

Forest Fire In Himachal Pradesh: An Impact Analysis

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Abstract: Forest fires create a myriad of environmental, social and economic impacts. The fire incidence prone areas has mostly the gymnosperms species like Pinus, Cedrus, Oak etc. which catches fire easily, while as the lots of medicinal species in the temperate regions also get destroyed. As a result leads to the ecological and economic loss to the state. The impact of this damage involves not only the amount of timber burnt but also environmental damage to forested landscapes leading, in some cases, to land and forest degradation and the prevention of vegetation recovery. However, further more improvement required to enhance the process of better assessment, monitoring and management of the forest resources of the planet earth. Forest fire is a perennial phenomenon in the state. Even as all the forest types are potentially vulnerable to fires with most of temperate and sub-tropical forests experiencing ground fires if winters go dry, it is the Sub – tropical Pine Forests (Chir Forests) spread over 1258.85 km² (3.4 % of total forest area of the state) that experience the heaviest annual forest fires during the dry months of March to June. Forests are not uniformly distributed throughout the state but are mostly confined to higher hills and interior valleys because the lower and more accessible areas, the forests have been cleared for cultivation and settlement. At the district level, Chamba has maximum area under forests and most of it is under very dense and moderately dense forests. The extent of forest fires in the state over the last ten years in the different districts are as total of 572 fire cases have been reported during 2008-2009 and the total area affected area was 6.586 ha, the affected area raised four times more till 2010, whereas 1906 incidences of fire occur during 2009-10; 870 incidences of fire occurred during 2010-11 meanwhile 168 fire incidences happened during 2011-12. In the year 2012-13 highest number of fire incidences (1798) occurred with the huge economic loss of 2,76,82,589 crore in this decade.

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Introduction

In Himalayan region, fires are common in May & June (IFFN, 2002). Fire has negative impact on Carbon storage, Carbon stock; net production & potential Carbon sequestration in a seasonally dry forest ecosystem. As per report of IFFN (2002) maximum frequent fire (50%) was reported in north-eastern region as compared to minimum (5%) in Dry deciduous. Fire encouraged fire-tolerant tree species & discouraged fire-sensitive species as reported by Ivanauskas *et.al* (2003). As per Jhariya *et.al* (2014) forest fire has a significant impact on biomass and carbon storage pattern on tree species while the shrubs produce higher biomass in the area where fire is more common on high severity as compare to protected site due to reduction of competition due to open canopy in tropical dry deciduous forest. Fire is a big disaster in the forest, causes loss of natural resources, depleting of soil biomass resulting the loss of various mobile nutrients (Raj and Jhariya, 2014). According to P.S. Roy (2002), the Forest Survey of India data indicate 50% of the forest areas as fire prone. This does not mean that country's 50% area is affected by fires annually. Very heavy, heavy and frequent forest fire

damages are noticed only over 0.8%, 0.14% and 5.16% of the forest areas respectively. Thus, only 6.17% of the forests are prone to severe fire damage. In absolute terms, out of the 63 million ha of forests an area of around 3.73 million ha can be presumed to be affected by fires annually. At this level the annual losses from forest fires in India for the entire country can be moderately estimated at US\$ 107 million. This estimate does not include the loss suffered in the form of loss of biodiversity, nutrient and soil moisture and other intangible benefits. The potential effect of global warming on the severity of the forest fires season in results were super imposed over historical sequences of daily weather, the relation between season severity ratings and annual provincial area burned by wildfire was analyzed. The results suggested a 46% increase in season severity rating, with a possible similar increase in area burned, as a result of doubling present CO₂ levels (Flannigan, M.D. & Wagner 1991). The causes of degradation of forests in India is forest fire and grazing by animals (S.N. Rai & Alok Saxena (1997). With the history any growth of forestry and its impact on importance of micro-watersheds innovation in forestry, the role of NGOs in forest problems

