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Present status and future trend of chilghoza forest in Goharabad, District Diamer, Gilgit-Baltistan, Pakistan

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Abstract

The current study was carried out in Chilghoza forest of Goharabad District Diamer. The study area is situated in the foothills of Hindukush mountain range at 5 Km from KKH, at an elevation of 2000 to 5000 m with an area of 310 km². Six stands of Chilghoza Forest were selected randomly for the enumeration of data from different locations and aspects suing Point Center Quadrate Method .Stand densities of the six stands were 16.61, 12.168, 7.367, 7.163, 4.320, 3.982 m²/ha respectively in all six stands. The distribution of *Pinus gerardiana* is satisfactory in almost in all the stands however the distribution of associated species were very poor. The poor distribution and gaps in small size middle and in large classes, *Juniperus excelsa and Quercus ilex* seem to be losing ground in this forest due to anthropogenic activities i.e. felling, grazing, sliding, burning and several human induced factors. As the study area falls under the category of private forest, thus it was found that all of the respondents were owners of the forest. It was interesting to know that the Chilghoza forests are exclusively used for nuts collection. It was found that 100% villagers depend on the Chilghoza forest for nuts collection and no timber or fuel wood collection is made from the Chilghoza forests, conservation committee have imposed fine on cutting of Chilghoza forests for fuel wood or timber. However, the associated tree species including Juiper , Oak, Birch and Blue pine are felled for fuel wood and other wood purposes. Government and non-governmental organizations should come forward to support local communities in conservation of the valuable Chilghoza forests.

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Introduction

Pinus gerardiana locally known as Chilghoza pine is a native species of Northwestern Himalaya in eastern Afghanistan, Pakistan, India and other scattered localities in the Hindu-Kush Himalaya growing at elevations between 1800-3350 m. It often occurs in association with Blue pine (*Pinus wallichiana*), Deodar (*Cedrus deodara*) Juniper (*Juniperus excela*) and Oak (*Quercus ilex*) (Richardson and Rundel, 1998).The species has aptly been described as the "*Champion of Rocky Mountains*" as it grows under difficult sites conditions as prevailing in the inner Himalaya. The species occurs in dry temperate region experiences low temperature and scanty precipitation received mostly in the form of snow during winter. Besides, the species is an excellent soil binder and prevent large scale soil erosion from the otherwise lose and fragile strata in the region. (Sehgal and Khosla, 1986). The tree is attacked by cone borers and bark Beatles. Grazing and collection of edible seed has limited natural regeneration (Shaikh, 1993) and green cones are collected from the trees during September, heaped and dried in the sun which causes them to open after which the seeds collected. The cones are removed from the tree by means of a long pole with a iron hock at the end. Much injury is likely to be done to the trees during the process of the collection of the cones. Often men climb up the trees, many branches are broken.Chilghoza is a slow growing tree. Rings counting was done on two stumps and it was found that it took 64 years to attain a girth of 2m at stump level (Javed, 2009).As the tree is of great economic value to the local people, they do not cut it till it dies. Thus very old trees with rugged appearance are found in the area. There are several dry trees standing in the area also which continue in the forest as there is not much demand of timber and extraction is also difficult.The seed gets attacked by a moth extensively while in the cone on the tree. The Pakistan Forest Institute has established a field station at Shinghar to study this insect attack. The insect attack the seeds in all stages of its growth during about 16 months out of 18 month of cone formation period (Chaudhry, 1958-59).*Pinus gerardiana* grows in the North-eastern portion of the Zhob district, adjoining D.I. Khan and District Diamer. The rampant decline in growth of Chilghoza pine throughout the world due to different reasons coerced the conservationists in the arena of natural resource management to include it in IUCN Red list of Threatened species (2013).

The Chilghoza forests of Gilgit Baltistan have been under over-exploitation without any proper management plan. No attention has been given to the sustainable management of forests based on scientific principles. Few studies have been conducted on these forests but mostly are focussed on socio-economic and livelihood aspects of the forest communities. The Chilghoza forests are faced with serious problems of regeneration but no data is available to determine the exact status and future trends of these forests. In order to fill this gap, the current study was conducted with the following objectives.

