

STATUS OF FOREST FIRE MANAGEMENT IN HARYANA

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ABSTRACT

This paper describes the status of forest fires and various approaches being used for their control in Haryana. The state is although not blessed with bounty of forest wealth, yet it is rich in diversity not usually imagined to be existing in a small geographical area of 44,212 km². Forest fire season in Haryana is from March to June, which affects plant, animal and human life. Ever since the Sukhomajri approach of Participatory Forest Management has evolved in the state, the people's cooperation in forest protection has resulted in reduction in fire incidences. For prevention of fires, control burning of leaf litter in early February is very effective in reducing fire incidences and intensity. Satellite based fire monitoring system is not in use in Haryana as the frontline staff is unable to locate the geo-coordinates on the ground. Moreover, due to good information network, the fire information is received well in time from the field functionaries. Forest department emphasizes on awareness generation and a forest fire protection week is observed in the first week of April besides holding regular meetings with people. Fire watch towers built on hill top, prove handy in collecting information. The state has formulated firefighting crisis management plan incorporating various methods for fire control. For the purpose of this paper, satellite based forest fire geo-coordinates provided by Forest Survey of India, Dehradun were overlaid on digitized forest boundaries to prepare map on spatial distribution of cumulative fire locations in Haryana during 2011-2016. Critical forest fire risk map for fire prone forest areas was prepared by plotting areas which burnt thrice or twice during last six years. This map along with awareness generation, maintaining constant liaison with people especially those living near forests and use of modern technology etc. will help in preventing and controlling forest fires in Haryana.

Key words: Fire, Natural regeneration, Control measures, Department initiatives and programmes.

Introduction

The state of Haryana is divided into four natural zones, the Shiwalik, the Indo-Gangetic plains, the western semi-arid, and the Aravalli Hills. The Yamuna and the Ghaggar rivers are the important fresh water-courses of the state and influence the vegetation. The state experiences sub-tropical monsoonal climate with bulk of rainfall received during summer and some sprinkles of rain during winter owing to western disturbance. The rainfall varies from 213mm in south-west to 1400mm in the north-east areas of the state. The annual mean temperature varies between 22.5°C to 25°C. The maximum and minimum being 48°C and 0°C. As per India State of forest Report (FSI, 2015), the forest cover in the state is 1584 km² (3.60% of the state's geographical area) and the tree cover in the state is 1335km² (3.0% of the total geographical area). Block forests constituting little less than half of the total forest area, are mostly found in Shiwalik belt all along the boundary of Himachal Pradesh. Some forest area shares boundary with Union Territory of Chandigarh and Uttarakhand state as well. Another half is in the form of strips along the rail, roads and canals adjoining farmer's

fields. Only about one per cent of the total land supports natural plants and in that land also more of monoculture spread leading to decimation of species. The natural vegetation is left in areas such as Morni, Panchkula, Pinjore, Kalesar, Jhir forest, Nimbi Duloth and Sohlabudin. In the Shiwalik hills with Northern Tropical Dry Mixed Deciduous Forest with small patches of sal and chir pine and bamboo, extends in these hills and experiences forest fires but majority of these forest fires are anthropogenic in nature.

The Global Forest Resources Assessment – 2010 (Anon, 2010) recorded that 118 countries, having 65 per cent of world forest cover are affected by fire annually. About 350 million hectares of forest worldwide and about 50% of Indian forests are prone to forest fires (Satendra and Kaushik, 2014). Annual report 2015-16 of Ministry of Environment, Forests and Climate Change, GOI also confirms that 50 per cent of Indian Forests are fire prone. Globally, forest fires are considered as one of the major drivers of global warming and climate change. Uncontrolled forest fire is the great enemy of the forests as it harms habitat and ecology in many ways. Its detrimental effects in the form of damage to growing stock, invasion of

Traditional method of Fire Management must be equipped with Satellite based GIS System for effective Fire Management in the state.

