

# FOREST HEALTH-GENERAL PROTECTION

	No of sessions	Concurrent Assessment
General Protection	16	30 %
<b>Pests and Diseases</b> <b>(Entomology , Forest Pathology)</b>	9 (4 + 5)	-
	25 sessions  Final written Examination – 70 %	

## SYLLABUS

### General Protection:

Sessions/  
self  
study/Assignments  
(Group presentation  
& Individual reports)

1. Agencies causing forest damage — fires, man, cattle, insects, pathogens, nature of damage

Self study & Group  
presentation (2 nos)

2. Forest fire — damage, control and protection, monitoring by Government of India, state and division level, damage assessment with the help of remote sensing and geographical information system, forest fire management plan and budgetary provisions

4 Sessions

3. a. Illicit felling,

b. Unrecorded removal (headloads),

c. Uncontrolled grazing,

d. Shifting cultivation -Encroachment-problem and remedial measures, eviction procedures;

4 Sessions

Both Group  
Presentation(5nos) &  
Individual  
Assignment topics  
based on OJT  
experience

## General Protection:

## Sessions/ self study/Assignments

4. Protection measures at divisional level — issuance of preliminary offence report, seizure, raid, first information report (FIR), court cases;

2 Sessions  
Group  
presentation(1 no)

5. Timber depot and its maintenance, disposal of seized and unclaimed timber, transit of forest produce etc.;

2 sessions

6. Damages by atmospheric agencies — control measures;

Self study & Group  
presentation(1 no)

7. Disaster management — basic concept of disaster management plan;

1 session

8. Participatory forest management for protection,

1 Session  
Group  
presentation(1 no)

**9. Intelligence gathering**

2 sessions

## **Pests and Diseases:**

Common forest insect pests and their control with the help of various case studies related to the field,  
Excursion to nearby forest area for sal borer attack and demonstration of tree-trap method;

**4 sessions**

Diseases of trees — symptoms causal organism, identification and control measures with the help of case studies,  
Excursion to nearby forest area to focus on different pathogens.

**5 sessions**

# Forest Fires-Planning, Prevention, Detection & control

## (Experience sharing of Melghat TR )

Dr.Sivabala.S  
Associate Professor  
IGNFA

## OUTLINE OF PRESENTATION – 2 sessions

- **DAY -1**
- Overview in Indian & Global scenario
- Basics of Fire – Behaviour, Dynamics, Types Causes, Effects
- History of Fire Management
- National Action Plan on Forest Fire (NAPFF)
- **DAY-2**
- Implementation of NAPFF in Melghat (Planning ,Prevention, Detection, Control )
- Sharing field experience
- Learnings

## Fire is a prevalent forest disturbance in the tropics

Forests face many disturbances that can adversely affect their health and vitality and reduce their ability to provide a full range of goods and ecosystem services. About 98 million ha of forest were affected by fire in 2015;<sup>1</sup> this was mainly in the tropical domain, where fire burned about 4 percent of the total forest area in that year. More than two-thirds of the total forest area affected was in Africa and South America.

Insects, diseases and severe weather events damaged about 40 million ha of forests in 2015, mainly in the temperate and boreal domains.

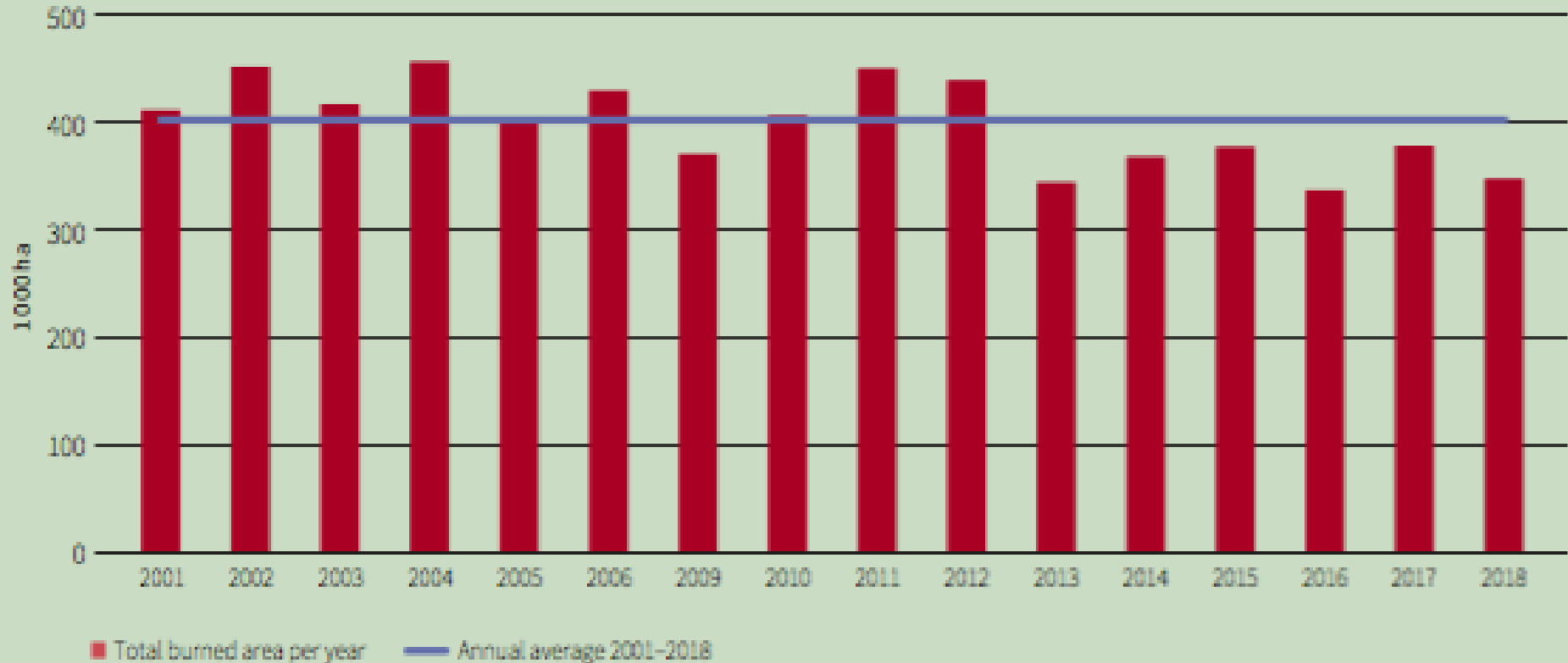
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<sup>1</sup> The latest year for which data are available.

