"Forest Fire in Uttarakhand Curse for Economy, Ecosystem & Human Being"

Dr. Neelam Kanwal Jalal

Assistant Professor, Economics Lal Bahadur Shastri Govt. P.G. College, Halduchour

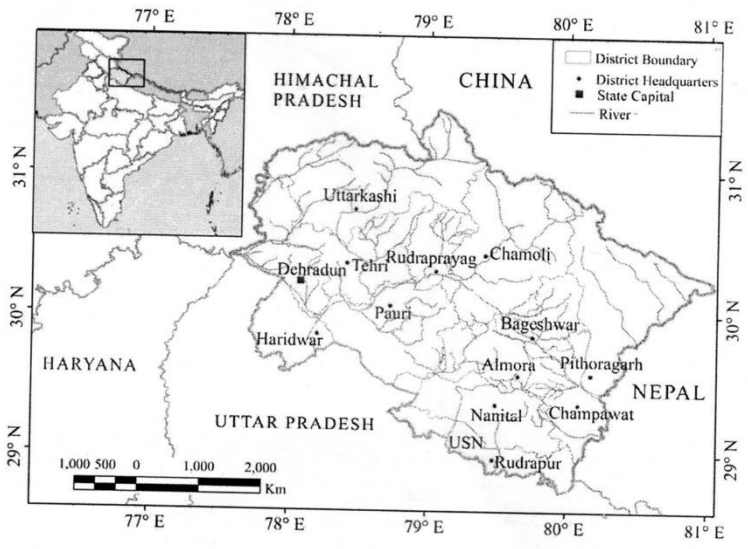
DOI: https://doi.org/10.51584/IJRIAS.2026.11030024

Received: 12 November 2025; Accepted: 17 November 2025; Published: 31 March 2026

Forest fire in Uttarakhand

Hill state Uttarakhand is famous for his rivers, Mountains, National Park and rich green forest. Forest resources are back boon of rivers and agricultures, all medical plant and precious trees is finding in whole area. It is a home of animals and several types of creatures.

Forest of Uttarakhand for his natural beauty and valley of flowers known in whole world. It is spread in 24,295 sq kilometer. The total geographycil area of forest is 45.43 percent. These forest is divided in hill and plan's area. All Uttarakhand forest is reach economicaly. It is a resources of river's small water pond's base of economy of Uttarakhand. But forest fire is damaged state's economy biodiversity of forest and destroy water resources. Every year 1750 hectares of forest fire occurs automatically in the season.



Uttarakhand forest fire-

Forest fire is a curse for Uttarakhand; forest fire is one of the major causes of degradction of forest in out state Uttarakhand. Precious forest resources and carbon, smokes is lost, which has an impact on the flow of goods and services from the forest area. The forest fire & disaster management wing of the Uttarakhand forest department has been alerting divisions, ranges, circles & various state holders on the detection of fire in a particular location as per the information received from FSI.

Cause of forest fire –

There are many cause of forest fire. Fire main cause of forest. Fire is heat wave that spread across Uttarakhand and were the worst recorded in the region with a reported 4,538 hectares (11,210 acres) of forest Burnt down and seven people dead (2)(3)

Forest fires caused by humans in the Himalayan state of Uttarakhand have been a regular event.

A major cause for the fires was attributed to the recorded high temperatures and severe lack of rainfall due to a dry winter. The Uttarakhand forest fires had also come as India suffered one of worst droughts in year with the government noting over 330 million were affected by water shortages mostly human activities causing forest fires includes campfires the burning of debris, negligently discarded cigarettes, escaped agricultural like rice burns equipment use and malfunctions and intentional acts of arson (sugihara act 2006) in Uttarakhand's hill areas heap of dry grass called a "Ghass ke loota" areas heap of dry grass called "Ghass ke loota" also cause of forest fire. There are three basic factors – fuel, environmental conditions and the source of ignition reflect the distribution of forest fires. Worldwide (krawchuk et at 2009)