inferior species, loss of wildlife habitat and biodiversity, modification of vegetation succession pattern, effect on species composition, structure/pattern of vegetation, pushing rare and endangered species of plants to extinction, burning of wild animals and their young ones, damaging of birds eggs, killing of microorganisms, volatilization of the nutrients like nitrogen depletion, alteration of biological nutrient cycling, increase in soil erosion, scorching of soil, reduction in its permeability and water retaining capacity, etc. are well known facts. Also the chemicals from fire smoke (carbon monoxide, benzene, formaldehyde, aerolein and polycyclic aromatics hydrocarbons) can cause/aggravate heart and lungs related disease.

Forest Fire: Haryana Perspective

Early March to June period was treated as forest fire season in Haryana. However, due to the visible impacts of climate change resulting into prevailing drier conditions, the danger of forest fires now starts from the end of February itself. As half of Haryana's forests are along the railway track, roads and canals, they frequently catch fire as most of the times unknowingly the passengers throw burning match stick, beedi/cigarette butts, etc. Burning carbon particles coming out of the exhaust of vehicles and burning of crop residues by the farmers are also the cause for roadside forest fires. Sometimes, strip forests along the railway tracks catch fire due to the sparks coming out of rail engine/overhead electric wires. On the other hand, Haryana block forests in Shiwalik belt are deciduous in nature. They shed huge quantity of leaf litter on the ground during winter or in early spring. As the spring approaches, the forests, soil and atmosphere are drained of the moisture. The leaf litter scattered under the trees just needs a spark to ignite the fire. Further, Haryana's Shiwalik forests are in continuation of the forests of Himachal Pradesh with predominance of trees and shrubs that produce very heavy leaf litter. So, sometimes Haryana forests receive fire from adjoining states as well. In pine zone of Morni hills comprising of about three hundred hectares, resin extraction has been banned in 1985 but practice is followed in adjoining states. It has been observed that the fire incidences in Morni hills of Haryana, which also harbour chir pine forests are now increasing every year.

The area affected by forest fires in Haryana depends upon rains received during rainy season and in winters. Sometimes, there are some rains in April and May too. So, in that case the fire incidences and spread are less. However, as per the official records of forest department, about two thousand hectare forests area comprising of both Shiwalik block and plain strip forests are affected by fires annually. Most of the fires take place between March and June, but it is the hottest month May that experiences maximum

number of fire incidences. Haryana state forest department has marked 15 such spots, identified the reasons and preventive and curative actions are taken accordingly.

Strategy for Forest Fire Management in Haryana: The strategy being used in Haryana for combating forest fires includes preventive and curative measures, which are described here:

Preventive and Curative Measures

Maintenance and creation of fire lines, forest roads and paths: The fire lines, forest roads and paths have been created/constructed in all block forests of the state. Generally, a compartment is the unit for creating a fire line. The length and breadth of the fire line depends upon the area to be protected. Besides these, forest paths and natural barriers are also treated as fire line. All these are cleared of the vegetation before the start of fire season. New fire lines are also created as and when required.

Control burning: Control burning of leaf litter is done every year in early February in fire prone block forests and strips. It is done especially in Kalesar National Park and Kalesar Wildlife Sanctuary (where very wide fire lines exist); in chir pine forest and areas infested with *Lantana camara*. Leaf litter has to be control burnt every year for two reasons, one, it is a fire hazard and second, the wild animals using it as shield easily reach to the nearby agriculture fields and cause harm to the crop. Although, control burning is not a complete method of forest fire control as many trees, shrubs and climbers shed their leaves towards the end of February when the drier conditions have started prevailing, yet the ground staff finds it very useful. The control burning in fact reduces the intensity and frequency of fire even if the forest floor is covered with scattered leaf litter. Further, the people living in the vicinity of the forest also want control burning as due to controlled lantana burning, the visibility improves and wild animals avoid entering the agricultural fields.