# GFRA, 2020 report

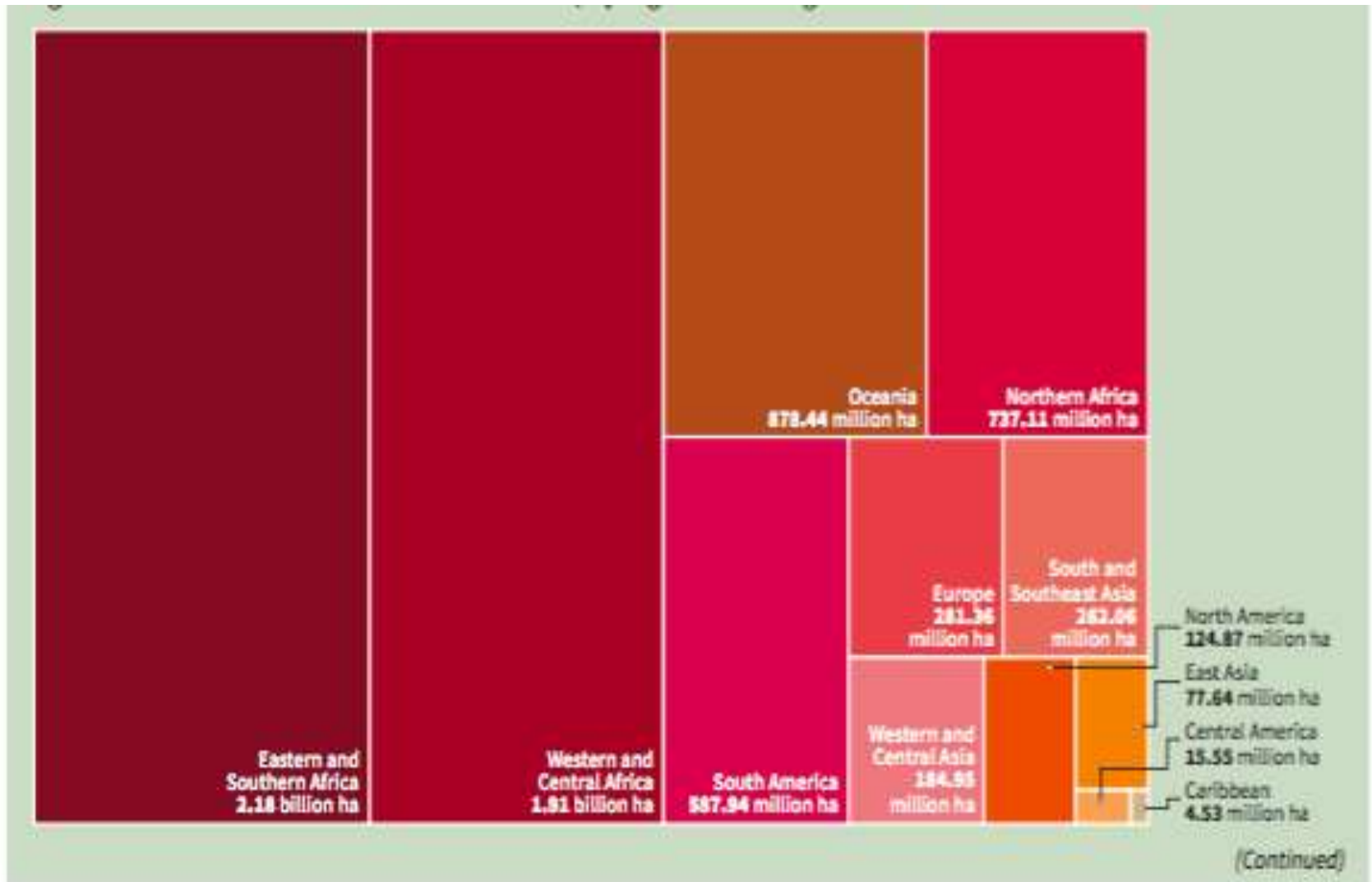
Box 7. (Continued)