METHODOLOGY

Study area –

Hill state Uttarakhand covers an area of 53,483 sqkm which is 1.63% of the Geographical area of the country. As the state lies in the Himalaya range, the climate and vegetation vary greatly with elevation from glaciers at the highest elevations to subtropical forest at the lower elevations. The highest elevations are covered by ice and bare rocks. The average annual rainfall is 1550 mm and the average annual temperature ranges between 0^0C to 43^0C. Many rivers including Ganga and Yamuna drain the state. The state has 13 Districts all of which are hill districts. (source land use statistics, ministry of agriculture GOI, 2013-14), based on interpretation of satellite data pertaining to Oct.-Dec. 2015 the forest cover in the state is 24,295 sq km which is 45.43% of the state's geographical area. In terms of forest canopy density classes, the state has 4,969sq km under very dense forest 12,884 sq km under moderately dense forest and 6,442 sq km under open forest. (Forest and tree resources in state and union territories)

The state has reported a recorded forest area of 38,000 sqkm which is 71.05% of its geographical area the reserved, protected and unclassed forests are 69.86% 26.01% and 4.13% respectively of the recorded forest area. However as the digitalized boundary of recorded forest area from the state covers only 28,186 sqkm (forest and tree resources in state and union territories)

The forest area of Uttarakhand constitutes approximately 63% of the geographical area out of the total forest area 68.1% is controlled by the state forest department (SFD) 19.3% is under Van Panchayat management 12.5% is administered by the revenue department and0.4% comprises municipality and cantonment forests. The area under the control of the SFD is fully protected. Mean while the Van Panchayat are conserved and utilized by the community people. The revenue forest is the most degraded and this land is often utilized for the construction of the state's infrastructure projects.

Data collection and analysis

The study of forest fire is based on qualitative and quantitative approaches were used to conduct this study. All data on the local and temporal aspects of forest fire incidents, affected forest and state forest and state economic loss from 1020 to 2023 were collected from a repot on news paper forest fire management control for the season of 2023 Dehradun. Additionally year wise (2010-2023) and month wise (2023) data on forest fire incidents affected area and economic Losses were collected Beyond secondary data sources field visit to 05 forest fire affected areas in the Nainital and Almora districts were conducted during the summer season (March to June) of 2023. During these visit the resource person or author observed the forest types and density the nature of the forest slopes the presence of water bodies like (Nolea) (Gadhera) and the climate of the fine affected areas. Observations were made regarding forest fine intensity frequency drives and economic loss and human life losses.

All figures indicate that the areas under pine forests, followed by deciduous forests, were highly affected by forest fires, whereas the mixed oak coniferous forests were largely unaffected in 2023 open forest area were detected as low burned areas.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue III March 2026

Forest fire incidents in Uttarakhand state

The state recorded 236 wildfire incidents between October 1, 2020 and January 4, 2021, reserve forests in the general region lost 129 hectares to 96 counts of fire incidents. Civil forests recorded 51 counts of wildfire incidents.

Reserve forest in Kumaon region lost 89.52 hectares of forests cover t0 64 counts of fire incidents civil forest lost 44.35 hectares to 25 counts. The fires caused a loss of Rs. 460110 to the state.

According to Bikram Singh Director Dehradun meteorological centre said the city experienced low rainfall between October and December. “It was largely a dry monsoon. The state experienced. The 71 percent deficit rain between October and December

The region usually recorded 60.5 millimetres of rainfall annually. It was merely 17.8 mm in 2020. In 2019 it recorded 114.2 mm rainfall, 25.5mm in 2018, 21.3 mm in 2017 and 16.2 mm in 2016.

Uttarakhand has lost 44,000 hectares of forest cover since it become a state in 2000.

Forest fire incidents in 2018

1. Garwal Region = 792
2. Kumaun Region = 424
3. Wild animal area = 59
4. Shivalik region =261

Year wise incidents of forest fire three year incidents –

Year	Incident	Infected area
2016	2074	4434 Hectare
2017	805	1245 Hectare
2018	2151	4481 Hectare

Garwal Region is most affected by forest fire – 16th June 2018

Region	Incident	affected area
Garwal	970	2533.5
Kumaun	641	1273.9
Wild animal area	75	161.636
Shivalik region	465	511
(Source 17 June 2018 Amar Ujala)		

Year wise incidents of forest fires –

Year wise data on forest fire incidents from 2013 to 2023 show that was a high annual variation in forest fire incidents. The highest number of forest fires was recorded in 2021, while 2020 had the lowest number of