Aim and Objectives of the study

The overall aim of this study is to determine the current status of Chilghoza pine forests in Goharabad, Diamer. The specific objectives of the study are as follows:

- To find out the current status and future trend of Chilghoza forest and associated species in Goharabad, District Diamer.
- To find out species composition of Forest.
- To find out the density of Chilghoza stands in the area
- To identify threats to Chilghoza pine forests and suggests measures for conservation of these forests.

Materials and methods

Description of the Study area

Diamer District is one of the seven districts of the Gilgit-Baltistan region of Pakistan with its boundaries meeting Gilgit District in north, Kohistan in South, Astore in east and Ghizer District in the west. The district has two sub-divisions, Chilas and Darel/Tangir, where Chilas town is the district headquarters situated along the Karakorum Highway at an altitude of 1260m above sea level. The district is

one of the main private forest hot spots in Gilgit-Baltistan and shelters the naked mountain, Nanga Parbat above the fairy meadows coniferous forests.

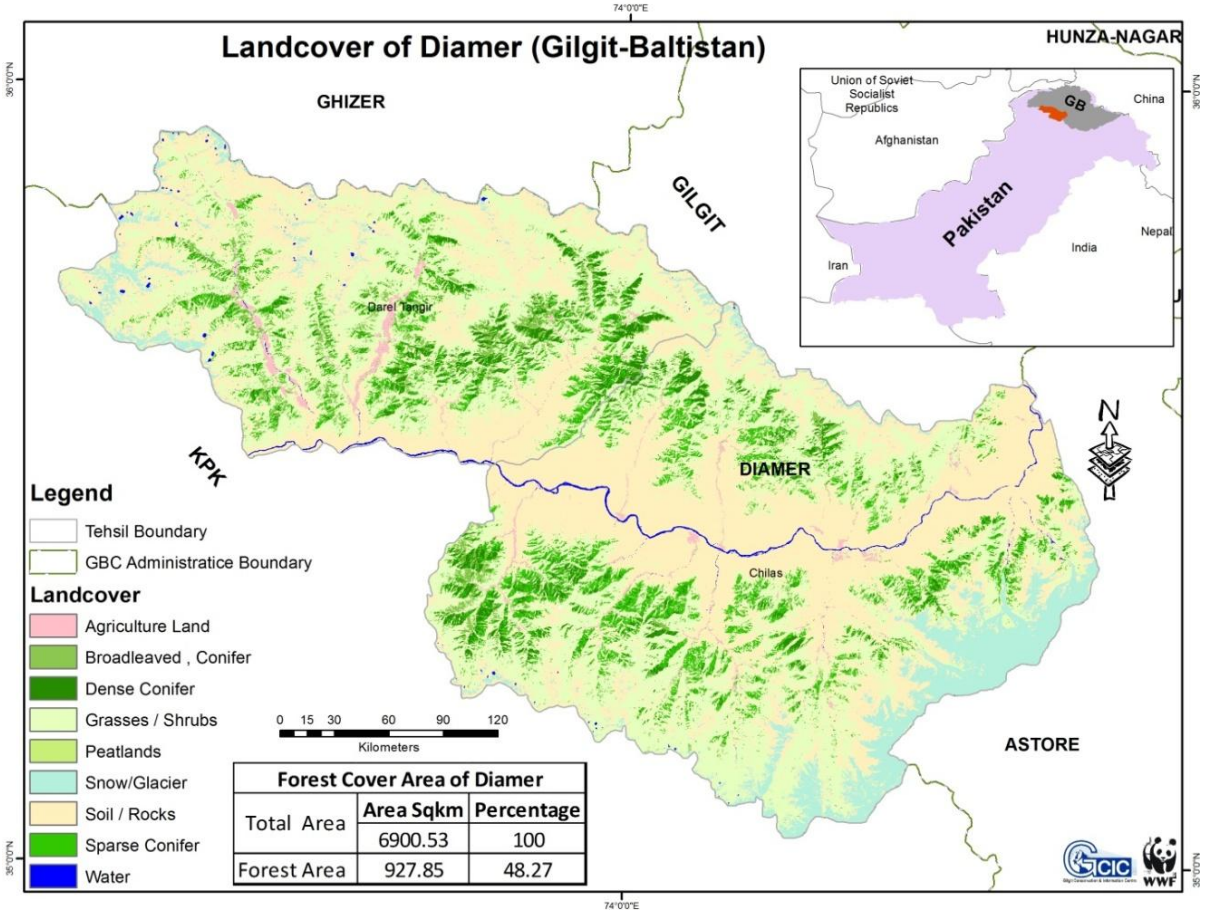

Fig. 1. Land cover Map of District Diamer (Source: WWF Gilgit).