Figure 40. Global total land area burned per year, 2001–2018



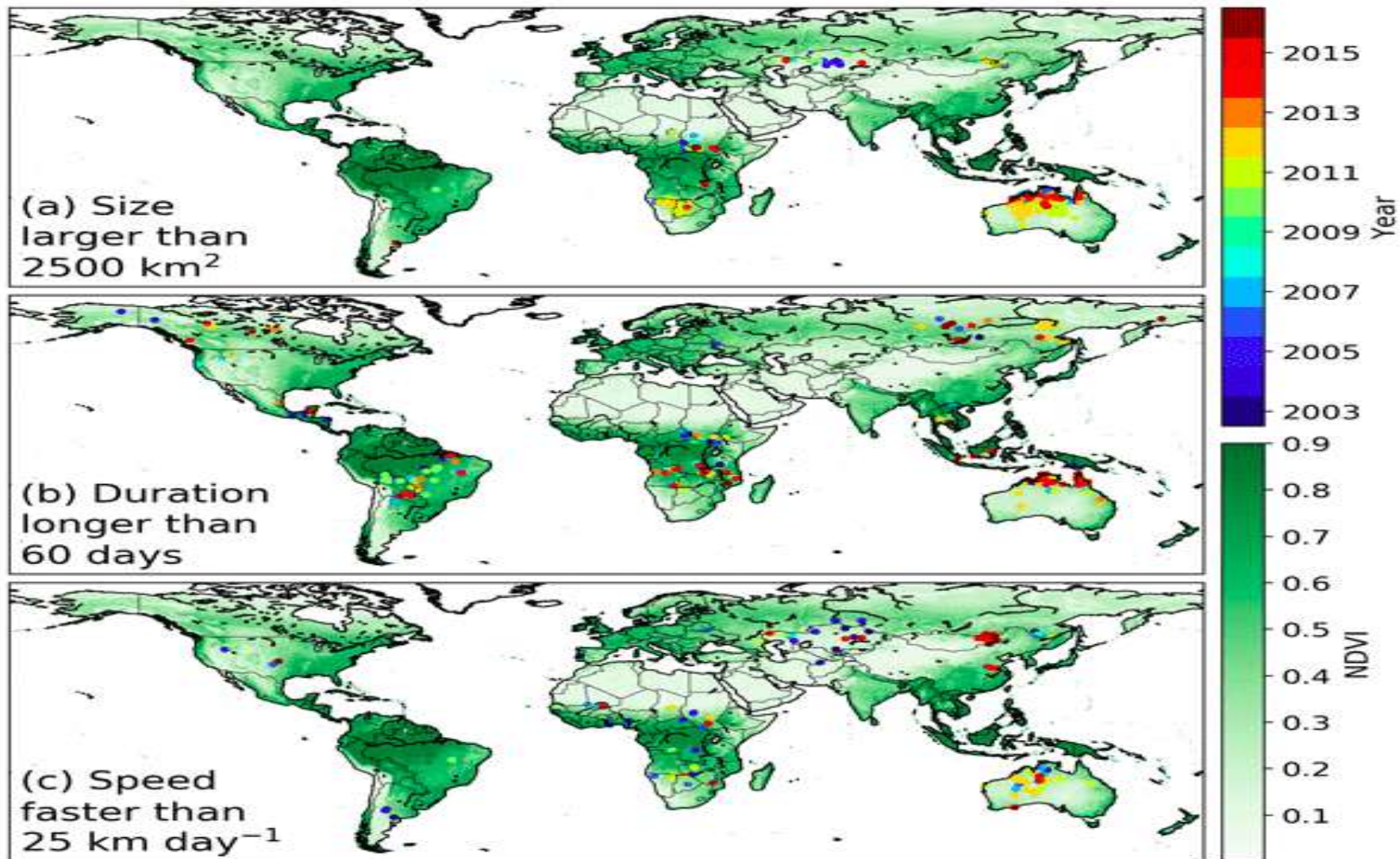


# Total land area burned in 2001–2018, by region or subregion



The global fire atlas of individual fire size, speed and direction (Andela et al 2019)

<http://www.globalfiredata.org/fireatlas.html>



## Box-4.1: Wild Fire Disasters from 1980 - 2008

### Overview

No of events:	294
No of people killed:	1,666
Average people killed per year:	57
No of people affected:	5,766,092
Average people affected per year:	198,831
Economic Damage (US\$ X 1,000):	42,806,705
Economic Damage per year (US\$ X 1,000):	1,476,093