Fire watch towers: This was and is still very effective method of keeping a watch on forest fire in inaccessible block forests. Forest department has constructed fire watch towers on hill tops in entire Shiwalik forest to keep vigil on large area. The fire watchers are deployed round the clock who remain in touch with frontline forest department staff through mobile. If there is no mobile signal or wireless connectivity, the fire watchers rush to the designated place to pass on the necessary information. Three watch towers namely Samlautha Devi Temple Watch Tower and Skylark in Panchkula district and Chicken Watch Tower in Yamunanagar district have proved extremely useful. Huge forest area is visible from these towers and any incidence of fire is reported to the range forest office immediately.

Community participation: Haryana Forest Department is known to create history in forest management by shifting from strict administrative to participatory approach involving people. Ever since 1982, when Sukhomajri approach of participatory forest management came into limelight in Haryana, Sukhomajri forest never caught fire because people protect forest at their own. Similar approach has worked elsewhere in the state in most other forest areas. European Union (EU) aided Haryana Community Forestry Project implemented in selected three hundred villages of the state from 2000 to 2009 was the practical field implementation of Joint Forest Management approach. Village was the unit for implementation and Village Resource Management Committee (VRMC) was constituted in each village. Two link workers (one male and female each) were appointed and self-help groups (SGHs) were constituted and nourished for overall management of natural and common property resources in and around villages. This included village common lands as well. All stakeholders were trained for community capacity building. The forest area near these villages is now rarely affected by forest fires. Now, the link workers have become resource persons and other departments like social welfare, women and child development, horticulture and agriculture, etc. utilize their services. The project was rated as one of the bests in Asia by EU. To involve people in the management of forest resources, 2452 village forest committees (VFCs) have been constituted and trained in the state. All VFCs are heterogeneous comprising of all sections of the society. Special representation is given to women and within women too, all castes and creeds are represented to have their say in the decision making process in management of common property resources. The response of all these VFCs in general and those located in Shiwalik in particular for forest fire control is worth appreciating. The reason being that the people in the Shiwalik belt have some dependence upon forests for fuelwood, fodder and small timber directly or for water indirectly. The committees doing commendable work are honoured on the occasion of departmental functions like Van Mahotsava. However, the frontline staff admits that it is only the middle aged and old people who come forward for the forest protection in general and fire control in particular. This is not a healthy trend and special awareness programme is required for taking youths along for protecting forest in posterity.

Back/counter fire: This is traditional method of fire fighting in the forests and is still very effective. In this case, the workmen are positioned in a row and from a safe distance, they set the area on fire towards the advancing fire blaze. The workmen stationed there use local green branches of shrubs like *Murraya koenigii*, *Vitex nugundo*,

Justicia adhatoda, etc. to put off the fire so that the fire does not spread on the other side. Green bushes are very effective in extinguishing the fire as they contain lot of moisture. They use fire line, stream, gullies and the paths for counter fire.

Forest Department has bought modern fire-fighting equipments like shoveller, pickaxe, goggles, backup pump, raker, sickle, brush hook, fire beater, double bit axe, bucket, spade and anti-heat dress, etc. However, the ground staff and the fire-fighting workers either do not find them useful or are not able to adjust with them. They instead use the local tools like Drat (heavy local sickle) for cutting bushes. Very effective, and supportive is Chhagal, which is a porous tarpaulin water container with three litre capacity costing less than one hundred rupees. The ground staff and the workers carry it on their back comfortably. It keeps them cool and provide drinking water whenever required.