management, and the strategies for preservation of biodiversity human ecology, deforestation, forest fire and illicit timber trade (A.S. Rawat (1999). The prevalent causes and extent of forest fires in India, the status of the Joint Forest Management Program, introduction of modern methods to combat forest fires, the recognition of the need for community involvement and initiatives taken by the government of India to encourage participation by communities (V.K Bahaguna & A. Upadhyay, 2002). Himachal Pradesh is a disaster prone state. The report states that in comparison with other parts of the country, the forests of the Himalayan region are more prone to forest fires. The report points out that severity of the problem may be judged from the forest fires of 1995 (Himachal Pradesh Development Report, 2007). The damages caused by fire which broke out in April-May 1984 in Nahar Forest division in H.P. and number of Chir pine trees slowly started dying one after the other even after 10 months of outbreak of fire. (R.S. Thapa & Singh, 1990). Fire is an important ecosystem disturbance with varying return frequencies, resulting in land cover alteration and change, and atmospheric emissions on multiple time scales. Fire is also an important land management practice and is an important natural abiotic agent in fire dependent ecosystems (FAO, 2009). Forest fire is one of the major hazards causing destruction to biodiversity, environment and humans.

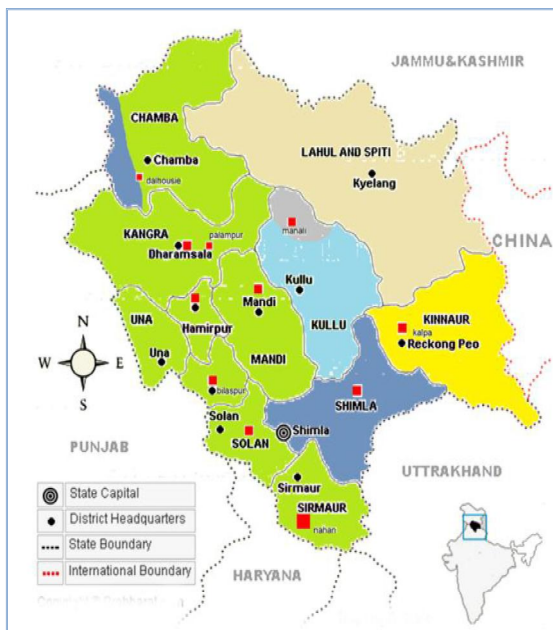


Figure:-1. Map of Himachal Pradesh.

Forest Fire incidences in Himachal Pradesh are alarming. The forests in recent times have been subjected to tremendous pressure not only from

natural calamities but also from human interference such as forest fires. The incidence of fire in the state is considerably very high, the main trend over the last ten years are an increase in the number of forest fires. There is no focus on fire in the state. There is no as such clear cut fire strategy or planning regarding it. Statistical data on forest fires where available these are either skeletal or unreliable. No system exists for fire weather forecasting danger rating fire reporting or preventive measures apart from some basic fire line clearance and prescribed burning on plantation boundaries. Himachal 's forest deserves a fully fledged fire management structure without studying and going in-depth in this field one cannot find solution regarding forest fires. More and more research is needed to be conducted on this issue. The time has gone when common people used to see for development functions to top government and they were out of reach.

Now the scenario has been totally changed and powers are vested in local institutions. This study is help to draw the guidelines to state forest fire prevention and control guidelines, which will identify the vulnerable areas of forest fires maps and creation of data bank on forest fires, economic loss, and revenue loss, evolving fire danger, provision for a crisis or disaster management group and efficient enforcement of legal provision.

Thus, it is essential that original research specific for the conditions to be conducted. Himachal Pradesh is that Himalayan state of Indian which is rich in natural resources and vegetation. Forests are the important assets of the economy. But during previous few years the state is affected by forest fires due to various causes. Therefore there was a desire need to conduct a specific study on this problem. The study was carried out for forest fire impact analysis and loss assessment due to forest fire in Himachal Pradesh.