### Number of events

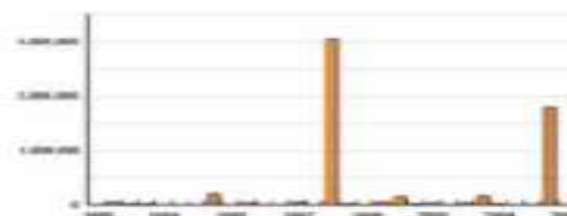


### Top 10 Disasters Reported

#### Affected people

Disaster	Date	Affected (no. of people)
Indonesia	1994	3,000,000
Macedonia FRY	2007	1,000,000
United States	2007	640,064
Argentina	1987	152,752
Portugal	2003	150,000
Paraguay	2007	125,000
Russia	1998	100,683
China P Rep	1987	56,313
Nepal	1992	50,000
Myanmar	1981	48,588

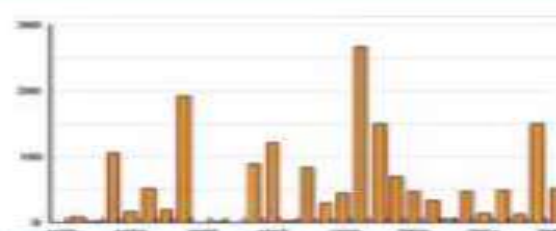
#### Number of people affected



#### Killed people

Disaster	Date	Killed (no. of people)
Indonesia	1997	240
China P Rep	1987	191
Australia	1983	75
Greece	2007	67
Indonesia	1991	57
Nepal	1992	56
Mexico	1998	50
Mozambique	2008	49
Sudan	1998	47
Poland	1992	35

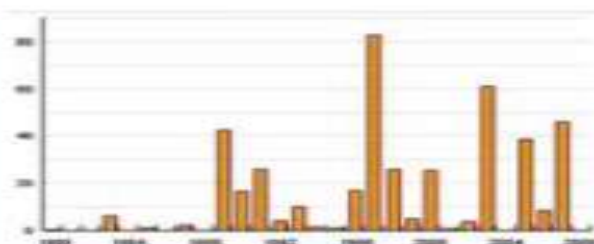
#### Number of people killed



#### Economic damages

Disaster	Date	Cost (US\$ X 1,000)
Indonesia	1997	8,000,000
Canada	1989	4,200,000
United States	2003	3,500,000
United States	2007	2,500,000
United States	1991	2,500,000
Spain	2005	2,050,000
Greece	2007	1,750,000
Portugal	2003	1,730,000
Mongolia	1996	1,712,800
Portugal	2005	1,650,000