Satellite Data for Fire Monitoring and Control

Satellite data have been the only source of observations on fires on a global scale. Hotspots have been observed from a variety of sensors like Advanced Very High Resolution Radiometer (AVHRR), Advanced Along Track Scanning Radiometer (AATSR), Tropical Rainfall Measuring Mission (TRMM), Visible and Infrared Scanner (VIRS), Moderate Resolution Imaging Spectro-radiometer (MODIS), Geostationary Operational Environmental Satellite (GOES) and Mars Global Satellite (MGS). In fact, as a part of the Disaster Management Support Programme of Indian Space Research Organisation (ISRO), information regarding active forest fire location is disseminating to Forest Survey of India (FSI) and State Forest Department through email and short message service (SMS) within half an hour of satellite overpass (Jha *et al.*, 2016). FSI Dehradun has been sending satellite based SMS alert since 2006 to tackle forest fires and helping all states. These alerts minimize the response time to deal with fire, which is crucial to prevent it from getting out-of control. FSI monitored forest fires on the basis of data received from Moderate Resolution Imaging Spectro-radiometer (MODIS) but on 23rd January 2017, it has launched Forest Fire Alert System 2.0 and has started disseminating alerts obtained from Suomi National Polar Orbiting Partnership-Visible Infrared Imaging Radiometer Suite (VIIRS) sensor, which has a better resolution (375x375m) compared to MODIS (1x1 Km). By providing information about the user like name, email, mobile number, state and organisation, etc. one can register and become the member of this fire alert system. Generally, the user gets SMS and Email alerts having geo-coordinates of the fire locations as well as a web link to view it on their browser within one and half

hour of detection of fire by SNPP-VIIRS sensor. In addition, every alert is accompanied by a feedback form, which can be filled by the user online. The improved alert system also provides opportunity to the registered users to modify their profile, area option as well as delete their profile, as may be needed. As on 20.3.2017, there were 6703 registered users of this system. The state of Maharashtra with 1861 and Telangana with 1049 registered users rank first and second as regards the use of this system. At present, the alerts are being disseminated up to beat level in ten states namely Andhra Pradesh, Bihar, Himachal Pradesh, Jharkhand, Karnataka, Maharashtra, Mizoram, Punjab, Telangana, and Tripura and range level for Kerala (FSI, 2015). There is only one user of this system in Haryana. However, the state has digitized its forest boundaries upto beat level and will be able to get alerts up to beat level as and when the users register themselves. The forest fire location received from the satellite are overlaid on forest cover maps and then the Geo-coordinates of fire.

Geo-coordinates and fire incidence map: All forest areas in the state have been digitized and geo-coordinates have been collected. However, the geo-coordinates are not being used much right now for fire monitoring and control, but they will certainly be very useful in near future. Remote Sensing and Geographical Information System (GIS) play an important role in detecting the active fire locations as well as help in assessment of fire risks based on several factors like topography, climate and other biological factors. Forest fire locations in Haryana like in other parts of the country are identified by Forest Survey of India (FSI), Dehradun through satellite based forest fire alert system. FSI records geo-coordinates of fire affected locations from Moderate Resolution Imaging Spectroradiometer (MODIS) satellite in collaboration with National Remote Sensing Centre (NRSC) and the same are disseminated to the registered users. The Time lag of the information is less than two hours from the pass of satellite. Effective forest fire management system requires to follow these geo-coordinates in effective manner. If geo-coordinates are already available with the users for the identified forest areas, then the information provided by FSI can be decoded into the actual area that is burning or has burnt. Geo-coordinates can also be seen on Navigation software or GIS software in mobile or on desktop. Using these coordinates and GIS software which operates spatial items, we can generate a fire map.