Data collection

The (PCQ) Method was developed by Cottam, G. and Curtis, J.T. (1956) as a plot less technique to estimate density. The (PCQ) technique is perhaps the most popular of the plot less sampling techniques Ahmed and Shaukat (2012). Each sample is taken at a random location in the area to be sampled. This is frequently done by choosing random points along a transect, in each stand 20 points were taken at every 20 m interval. The area near each random point (sample point) is divided into four imaginary quadrants. Within each quadrant, the distance from the random point to the centre of the nearest individual is measured. As there were four quadrants so a total of four trees were measured at each sample point. For each individual, the specie name and its DBH was also recorded.GPS was used to record the elevation and co-ordinates while degree of slope was recorded by slope meter.

Analysis of present status and future trend

Diameter at breast height (Dbh) of each tree in a stand was divided into 10cm Dbh size classes. Total 11 size classes were made according to the range of Dbh which was lesser than 120 cm.Various size classes and size structure of individual stands were made using by MS Excel 2003 and 2007. Further more in each stand, size classes divided into four categories i-e small size classes (10 to 30 cm Dbh), middle size classes (40 to 60 Dbh cm), large size classes (70 to 90) and above (90 Dbh) extra large size classes. It should be borne in mind that this area was subjected to extensive logging and cutting and large sized trees were removed. The dominant tree species was select following the method described by Ahmed (1984),

Siddiqui (2011), Wahab (2011) and Khan (2011), Akber *et al.,* 2013, Akber *et al* .,(2014), Hussian *et al* .,2013 and Hussian *et al*.,(2014).

Results

Stand No 1: (Latakhand Forest)

Stand was located between N 35°.3 and E 74°.32 at an elevation of 8794 ft above sea level, while degree of slope is 45°on West exposure in Goharabad. Density of the stand was calculated as 128.4 stems/ha with basal area 16.61 m²/ha. *Pinus gerardiana* was the leading dominant species with a density of 101 stems/ha while *Juniperus excelsa and Quercus ilex* attained 14 stems/ha and 13 stems/ha respectively. In this area, 45% of the individuals of all the species found in small class were as 47% found in middle class , 7% in large class and some individuals of *Pinus gerardiana* and *Juniperus excelsa*. There is no evidence of *Juniperus excelsa* individuals in medium classes while few are seen in large class. The size classes of *Pinus gerardiana showed* ideal distribution pattern while small gaps were found in *Juniperus excelsa*. The small gaps and less density due to the anthropogenic disturbance. Overall grazing was common in this forest. Due to the poor distribution in small size classes, *Juniperus excelsa and Quercus ilex* seems to be losing ground in this forest. Therefore it is suggested that deforestation should be seriously discouraged and proper management will save this important forest.

Stand No 2: (Bamur-1 Forest)

This stand lies between N 35°.3 and E 74°.32 at an elevation of 8506 ft above sea level, while degree of slope is 45°on West exposure in Goharabad. Density of the stand was calculated as 104.9 stems/ha with basal area 12.168 m²/ha. In this stand the there is satisfactory distribution of *Pinus gerardiana* having density of 71 individuals/ha while *Quercus ilexa and Juniperus excelsa* occupy 24 individuals/ha and 10 individuals /ha respectively. In this stand, 46% of all the individuals of the species found in small class were as 41% found in middle class, 10% individuals of only *Pinus gerardiana* found in large class and some individuals were also found in extra large class. The size classes of *Pinus gerardiana* showed ideal distribution pattern while size class of *Juniperus excelsa* showed gaps in large size classes which indicate that there is anthropogenic activities existed. However the forest can be saved with little effort by controlling illegal cutting and take proper management.

