheep and six wild ungulates in Quinghai Province, China, have spatial overlap in summer, they had different diet selection trends. The high faunal diversity in GHNPCA also indicates that the faunal species in the high altitudes either have different habitats or have adapted to livestock grazing.

The study calls for a careful delineation of PA boundaries in high altitude landscapes, based on physical characteristics and the availability of representative natural resources. In addition, the vertical and horizontal landscape intricacies and large scale variations in the physical environment need to be considered. GHNPCA harbours a rich floral and faunal diversity despite, or possibly because of, long term livestock grazing. Realising that grazing is an integral part of the Indian landscape, it is time to develop inclusive, participatory, forest and range resource management programs, rather than policies based on exclusion. Diversity may be enhanced by maintaining a mosaic or spatial mix of habitats, patch sizes, seral stage variety, and forest stands/pastures with mixed attributes, while maintaining connectivity among them. Countering the common notion that livestock grazing reduces diversity, many examples from various studies demonstrate that moderate levels of grazing can lead to high level of floristic diversity (Grubb 1976; Belsky 1986 and 1992; McNaughton 1979 and 1993; Hobbs and Huenneke 1992; Howe 1994;). Furthermore, its elimination has resulted in an increase in woody species, drastic increase in weed species and an overall decline in flowering herb and forb species diversity (Ali and Vijayan 1986; Gopal 1991; Naithani et al. 1992). Livestock grazing in the region of GHNPCA can, and should, be practised on the sound principles of spatio-temporal use of grazing resources. This calls for the distribution of uniform livestock pressure as far as possible across different villages, migratory routes, camping sites, grazing resources, sub-watersheds, and the overall landscape. A conservation awareness campaign for the local community can be very useful to educate them about the ill effects of site-specific pressures exerted by lopping, girdling of trees, and uprooting of medicinal herbs. The present study calls for a comprehensive strategy for experimental research and built-in long term ecological monitoring to track biodiversity status and trends. This will ensure long term sustainability of the unique and diverse high altitude ecosystem of the GHNPCA and the local population's well being.

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