Geo-coordinates for the number of fire incidences that happened in Haryana were obtained from FSI web site for the past six calendar years from 2011 to 2016. In all, 99 incidences have been recorded. Four incidences were

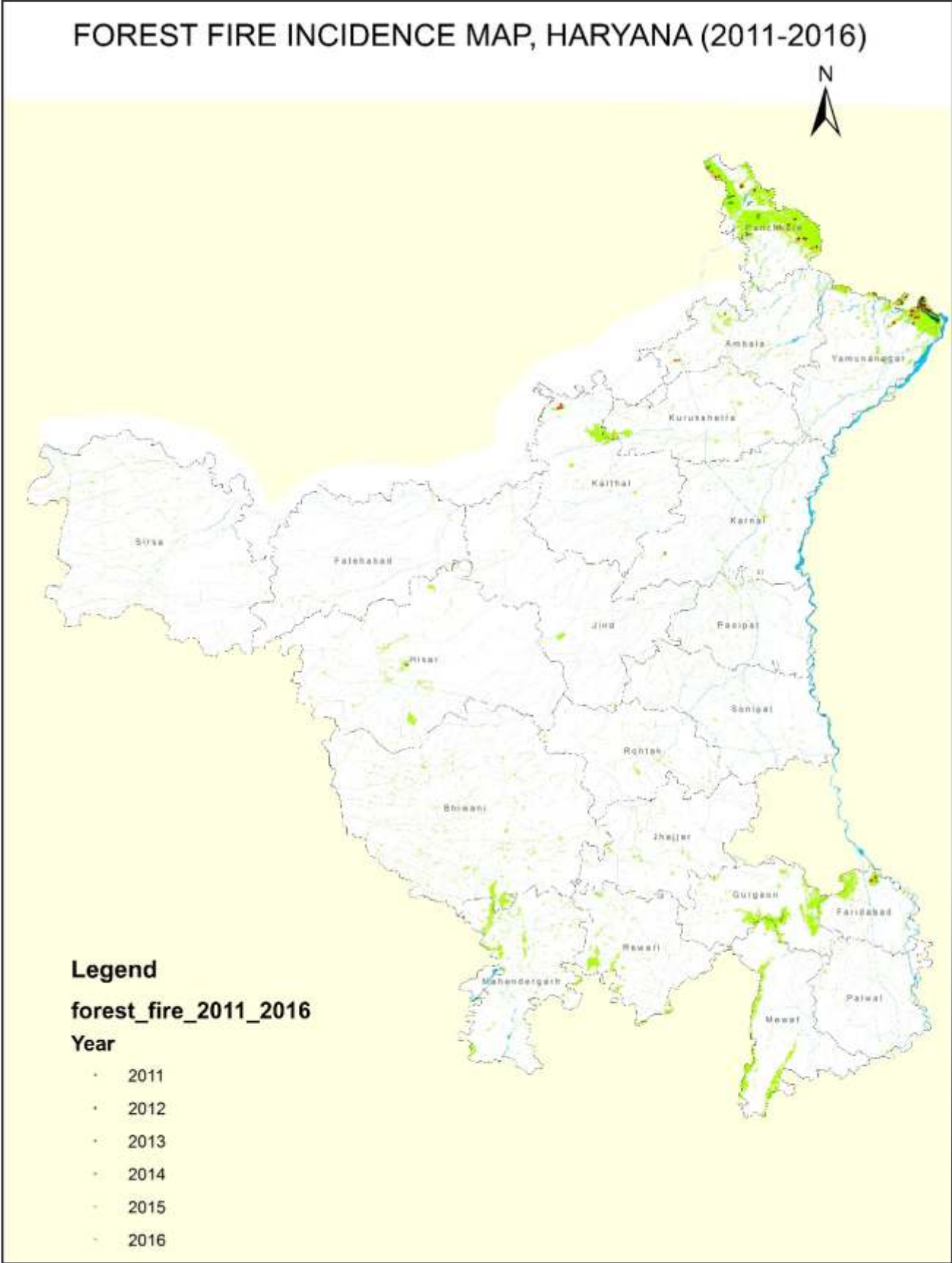
recorded in 2011, 42 during 2012, five each during 2014 and 2015; and 43 during 2016. These coordinates overlaid on digitized forest boundaries provided the names of the forest areas which caught fire during last six years. Forest cover map prepared by FSI for the year 2013 has been used to show forest layer.