Study area

The study area lies between latitude 30°22'40" N to 33° 12 40 E and 75°45'55" E to 79° 04 '20" E longitudes in India. The state covers a geographical area of 55,673 km which is 1.69% of India's total area. The forest cover is 14,696 km² i.e 26.40% and the legal forest area is 37,033 km² i.e 66.52%. Himachal Pradesh, nestled in the north western Himalayas, literally means the "land of snowy". The state is divided into 12 districts for administrative purpose: Hamirpur, Bilaspur, Solan, Kangra, Mandi, Sirmaur, Shimla, Chamba, Kullu, Kinnaur, Lahaul and Spiti. The forest also perform very important ecological function of recharging the aquifers ensuring regular flow of water in the Yamuna, Sutlej, Beas, Ravi and Chenab river systems.

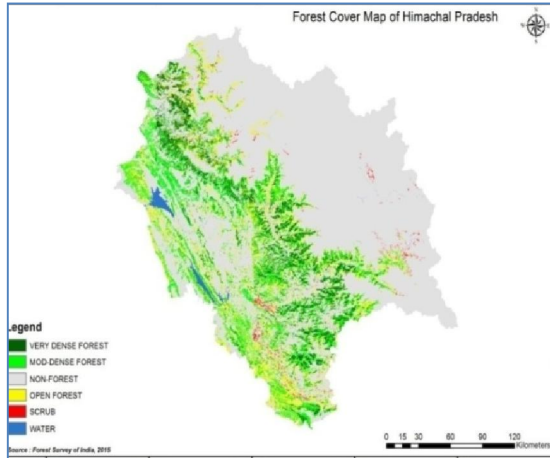


Figure: -2. Forest cover map of Himachal Pradesh.

The state receiving precipitation only during monsoons and winter months, experiences 7-8 dry months every year making the forests highly vulnerable to fires. Himalayas and its physiographic features vary in the extreme. On the basis of the

elevation and slope, there are three distinct topographic regions:-

(1) Shivalik hills (2) Mountains – Greater and Lesser Himalayas (3) Valleys - Shivalik dun valleys, fluvial and glacio-fluvial valleys. The great diversity in relief, variation in elevation and the geographic location of Himachal Pradesh has given the state diverse climatic conditions. The average monthly temperature of summer months varies from 26°C in the lower outer valleys to 14°C in the inner valleys zone and that of winter month from 13°C to minus 4°C. Temperature also decreases with increasing altitude. Most of the rainfall is received from the southwestern monsoon, starting from June and up to September. Maximum rainfall occurs during month of July and August. Snowfall is also received from western disturbances throughout the state. The state has over 2500 glaciers. Most of the rivers in the state are perennial rivers, which originate from glaciers and snow fields.

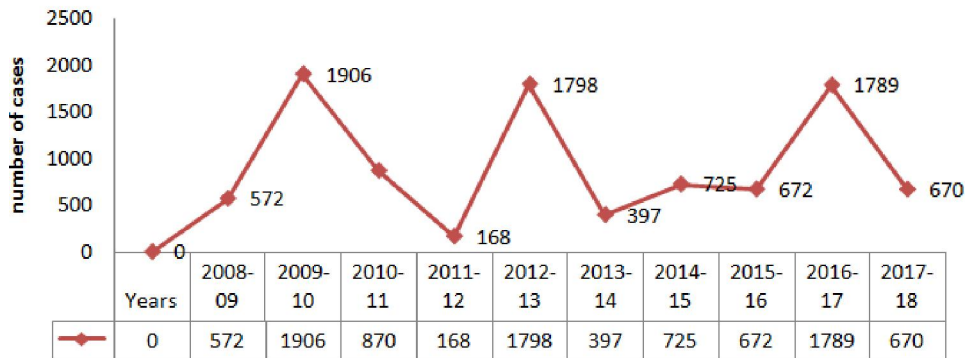
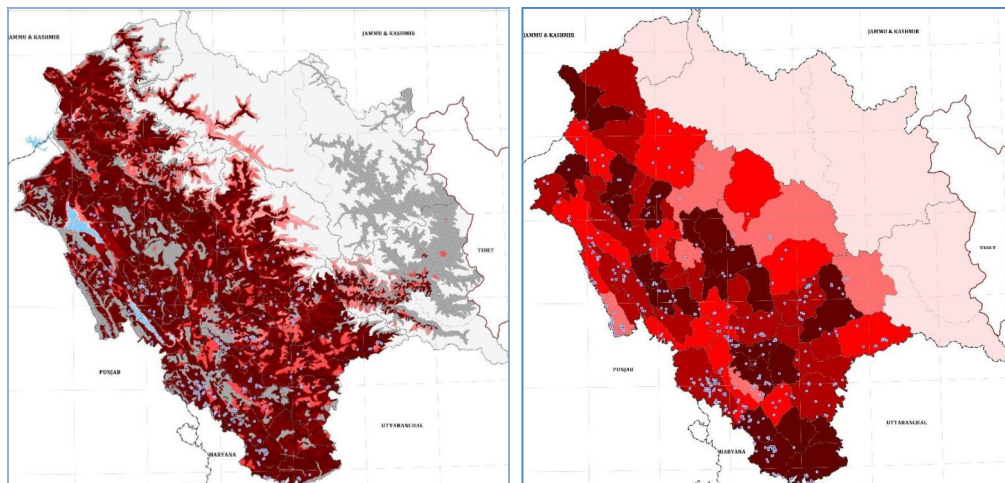