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue III March 2026

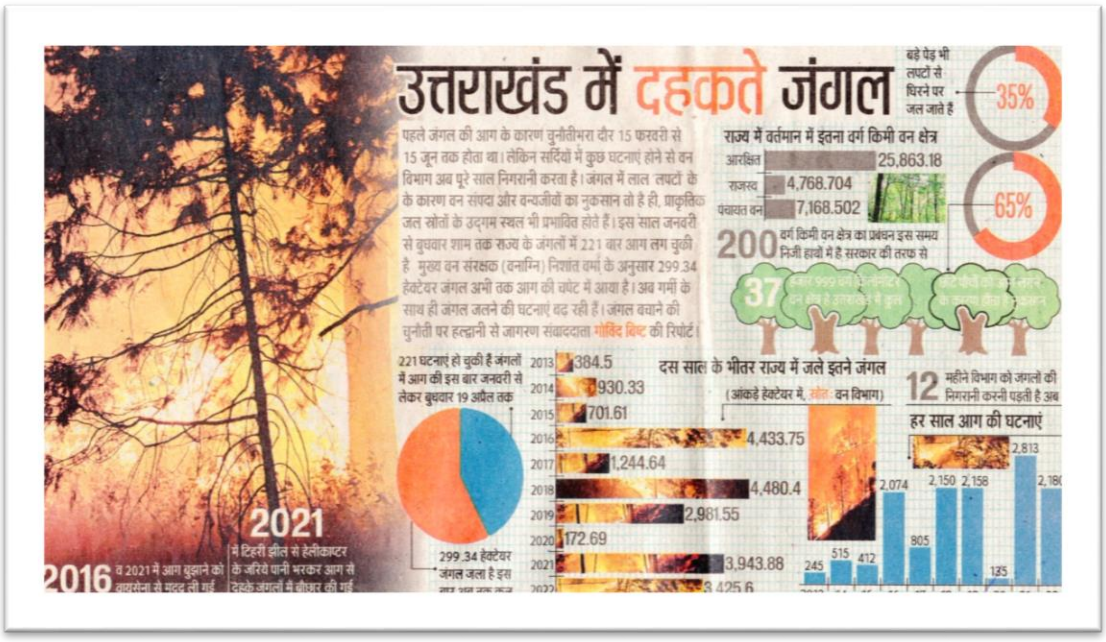
incidents. The overall analysis of forest fire data indicates that the trend of forest fire incidents has been increasing from 2013 to 2023.

Year wise affected forest area –

Year wise data on areas affected by forest fires from 2013 to 2023 show that the largest area was impacted in 2018, followed by 2016 in 2021, a cultivated and residential area was also affected by forest fires. Conversely, the smallest area affected by forest fire was recorded in 2020 with 2013 and 2015 also registering low incidents. Overall the trend of the area affected by forest fires has been increasing, the data suggests that as the number of forest fire incidents rises, The affected area increases, and vice versa.

Year wise incidents of forest fire –

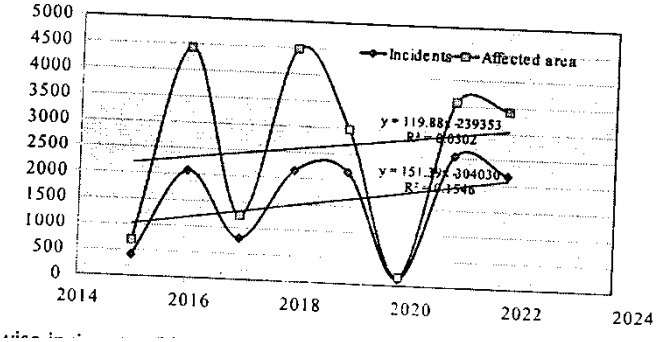
Year	Incidents	Affected area (Hectare)	Dead and injured people
2013	245	384.50	
2014	515	930.33	17
2015	472	701.61	00
2016	2074	4433.75	631
2017	805	1244.64	01
2018	2150	4480.40	06
2019	2158	2981.55	115
2020	135	172.69	21
2021	2813	3943.88	23
2022	2180	3425.60	27
2023	773	933.50	33



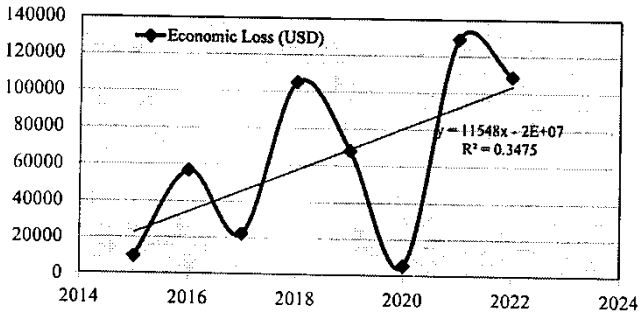
ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue III March 2026

Economic Loss –

During the forest fire period, the highest economic loss occurred in 2021 ammounting to approximately 1,24,000 USD, with 2018 following more then 86 lack. The least economic loss was observed in 2020 at roughly 4,000 USD. Figure 1-2 illustrates that the yearly variability in economic loss due to forest fires was highly variable yet the trend showed and increase.