#### Reported economic damages (US\$ in billion)

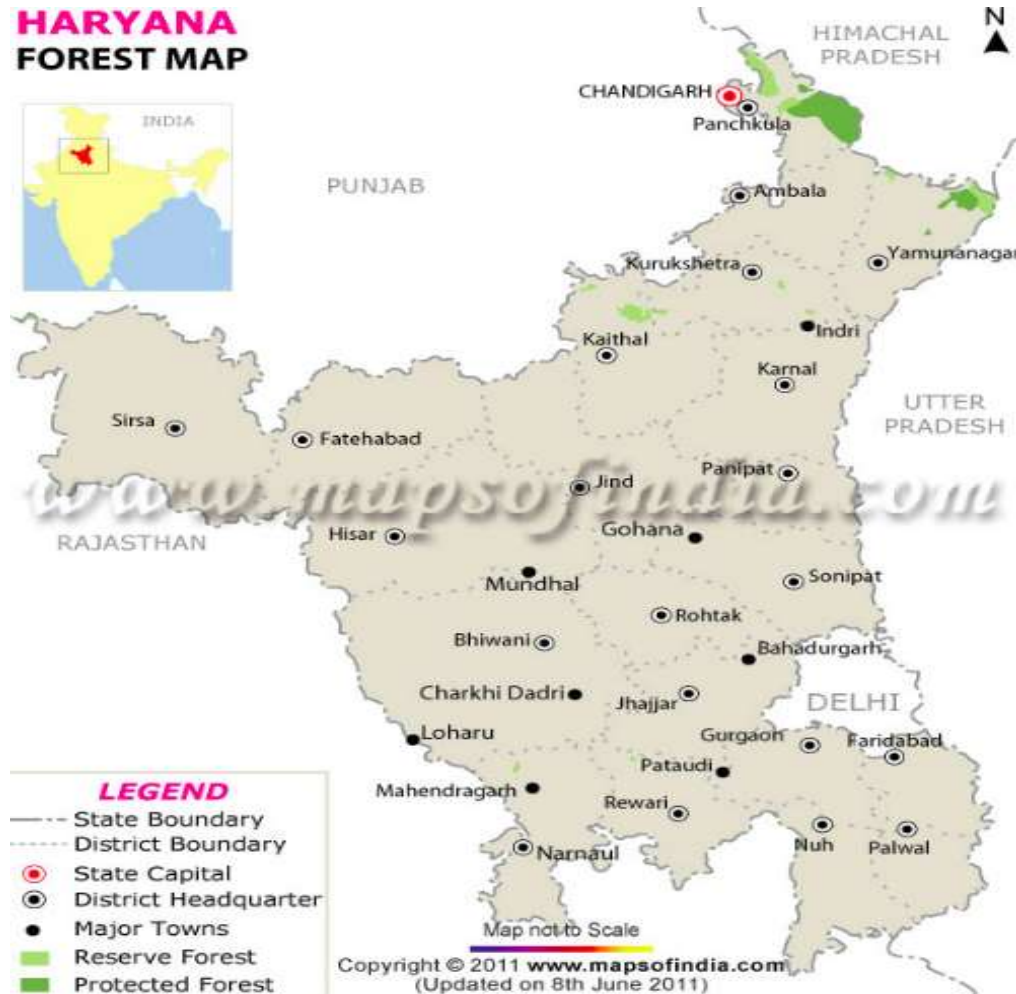


**Source:** "EM-DAT: The OFDA/CRED International Disaster Database, University catholique de Louvain, Brussels, Bel." Data version: v11.08



# Overview of Indian Scenario

## 2014 burnt area = Haryana Geographical Area



**Table-5.6: Major forest fire in Indian States during 1990-2011**

S. No.	State/ Year	Location	Area affected (ha)	Source
1.	Uttrakhand, 1995	Uttrakhand hills	3, 75,000	Kaushik, 2004
2.	India, 1999	Ganga Yamuna watershed	80,000	Kaushik, 2004
3.	Himachal Pradesh June 2007	Shimla & Solan Districts	2000 (Reserve forest)	EMDAT
4.	Maharashtra 15 June 2008	Melghat-gugamal National park in Maharashtra	10000	Anonymous
5.	Gujarat Feb-09	Gir forest, Gujrat	32.38	Anonymous
6.	2009- March India	Taboda Researve forest	50	Anonymous
7.	2009- March India	Chamundi Hills	20	Anonymous
8.	Aprill 2009,India	BaHudson Beer	200	Anonymous
9.	Uttrakhand, April 2009	Chamoli/Gochar/ Devprayag/Hrishikesh	5	The Hindu, Apr 21, 2009
10.	2009 India	Way Land	424	Anonymous
11.	Maharashtra Jan-May2010	Mumbai	10300	Anonymous
12.	Nagaland 18-Feb-10	Tuesang District in nagaland	4	Anonymous
13.	Himachal Pradesh Jun-10	Himachal Pradesh	19,109	Anonymous
14.	TamilNadu, 2011	Ooty in Nilgiris	10 hectares (Reserve forest)	TOI,TNN Mar 8, 2011

- **Fire season 2019-2020** (i.e. from 01st November, 2019 to 30th June, 2020) has been assessed as **11,094 sq. km** with 95% confidence level
- 1.56% of the total forest cover area of the country.
- Two physiographic zones {70% of BFA}
  - Deccan (5626 sq. km)**
  - Central Highlands (2160 sq. km)**
- North-east region - maximum number of MODIS- detected forest fire points in the last fire season, only 12.50% (BFA)

Source:-

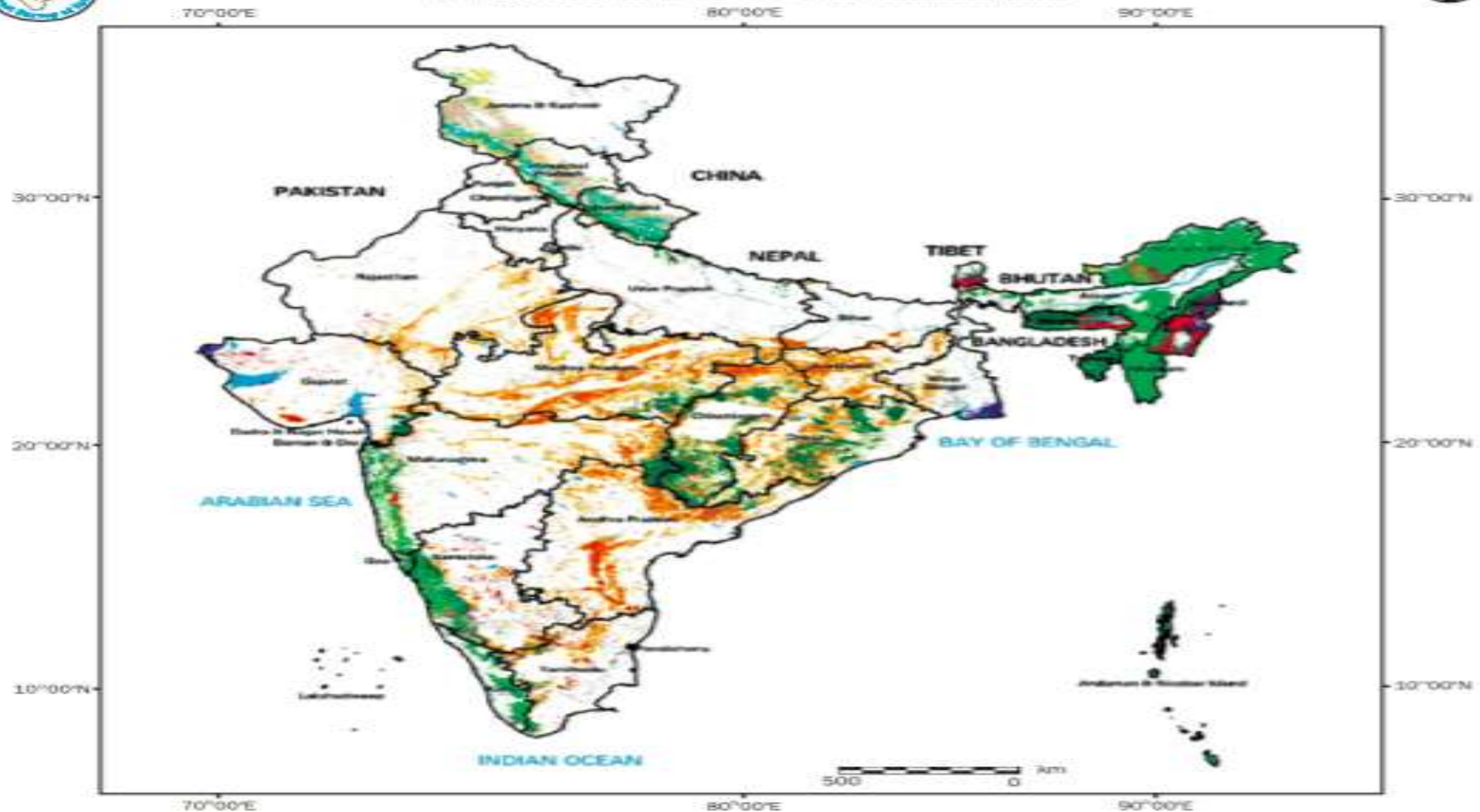
[FSI TECHNICAL INFORMATION SERIES](#)