Figure:-3. Graph showing No. of fire incidences in Himachal Pradesh from 2008-2018.



Map: I & II Forest fire hazard zonation: fire incidences and Block wise area under high and very high forests fire risk

Result & Discussion

Forest fire is a perennial phenomenon in the state. Even as all the forest types are potentially vulnerable to fires with even temperate forests experiencing ground fires if winters go dry, it is the Sub – tropical Pine Forests (Chir Forests) spread over 1258.85 km² (3.4 % of total forest area of the state) that experience the heaviest annual forest fires during the dry months of March to June.

The above graph is showing the number of fire incidences happened in this decade. The extent of forest fires in the state over the last ten years in the different districts are as total of 572 fire cases have been reported during 2008-2009 and the total area affected area was 6.586 hac, the affected area raised four times more till 2010, whereas 1906 incidences of fire occur during 2009-10; 870 incidences of fire occur during 2010-11 meanwhile 168 fire incidences happened during 2011-12. In the year 2012-13 highest number of fire incidences (1798) occurred with the huge economic loss of 2,76,82,589 crore in this decade.

The forests of Himachal Pradesh can be classified into nine forests types: Dry Alpine forests found in the Lahual & Spiti, Kinnaur, Pangi region of Chamba district. They are almost treeless expanse with only few junipers growing. Due to scarcity of precipitation, plants generally grow among moist river margins or in moist rocks crevices. Moist Alpine Scrub forests flora is fairly rich & herbs grow in belts along the edges of melting glaciers. Mosses and lichens are also found in this zone. Subalpine forests are found above the altitude of 3500m and below the alpine scrub forest. These types of forests are covered with Rhododendron and junipers. Himalayan Temperate forests are further sub grouped into Himalayan moist temperate forests, Dry temperate forests, and temperate coniferous, temperate deciduous forests. Wet temperate forests are confined to the wet slopes of the Dhauladhar ranges of the Kangra district. Subtropical Pine forests occur in the lower Himalayas between 1000 and 2000 m. Chir pine is the most dominant species of this zone. Subtropical Broad-leaved Hill forests are found around Mandi town along Beas River below 1200 m a latitude. Tropical Dry Deciduous forests occurs upto 1200 m in the lower hills extending into the interior valleys along the rivers. Sal is dominant species, largely found in the Nahan region of Sirmaur district. The area of prevention and control the forest fire in the state depends upon two basic components: 1. Control Burning, 2. Clearing of forest lines. The main forest divisions in the state are 28 with almost 161 blocks and the main forest circles of the state includes the district Chamba, Dharamshala, Mandi, Kullu, Bilaspur, Shimla, Nahan, Solan, Rampur and