In Uttarakhand April, May and June peek season of fire incident. In 2022 a total of 2186 forest fire incidents were reported with the highest number (1676 incidents, accounting for 76.7% of the total) occurring in April, in May there were 198 incidents (9.1%) and in June there were 172 incidents (7.9%) March being comparatively warmer recorded a total of 136 forest fire incidents. The data indicates that the majority of forest fires happened during the four months of March, April, May and June.



Life Loss –

Many people losses their life in forest fire. It is a serious matter of concern that so for many people have lost their life in every fire season. The highest number of deaths due to forest fire in the state since 2016. There were a total of 6 deaths during the entire forest season in 2016. In the year 2020 two (2) deaths was reported, 2021, 8 person deaths were reported 2022 two deaths were reported 2023 thirty three (33) person deaths were reported while one death was reported in 2019 in 2017 and 2018 the picture is more frightening that every year people have lost their lives when forest season is yet to come an end.

Pine forest is main source of forest fire –

A pine locally known as chir ka ped (scientific name pines roxburghii) is a conifer that covers about 16% of the forest area in Uttarakhand. In the Uttarakhand state the high prevalence of pine forest (28% of the forest area) and expansive subtropical forests are the main source of forest fires. During the fire season pine and subtropical deciduous trees shad their leaves, which remain dry and highly flammable there significantly increasing the fire catching capacity of pine trees. Due to the mountainous terrain rain water runoff causes the surface to remain dry village peoples after burn grass near their settlements to encourage rapid growth. Forest mafias (smugglers) are increasingly causing forest fires (to lia, 2016). Additionally erratic rainfall and rising temperatures and exacerbating the frequency and intensity of forest fires. Uttarakhand is a state of villages. Agriculture is a base of income but fire also effect rural settlements by damaging wheat crops properties lives and livelihoods and have an adverse impact an tourism activities. Forest fires lead to a reduction in soil moisture and humus the

nutrient rich top layer increasing soil acidity and degrading non timber forest products national parks and wild life sanctuaries have been extensively affected by forest fire (GBPIHED 2008).

Effects of forest fire –

Forest in Uttarakhand is important for the state's economy and environment but they are also threatened by a number of factors including forest fire and climate change.

1. Forest fires can impact the economy as many families and communities depend on the forest for food, folder and fuel.
2. It burns down the small shrubs and grasses leading to landslides and soil erosion.
3. Burning of forest causes smoke and poisonous gas emissions that result in significant health issues in humans.
4. Loss of trees can disrupt the climatic conditions and break down the carbon chain.
5. Wild fires damage the habitat of animals causing them to wander in cities. Many die in the fires, unable to escape.
6. These fires destroy the vegetation soil quality and overall flora and fauna.

Climate change and other natural disasters are contributing to the degradation of forest in Uttarakhand property loss and damage are the most common impacts of forest fires with the loss of property comes the displacement of people and loss of business and livelihood for those who depend on forests.

Looking at the sensitivity of impact of forest fire which not only impacts livelihood of people who solely are dependent on forest produce but disturbs the overall natural biodiversity forest fire burns trees hases, wild fruits, vegetation wild animal and biodiversity and impact hand water and environmental conditions.