[Volume 2 No. 2 2020 Rapid Assessment of Fire affected Forest Areas in the Country based on MODIS-detections following a Sampling Approach](#)



### FOREST TYPE MAP OF INDIA

(Showing Type Group as per Champion & Seth's Classification, 1968)



**LEGEND**

	Group 1 - Tropical Wet Evergreen Forests		Group 10 - Subtropical Dry Evergreen Forests
	Group 2 - Tropical Semi - Evergreen Forests		Group 11 - Montane Wet Temperate Forests
	Group 3 - Tropical Moist Deciduous Forests		Group 12 - Himalayan Moist Temperate Forests
	Group 4 - Littoral and Swamp Forests		Group 13 - Himalayan Dry Temperate Forests
	Group 5 - Tropical Dry Deciduous Forests		Group 14 - Sub-Alpine Forests
	Group 6 - Tropical Thorn Forests		Group 15 - Moist Alpine Scrub
	Group 7 - Tropical Dry Evergreen Forests		Group 16 - Dry Alpine Scrub
	Group 8 - Subtropical Broadleaved Hill Forests		Plantation / TOF
	Group 9 - Subtropical Pine Forests		Non Forest

Prepared by FSI under the NRMS SC-B, Project on 'Mapping of Forest Types of India'

Figure 5: Forest type group map of India



## VULNERABILITY OF INDIA'S FORESTS TO FIRES

**Table 3: Forest fire incidences in different forest type groups during period 2004-11 (year wise) as per Champion and Seth's classification**

Sl. No.	Type Group	No of fire incidence							Total
		04-05	05-06	06-07	07-08	08-09	09-10	10-11	
1	Tropical Wet Evergreen Forests	32	144	93	50	182	184	107	<b>792</b>
2	Tropical Semi-Evergreen Forests	1447	5274	3705	3007	5121	6324	2999	<b>27877</b>
3	Tropical Moist Deciduous Forests	2316	6079	5239	4367	7113	9514	3997	<b>38625</b>
4	Littoral & Swamp Forests	8	9	3	11	18	16	1	<b>66</b>
5	Tropical Dry Deciduous Forests	3281	5111	5116	6700	9120	9583	4260	<b>43171</b>
6	Tropical Thorn Forests	70	109	96	75	90	81	71	<b>592</b>
7	Tropical Dry Evergreen Forests	5	6	10	2	9	7	0	<b>39</b>
8	Subtropical Broadleaved Hill Forests	167	1093	773	822	987	1633	780	<b>6255</b>
9	Subtropical Pine Forests	64	272	247	325	479	531	144	<b>2062</b>
10	Subtropical Dry Evergreen Forests	0	0	0	0	0	0	0	<b>0</b>
11	Montane Wet Temperate Forests	8	139	79	96	132	227	109	<b>790</b>
12	Himalayan Moist Temperate Forests	53	48	113	136	410	156	64	<b>980</b>
13	Himalayan Dry Temperate Forests	0	0	1	13	12	4	1	<b>31</b>
14	Sub-Alpine Forests	0	18	16	14	35	23	17	<b>123</b>
15	Moist Alpine Scrub	0	2	0	3	6	3	0	<b>14</b>
16	Dry Alpine Scrub	0	0	1	3	1	0	0	<b>5</b>
	Plantation/ToF	28	50	35	64	64	93	30	<b>364</b>
	Non Forest	1166	2213	1252	1576	2401	2513	1318	<b>12439</b>
	<b>Total</b>	<b>8645</b>	<b>20567</b>	<b>16779</b>	<b>17264</b>	<b>26180</b>	<b>30892</b>	<b>13898</b>	<b>134225</b>