On the basis of these records, a shape file was created on projected coordinate system using GIS software World Geodetic System (WGS) 84 and Universal Transverse Mercator (UTM). For this purpose, different colours for different years were used for the fire points that were depicted using geo coordinates. Map-I shows all areas that caught fire during the last six years. However, it can be seen that most of the fire incidences fall in Shiwalik belt (Yamunanagar district and Panchkula district) adjoining Himachal Pradesh, Chandigarh and Uttrakhand. Some forest areas in Hisar, Bhiwani, Mahendergarh, Gurgaon Faridabad, Rewari, Jhajjar, Jind and Kaithal districts also recorded fire incidences. Sonapat, Rohtak, Sirsa and Fatehabad remained free from the forest fires. No data regarding extent of fire damage through remote sensing technology is supplied by FSI, whereas, the records of forest department has information only for past few years.

Critical Fire Risk Map

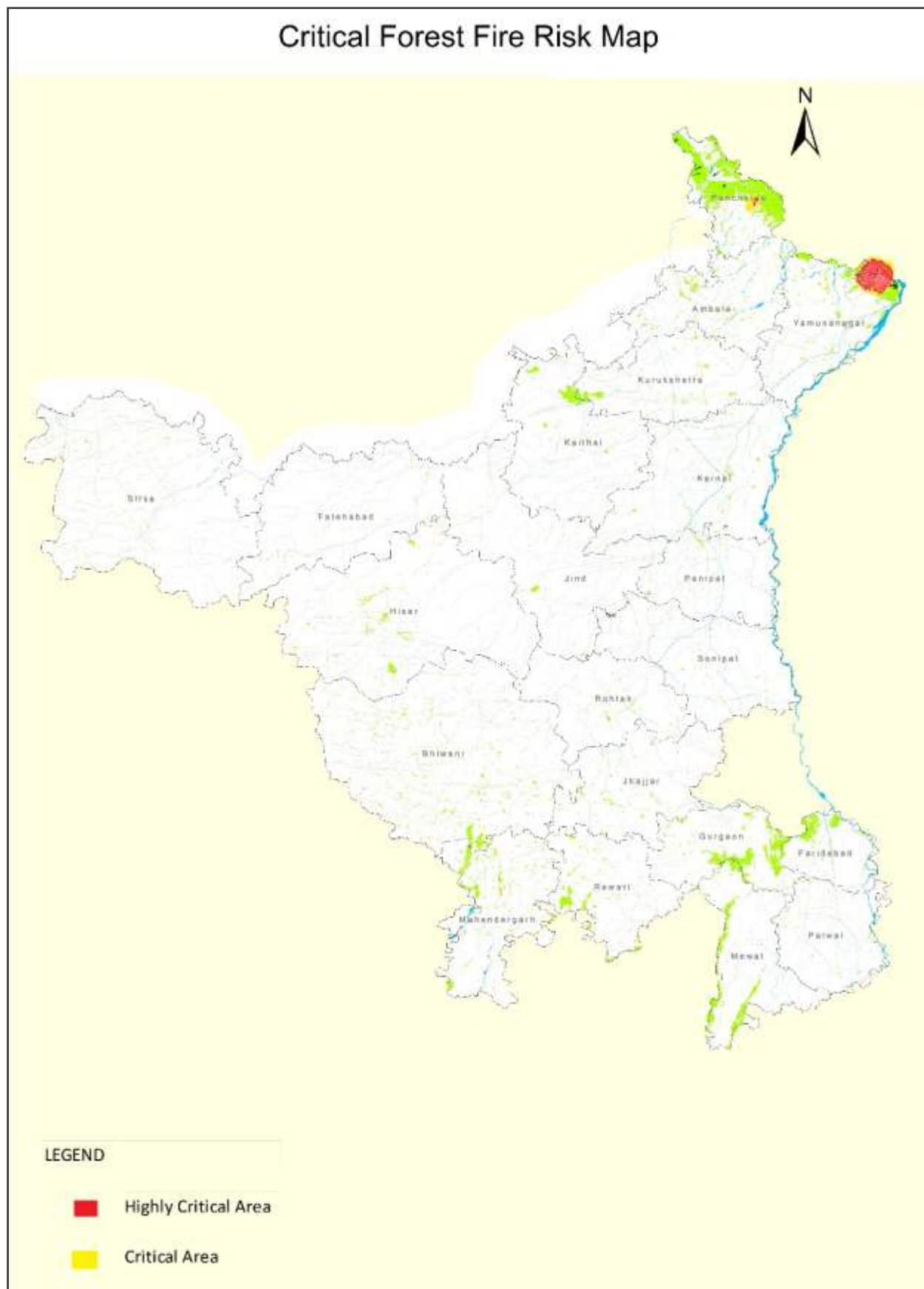
The vulnerability of forest prone areas depend on various factors like type of forests, slope, aspect, proximity to roads and habitation, etc. Some very critical areas can also be seen in the Map-1 where recurrent fires can be noticed as different coloured dots for the year 2011 to 2016. There were areas which recorded fire only once during past six years and the maximum number an area got fire was three times. Hence, areas that burnt thrice and twice were considered for generating 'Critical Forest Fire Risk Map'