REFERENCE

1. Danik Jagran 20 April 2023 Haldwani. www.jagran.com
2. Amar Ujala 29 May 2018 "Chandra Shekhar Tiwari) (pUæ'ks[kj frokjh)
3. Amar Ujala 29 April 2024 Nainital. amarujala.com
4. Babu, K. V. S. (2019). Developing forest fire danger index using geo-spatial techniques [Doctoral dissertation]. (pp. 1–131).
5. Babu, N. S., Murthy, C. L., Kakara, S., Sharma, R., Swamy, C. V., & Idris, M. M. (2016). MPTP induced Parkinson's disease in zebrafish. Proteomics, 16(9), 1407–1420.
6. Bahuguna, V. K., & Singh, S. (2002). Fire situation in India. International Forest Fire News, 26, 23–27.
7. Bahuguna, V. K., & Upadhay, A. (2002). Forest fires in India: Policy initiatives for community participation. https://doi.org/10.1505/ifor.4.2.122.17446
8. Bargali, H., Kumar, A., & Singh, P. (2022). Plant studies in Uttarakhand, western Himalaya–a comprehensive review. Trees, Forests and People, https://doi.org/10.1016/j.tfp.2022.100203
9. Bhandari, B. S., Mehta, J. P., & Semwal, R. L. (2012). Forest fre in Uttarakhand Himalaya: An overview. In G. C. S. Negi, & P. P. Dhyani (Eds.), Glimpses of forestry research in the Indian Himalayan region (pp. 61–71). GB Pant Institute of Himalayan Environment and Development. Bishen Singh Mahendra Pal Singh.
10. Boer, C. (1989). Effects of the forest fire 1982–83 in East Kalimantan on wildlife (FR report No. 7). Deutsche For stservice GmbH.
11. Brown, A. A., & Davis, K. P. (1973). Forest fire: Control and Use. McGraw Hill.
12. Butry, D. T., Mercer, D. E., & Prestemon, J. P. (2001). What is the price of catastrophic wildfire? Journal of Forestry, 99(11), 9–17.

13. Chaudhary, R. (2018). Factors influencing green purchase behavior of millennials in India. Management of Environmental Quality An International Journa. https://doi.org/10.1108/MEQ-02-2018-0023
14. Crutzen, P. J., & Andreae, M. O. (1990). Biomass burning in the tropics: Impact on atmospheric chemistry and biogeochemical cycles. Science, 1669–1678. https://doi.org/10.1126/science.250.4988.1669
15. Dobriyal, J. R., & Bijalwan, A. (2017). Forest fire in western Himalayas of India: A review. New York Science Journal, 10(6), 39–46.
16. Dobriyal, M. J. R., & Bijalwan, A. (2016a). We did start the fire - A range of preventive and remedial steps must be taken in hill forests of Uttarakhand-The Indian Express (Ideas page 15). Friday, May 6, 2016.
17. Dobriyal, M. J. R., & Bijalwan, A. (2016b). Why cutting down Chirpine is not a solution to Uttarakhand forest fires. Down to Earth. Blog.
18. Doerr, S. H., & Santín, C. (2016). Global trends in wildfire and its impacts: Perceptions versus realities in a changing world. Philosophical Transactions of the Royal Society B: Biological Sciences. https://doi.org/10.1098/rstb.2015.0345
19. Dogra, P., Mitchell, A. M., Narain, U., Sall, C., Smith, R., & Suresh, S. (2018). Strengthening forest fire management in India. The World Bank. https://doi.org/10.1596/30013
20. FAO. (2020). Global forest resources assessment 2020: Main report. Reforming China's Healthcare System. https://doi.org/10.4060/ca9825en
21. Fearnside, P. M. (2000). Global warming and tropical land-use change: Greenhouse gas emissions from biomass burning, decomposition and soils in forest conversion, shifting cultivation and secondary vegetation. Climatic Change, 115–158. https://doi.org/10.1023/A:1005569915357
22. Fernandes, P. M., Davies, G. M., Ascoli, D., Fernández, C., Moreira, F., Rigolot, E., & Molina, D. (2013). Prescribed burning in Southern Europe: Developing fire management in a dynamic landscape. Frontiers in Ecology and the Environment, e4–e14. https://doi.org/10.1890/120298
23. Flannigan, M. D., Amiro, B. D., Logan, K. A., Stocks, B. J., & Wotton, B. M. (2005). Forest fires and climate change in the 21ST century. Mitigation and Adaptation Strategies for Global Change, https://doi.org/10.1007/s11027-005-9020-7
24. Forest Survey of India (FSI). (2019). India state of forest report 2019. Forest Survey of India, Ministry of Environment and Forests.
25. FSI. (2001). State of the Forest Report, Forest Survey of India, Ministry of Environment and Forests, GoI.
26. FSI. (2015). Forest Survey of India Report, Dehradun, Uttarakhand, India.
27. GBPIHED. (2008). Inventory on natural springs of the Central Himalaya. Govind Ballabh Pant Institute of Himalayan Environment and Development.
28. Goldammer, J. G. (2000). Overview of fire and smoke management issues and options in Tropical Vegetation. The Global Fire Monitoring Center / Fire Globe Web site.
29. Gubbi, S. (2003). Deccan Herald. Retrieved January 2004, from
30. Gupta, A., Evans, R. K., Koch, L. B., Littleton, A. J., & Biggins, S. (2018). Purification of kinetochores from the budding yeast Saccharomyces cerevisiae. Methods Cell Biol, 144, 349–370.
31. Hao, W. M., Ward, D. W., Olbu, G., & Baker, S. P. (1996). Emissions of CO2, CO, and hydrocarbons from fires in diverse African savanna ecosystems. Journal of Geophysical Research: Atmospheres, 23577–23584. https://doi.org/10.1029/95JD02198
32. Jain, P., Coogan, S. C. P., Subramanian, S. G., Crowley, M., Taylor, S., & Flannigan, M. D. (2020). A review of machine learning applications in wildfire science and management. Environmental Reviews, , 478–505. https://doi.org/10.1139/er-2020-0019
33. James, C. (2014). The "haze" over Southeast Asia: Challenging the ASEAN mode of regional engagement. Pacifc Afairs, 72, 331–351.
34. Joshi, G., & Negi, G. C. (2011). Quantification and valuation of forest ecosystem services in the western Himalayan region of India. International Journal of Biodiversity Science, Ecosystem Services & Management,
35. Juhi, C. (2018). India climate dialogue. Hindustan Times, 4.4.2018.
36. Kavita, U. (2016). Uttarakhand battles fire crisis. The Hindu. Dehradun, 30 April 2016.