70°00'E

80°00'E

90°00'E



# Forest Fires Vulnerable Districts, India

Based on Forest Fire Incidences during 2004-2011



40°00'N

40°00'N

30°00'N

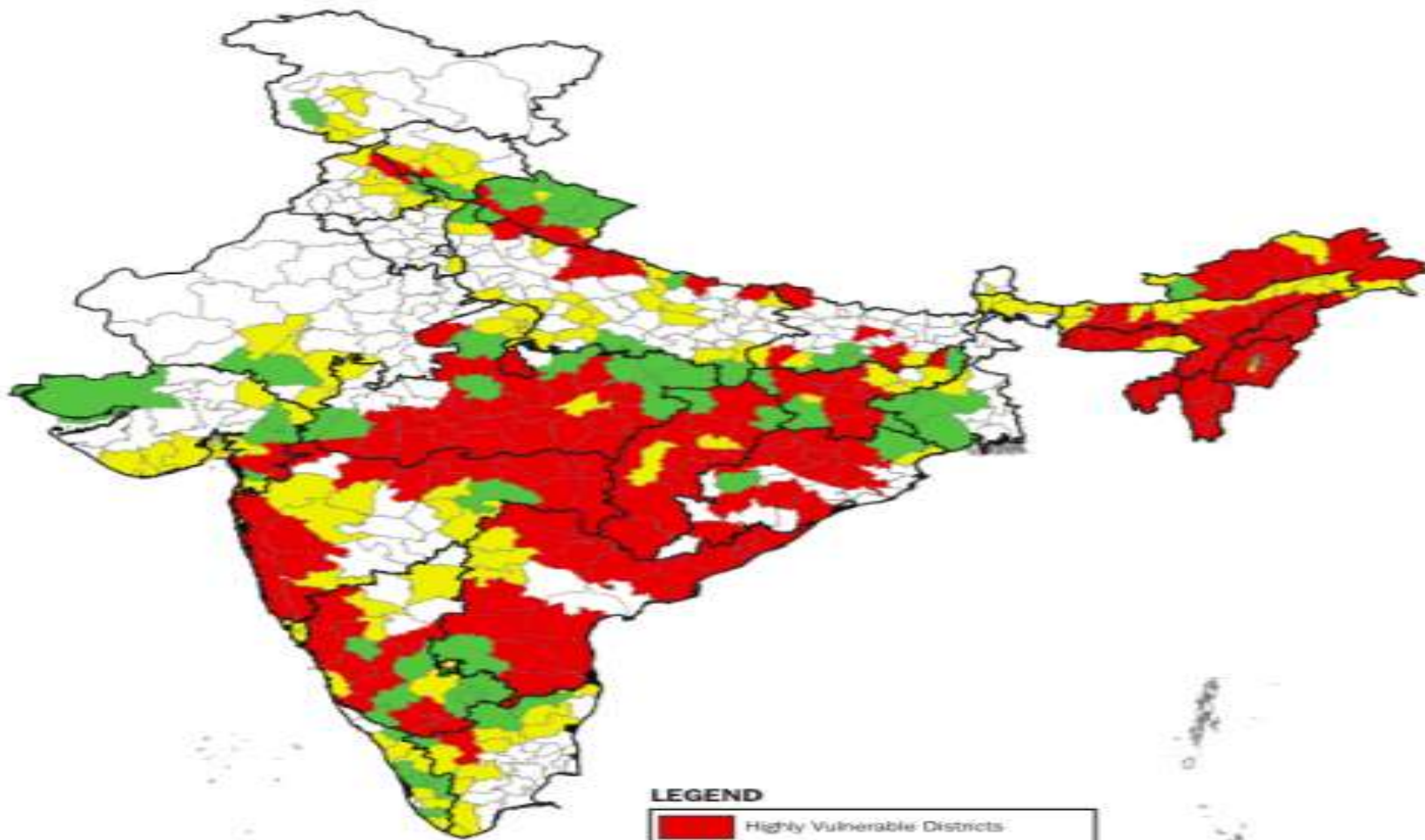
30°00'N

20°00'N

20°00'N

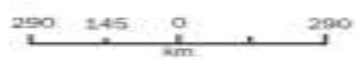
10°00'N

10°00'N



### LEGEND

	Highly Vulnerable Districts
	Moderately Vulnerable Districts
	Less Vulnerable Districts