Stand No 3: (Bamur-2 Forest)

This is located in Goharabad lies between N 35°.3 and E 74°.32 at an elevation of 8354 ft above sea level, while degree of slope is 45, facing on Eastern exposure. Density of the stand was calculated as 85.14 stems/ha with basal area 7.367 m²/ha. *Pinus gerardiana* was recorded as dominant species with 72 trees/ha, while the *Quercus ilex* recorded as co-dominant species having density of 13 trees ha-1. .*Pinus gerardiana and Quercus ilex* received 56% in small class, 25% indiduals in middle and 10% individuals of only pinus gerardiana present in large classe, *Quercus ilex* have less density as compared to *Pinus gerardian* and some trees of Pinus gerardiana also seen in extra large class. The size class distribution of *Pinus gerardian* is satisfactory the whole pressure is on the other associated specie the future of forest may be secured with a little effort by controlling illegal cutting and seedling development is promoted. Sliding, cutting and grazing were common phenomena while many boulders were exposed due to soil erosion in this forest. If the present activities do not stop the associated specie will disappear in the years to come.

Stand No 4: (Daskil-1 Forest)

This is pure stand of *Pinus Gerardiana* was situated at N 35°.3 and E 74°.32 elevation above sea level between North latitude 35°.33 and 74°.32 East longitude on slightly plain surface with 10 degree of slope having Northern aspect. The canopy of this forest was moderate. The density of this pure stand was recorded 72.9 /ha with basal area 7.163 m²/ha. Small size classes attained higher number 75% of trees but in middle classe it decreases and attained

36% trees, while in large classes only (3%) individuals were present but old tree with DBH more than 100 cm was also observed in extra large class. The future of this forest may be protected. For this purpose, cutting, grazing and other kinds of disturbances should be stopped. The size classes of this forest showed roughly normal distribution. In the small classes some individuals are found, which are not enough for the existence of this forest in future.

Stand No 5: (Daskil-2 Forest)

The stand is located in Goharabad at an elevation of 9118 ft above sea level, while degree of slope is 45, facing on Estern exposure. The total density of the stand was calculated 98.52 trees/ha with basal area 4.320 m²/ha. The slope was 33 facing on North, while due to the heavy cutting the canopy was opened. Three different tree species, *Pinus gerardiana*, *Quercus ilex* and *Juniperus excelsa*, were recorded occupying densities 81.2/ha, 23.5/ha and 3.96/ha respectively. The densities of juniper and Quercus is very poor. In this stand 86% individuals present in small and 14% individuals of only *Pinus geragdiana* is present in middle size class. No individuals were present in large class. Presence of large number of individuals in small class is good sign for future. *Pinus gerardiana* showed the best distribution as compared to other two species. Remaining two species showed very poor distribution due to the excessive cutting and human influence. The distribution of *Quercus ilex* and *Juniperus excelsa* is not satisfactory. If prompt action is not taken and conservation plan is not imposed these species will vanish in near future. Less individuals is large classes shows that the large individuals are deteriorate by human influence for fuel and wood purpose.

Stand No 6: (Daskil-3 Forest)

This Stand is also located in Goharabad at an elevation of 8942 ft above sea level, while degree of slope is 55, facing on Estern exposure. The total density of the stand was calculated 57.50 stems/ha with basal area 3,982 m²/ha. *Pinus gerardiana* was recorded as dominant species having density 45.2 /ha, while *Quercus ilex and Juniperus excelsa* having density of 7.18 stems/ha and 5.03 stems/ha respectively. . In this stand, 77% individuals of all the species are found in small class were as 16% found in middle class, 4% individuals of only *Pinus gerardiana* found in large class and some individuals were also found in extra large class. The size classes of *Pinus gerardiana* showed ideal distribution pattern. There were no any individuals of Oak and Juniper were found in middle and large class. This shows that these species were under high stress. In this forest, distribution pattern of *Pinus gerardiana* is satisfactory which may control through introduce new recruits while *Quercus ilex* and *Juniperus excelsa* indicated that these species may vanish soon from this forest, if current activities not stopped. Conservation plan should be introduced immediately to save the future of this forest. Size classes of this stand showed roughly linear with negative trend due to illegal cutting, sliding, and grazing. If present practices will not stop, these species will be disappeared with the passage of time.