Forest area that burnt thrice included three forest areas of Panchkula district namely Ramgarh Beat (2011, 2013 and 2014) and one area of Yamunanagar district namely Kalesar forest (2012, 2015 and 2016). Areas that burnt twice during these years are in Yamunanagar district namely Kathgarh (2012 and 2016), Darpur (2012 and 2016), Khol – Fatehgarh (2012 and 2016), Salahpur (2015 and 2016) and in Panchkula district namely Nanakpur Beat (2012 and 2016) and Taal Beat (2012 and 2016). Mars Red colour in map depicts 'highly critical' (burnt thrice) and Yellow for 'critical' (burnt twice). Accordingly, another Map2 was generated. Inspection of Rampur, Nanakpur and Kalesar revealed that mainly it is the leaf litter, which is the cause of frequent fires. However, some human related incidences have also been confirmed. By creating KML file



Map 1: Spatial distribution of cumulative fire locations in Haryana during 2011-2016

Coloured



Map2: Critical forest fire risk map for Haryana

Coloured

from shape file, these areas can be directly seen on Google Earth.

Fire control room: A control room for forest fire monitoring and control has been established under the control of Chief Conservator of Forests, Protection -1, Van Bhawan, Sector 6, Panchkula. Any information related to fire is passed on at phone number (0172-2565398) or through email (ccf.pkl@yahoo.in).

Forest Fire Crisis Management Plan

Haryana Forest Department in February, 2017 has formulated a Forest Fire Crisis Management Plan. The plan contains provision for the preparation of forest fire vulnerability map, creating awareness about places and seeking their cooperation, sensitization of the village forest committee and villagers through meetings involving self help group (SHG) members in sensitizing the rural women, construction of new watch towers, creation of new fire lines and maintenance of old ones, mechanism of fire control spread outside forest area, purchase of fire tenders, improving communication between control room and field staff, strengthening and strict implementation of forest and wildlife protection laws.

Due importance is given to the control of forest fires in Haryana. The state spends on an average about two crores rupees on various fire control related activities. For this purpose, state forest department receives funds from Compensatory Afforestation Fund Management and

Planning Authority (CAMPA), Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), state scheme and Shiwalik Development Agency. Under centrally sponsored scheme, especially meant for forest fire management and control, the department receives about one crore rupees annually under two components namely – clearance of fire lines and engagement of fire protection watchers on 60:40 sharing basis. The department has purchased vehicle mounted pressure water tankers for the Shiwalik Forest Divisions. They are effective in controlling the fire in areas accessible by general or forest roads.