Hamirpur along with the divisions such as Palampur, Nurpur, Sundernagar, Karsog, Banjar, Renuka, Paonta, Rajgarh, Nalagarh, Ani, Dehra and Una etc. The State's forests are characterized by the occurrences of various forest types varying from the Tropical Deciduous Forests to Subtropical Pine and Broad-leaves Forests, Sub-alpine Forests, and Alpine forests. The total forest area is of 66.52% of the geographical area of the state (Map-II). The maps showing the forest fires hazards risk zonation areas with fire incidences as well as blockwise percentage area under high and very high forest fire risk. The fire risk probability is emphasized as very high, high, moderate, low and very low categories. The vulnerability of forests to fires varies from place to place depending upon the type of vegetation and climatic conditions. The coniferous forest in Himalayan region comprising of fir (*Abies spp.*), Spruce (*Picea smithiana*), *Cedrus deodara*, *Pinus roxburghii* and *Pinus wollichiana* etc. is very prone to the fire. The study area is prone to the fire because of dominant species of pines which are highly susceptible to fires due to the presence of the resins. The greatest danger from fires occurs during the month of April to June in high temperatures periods.

In hilly forest areas the effective way to check forest fire expansion are maintenance of fire lines, block lines, installation adequate watch tower, networking through wireless communication system and a highly mobile fire fighting crew system to reach the nearest sight of fire by road. The damage due to forest fires varies from just burning to leaf litter and dry grass in case of ground fires to extensive damage to the trees, biodiversity, and ecology in case the fires turn into crown fires. The forest fires also carry the risk of getting out of control and extending to habitations, posing danger to human life and property. The major damages caused by forest fires are winter fires occurring in the high temperate forests are usually low fires burning the dry grass and leaf litter piled up due to leaves shed by deciduous trees. The summer fires occurring from March to June are more severe as this summer dry season coincides with shedding of needles by Chir Pine trees that are highly combustible. The adverse ecological and social impact of forests fires may be summarized as: Loss of valuable timber and minor forest produce resources, Loss of livelihood for tribal population living within or near the forest, Increase in the incidence of respiratory diseases, Loss of human lives, Depletion of Carbon sinks, deteriorating the environmental condition, Loss of bio-diversity and extinction of plant and animal species, Soil erosions resulting in loss of soil productivity and flooding of downstream valleys, Loss of agricultural land due to erosion and landslides, Degradation of watersheds resulting in low rainfall

and fall in the water table, Damage to wildlife habitat and their death, Damage to natural regeneration and reduction in forest vegetation, Increase in the percentage of CO₂ in the atmosphere, Degradation of the microclimate of the area making it unhealthy for living. Forest fires are not always harmful. Small and controlled fires in the form of prescribed burning are very essential and useful. In the absence of fire, vegetative changes may result in fuel loads far exceeding safety levels, which would pose a serious threat to forest if ignited. The small scale controlled fires provide social and ecological benefits too, like reducing risk of catastrophic forest fire, improving silvi-cultural opportunities, increasing forage and habitat opportunities for wildlife, enhancing biodiversity and so on.

Conclusion

Forest fire is a major cause of forest degradation and has wide ranging adverse ecological, economic and social impacts including natural resources, land use, climate change, and biodiversity and forest ecosystem. Forest fire is one of the causative factors, which periodically covers large forest areas destroying timber, other properties and wild life etc. The ecosystems are under severe threat due to recurrent fires, which is attributed to the forest degradation, soil erosion, reduced productivity etc. Fire can influence a physio-chemical property of soil including texture, colour, bulk density, ph, porosity, organic matter, nutrient availability and soil biota. Fire results in reduction of micro-organism biomass, which plays an important role in nutrient cycling and energy flow in forest ecosystem. Fire can also influence soil water repellency and have also significant impact on soil physical properties like texture, bulk density, moisture regime etc. They can increase soil pH, electrical conductivity (EC), available P & K, Organic N context; reduced CEC, porosity, total organic carbon and soil water context. Fire results in reduction of micro-organism biomass, which plays an important role in nutrient cycling and energy flow in forest ecosystem. In a social context, fire directly affects people, property and infrastructure, thereby directly affecting the health and livelihood of individual and communities. Extensive areas are burnt and deforested every year, leading to widespread environmental and economic damage. The impact of this damage involves not only the amount of timber burnt but also

environmental damage to forested landscapes leading, in some cases, to land and forest degradation and the prevention of vegetation recovery.

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