Discussions and conclusions

The pattern of DBH size classes' distribution of different species indicates about the present status and the future trend of these forests, in thus study among the 6 stands, the distribution of *Pinus gerardiana* were found satisfactory and these can be assumed as regular distribution pattern. Present study show that *Pinus gerardiana* is present in all the six (06) stands as the leading dominant specie. The average density of the forest was calculated as 91 individuals/ha. Among the stands the highest density of *Pinus gerardiana* is recorded as 101 stems/ha in stand # 01 with basal area 16.61 m²/ha and lowest density was recorded 45 trees/ha in stand # 06 with basal area 3.982m²/ha, where as the distribution of *Juniperus excelsa* and *Quercus ilex* is very poor in almost all the stands. The variation of distribution pattern of size classes, density may be due to the anthropogenic activities i.e. overgrazing, cutting, sliding , burning and other several human induced factors. These kinds of reason also discussed by the

previous researcher during the survey of different forested area in other part of Pakistan , i.e., Beg and Khan, 1984, Ahmed (1984), Ahmed *et al*. (2009), Wahab *et al* (2008), Siddiqui *et al*. (2009), Khan *et al*. (2010) and Akber (2013). In the light of this study, it is concluded that each forest is disturbed, unstable and showing varied size distribution. Most of the forests have low seedlings, young trees or they do not show signs of seedling recruitment. Whereas there is gap in middle and large class these are due to anthropogenic disturbances, i.e., illegal cutting, grazing, and sliding, burning, etc., are most familiar in these areas. Present practices are threatening and alarming for the future of these forests. So proper regeneration activities, management skills and conservation plan should be introduced and applied immediately to rehabilitate and save these valuable forests. From this study it is concluded that there is no threat to *Pinus gerardiana* because Chilghoza trees are source of income of local communities they get revenue from Chilghoza nuts annually therefore they conserve Chilghoza trees and the whole pressure is on other associated specie i.e. Juniper and Oak because the local community fulfill their requirements such as fuel wood and timber for construction and other purposes, If this illicit cutting of Juniper trees not stop it will vanish from the forest very soon. Therefore, special attention is needed to protect these forests and the natural vegetation upon which the wildlife depends

Recommendations

The sustained growth of the forestry sector and long-term benefits from the forest resources of the region can only be achieved through better conservation and management. The major constraints for realizing these are lack of coherent set of policies to address forestry management and conservation problems and political will to formulate such policies besides their effective implementation. The forests of the region are highly important from biodiversity, conservation and watershed management point of view in addition to a number of direct tangible and intangible benefits. Based on the conclusion of result the following measures are suggested for the development of forests and forestry in the tract.

- Custodian Departments of Chilghoza forest should take immediate steps with the participation of village committees/Zaitoo to stop illicit cutting of other associated of Chilghoza Forest and overuse of rangelands. In this regard a long term mutual planning and collaboration is need of the time.
- Enforcement of Forest Acts and Rules
- Forest policies should be modified with modern world requirement
- Like other forest of the country Chilghoza forest must managed under proper management plan. For the purpose a complete inventory of the standing stock be prepared and following information need to be collected i.e. annual increment/ha, number of trees/hectare and natural regeneration status in the forest etc.

- Participatory watch and ward system should be implemented to monitor the logging from Chilghoza forest.

- Energy plantations should be raised to relieve pressure on the natural forest resource and meet the subsistence needs of the local community. Alternate livelihood option should be explored and promoted to enhance the income level of the project community.

- Community should be mobilized for the sustainable use of natural resources through extension programs. For this a comprehensive awareness and conservation strategy should be devised for various target groups.

- Rotational grazing system should be implemented and it should be ensured that the biomass consumption should not exceed 50 % and that livestock should be distributed evenly over the forest area.

- People should be trained for pre imposed harvest management of Chilghoza nuts and establishment of market linkages with Chilghoza whole dealers and

exporters to pass on the increase benefits from the sale of Chilghoza nuts to the local community.

- Proper equipment and tools as specified in earlier should be given to the local communities for nuts collections so that the injuries and disability could be avoided up to maximum extent.

- Capacity building training should be conducted on fruit collection processing and value addition aspect so that the product could bring more profit for communities.

- WCS, IUCN, WWF and Government forest department with the co-ordination of village committees/ Zaitoo can help to develop direct linkages with the national and international markets avoiding the middle-men and agents that will ensure maximum benefit to the community.

- Establishment of net work of nurseries to supply planting stock at door steps at subsidized rates, through Forest Department, Allied Government Departments NGO's, Community based organizations and through Private persons.

- Afforestration and filling up of the blanks in forests in animal prohibited blocks for 4 to 5 years to grow up the trees to a reasonable height, above the trampling/browsing limit.

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