37. Kinnaird, M. F., & O'Brien, T. G. (1998). Ecological effects of wildfire on lowland rainforest in Sumatra. Conservation Biology, , 954–956. https://doi.org/10.1046/j.1523-1739.1998.00005.x
38. Krawchuk, M. A., Moritz, M. A., Parisien, M. A., Van Dorn, J., & Hayhoe, K. (2009). Global pyrogeography: The current and future distribution of wildfire. PLoS One, e5102.
39. Krishna, P. H., & Reddy, C. S. (2012). Assessment of increasing threat of forest fires in Rajasthan, India using multi-temporal remote sensing data (2005–2010). Current Science, 102(9), 1288–1297.
40. Kumar, C. (2002). Community involvement in forest fire prevention and control: Lessons from Joint Forest Management (JFM). International Forest Fire News, 26, 28–31.
41. Lourenco, L. (2007). Riscos naturais, antrópicos e mistos. Territorium, 109–113. https://doi.org/10.14195/ 1647-7723_ 14_11
42. Mehta, J. S. (1996). Forest fires and land degradation in Uttarakhand. In K. Kumar, P. P. Dhyani, & L. M. S. Palni (Eds.), Land utilization in the central Himalaya: Problems and management options (pp. 125–133). Indus Publishing.
43. Miller, D. (2022). Sciencing. The diference between tree sap & tree resin
44. MoEF. (1987). India's State of Environment, Ministry of Environment and Forest, Government of India, New Delhi.
45. Nair K. K. (1992) Prevention of Forest fires (National Seminar on Forest Fires Report, 1992). Government of Kerala, India.
46. Negi, G. C. S. (2019). Forest fire in Uttarakhand: Causes, consequences and remedial measures. International Journal of Ecology and Environental Sciences, 45(1), 31–37.
47. Negi, G. C. S., & Dhyani, P. P. (2012). Glimpses of forestry research in the Indian Himalayan region (p. 184). G.B. Pant Institute of Himalayan Environment & Development, Almora.
48. Negi, M. S., & Kumar, A. (2016). Assessment of increasing threat of forest fres in Uttarakhand, using remote sensing and GIS techniques. Global Journal of Advanced Research, 3(6), 457–468.
49. Niklasson, M., Zin, E., Zielonka, T., & Feijen, M. (2010). A 350-year tree-ring fire record from Białowieża Primeval Forest, Poland: Implications for Central European lowland fire history. Journal of Ecology, 1319–1329. https://doi.org/10.1111/j.1365-2745.2010.01710.x
50. Podur, J., Martell, D. L., & Csillag, F. (2003). Spatial patterns of lightning-caused forest fires in Ontario, 1976–1998. Ecological Modelling, 1–20. https://doi.org/10.1016/S0304-3800(02)00386-1