Conclusion

In modern satellite era, the traditional methods and area specific local innovations are still proving very cost effective in controlling forest fires in Haryana. But there is also a need to keep pace with the modern technology. Remaining in constant dialogue with people is the key to the success. Mass awareness programmes using modern tools and techniques must go on so that people know the importance of forests in general and ill effects of forest fires in particular and do not knowingly or unknowingly set forests on fire. The habitual offenders must be punished under the provisions of suitable law in force. Satellite based Geographical Information System (GIS) for fire monitoring and control must be used to keep pace with the changing technology.

हरियाणा में वनाग्नि प्रबंध का स्तर

जगदीश चन्दर

सारांश

इस शोधपत्र में हरियाणा में वनाग्नियों की स्थिति और उनके नियंत्रण हेतु अपनाए जा रहे विभिन्न तरीकों का वर्णन किया गया है। यद्यपि राज्य में वन सम्पदा की प्रचुरता नहीं है, फिर भी यह विविधता में समृद्ध है, जिसकी विद्यमानता की सामान्यतः 44,212 वर्ग कि.मी. के एक छोटे से भौगोलिक क्षेत्र में कल्पना नहीं की जा सकती है। हरियाणा में वनाग्नि का मौसम मार्च से जून तक है, जो पादप, पशु और मानव जीवन को प्रभावित करती है। राज्य में जब से सहभागी वन प्रबंध की सुखोमाजरी पद्धति विकसित की गई है, वन सुरक्षा में लोगों के सहयोग के फलस्वरूप आग की घटनाओं में कमी आई है। आग की रोकथाम के लिए फरवरी के शुरूआती दिनों में गिरी पत्तियों का नियंत्रित दहन आग की घटनाओं एवं तीव्रता को घटाने में बहुत प्रभावी है। उपग्रह आधारित अग्नि निगरानी प्रणाली हरियाणा में उपयोग में नहीं है, क्योंकि अग्रणी स्टाफ धरातल पर भू-समन्वयकों का पता लगाने में असमर्थ रहता है। इसके अलावा, अच्छे सूचना नेटवर्क के चलते आग लगने की सूचना क्षेत्र कार्मिकों से समय पर मिल जाती है। वन विभाग वनाग्नि के कहर के प्रति जागरूकता पैदा करने पर जोर देता है और लोगों के साथ नियमित बैठकों का आयोजन करने के अलावा अप्रैल के प्रथम सप्ताह में वन अग्नि सुरक्षा सप्ताह मनाया जाता है। पहाड़ी के ऊपर बनाये गये आग निगरानी स्तम्भ सूचना एकत्र करने में प्रभावी सिद्ध हुए हैं। राज्य ने आग नियंत्रण हेतु विभिन्न विधियों को समाविष्ट करके फायर फाइटिंग संकट प्रबंधन योजना बनाई गई है। इस शोधपत्र के उद्देश्य के लिए भारतीय वन सर्वेक्षण, देहरादून द्वारा उपलब्ध कराए गए उपग्रह आधारित वनाग्नि भू-समन्वयकों को, 2011-2016 के दौरान अंकीयकृत वन सीमाओं पर आवरणित किया गया ताकि हरियाणा में संचयी अग्नि स्थानों के स्थानिक वितरण पर मानचित्र तैयार किया जा सके। गत छः सालों के दौरान तीन अथवा दो बार जले गए नये क्षेत्रों की प्लॉटिंग करके अग्नि प्रवण वन क्षेत्रों के लिए क्रान्तिक वनाग्नि जोखिम मानचित्र तैयार किया गया। जागरूकता सृजन के साथ यह मानचित्र, विशेषकर वनों के समीप निवास कर रहे लोगों के साथ सतत सम्पर्क के अनुरक्षण और आधुनिक प्रौद्योगिकी के उपयोग हरियाणा में वनाग्नियों की रोकथाम एवं नियंत्रण में सहायता करेंगे।

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