70°00'E

80°00'E

90°00'E

Figure 10: Map showing forest fire vulnerable districts



# Forest Fire Vulnerability and Poverty Map

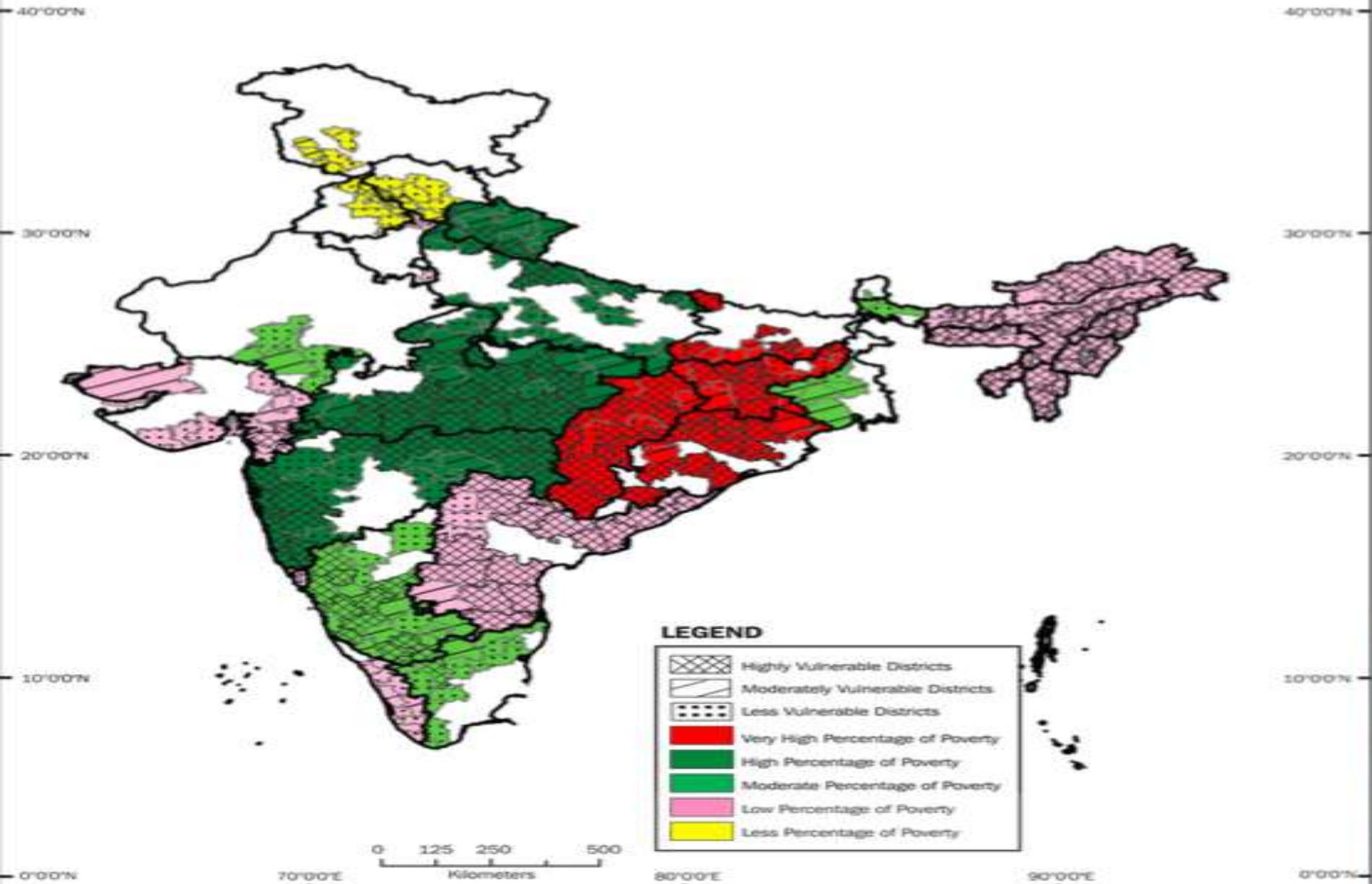


Figure 14: Map showing forest fire vulnerable districts overlaid with Poverty affected districts



**Table-5.7: Forest fire season in India (Annual)**

State and UTs	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Assam	*	**	**	*	*	X	X	X	X	X	X	*
Andaman and Nicobar Islands	**	**	**	*	*	X	X	X	X	X	X	*
Andhra Pradesh	X	*	**	**	**	*	X	X	X	X	X	X
Bihar	X	*	**	**	**	X	X	X	X	X	X	X
Dadra and Nagar Haveli	*	*	**	**	**	*	X	X	X	X	X	X
Gujarat	*	*	**	**	**	*	X	X	X	X	X	X
Goa, Daman and Diu	X	*	**	**	**	X	X	X	X	X	X	X
Haryana	*	*	*	**	**	**	X	X	X	*	*	*
Himachal Pradesh	*	*	*	**	**	**	X	X	X	*	*	*
Karnataka	*	**	**	**	*	*	X	X	X	X	*	*
Kerala	*	*	**	**	**	*	X	X	X	X	X	*
Maharashtra	X	*	**	**	**	*	X	X	X	*	*	X
Madhya Pradesh	*	*	**	**	**	X	X	X	X	*	*	*
Nagaland	X	*	**	*	X	X	X	X	X	X	X	X
Punjab	X	*	*	**	**	**	X	X	X	X	X	X
Rajasthan	*	*	**	**	**	*	X	X	X	X	X	X
Sikkim	*	*	**	**	*	X	X	X	X	X	X	X
Tamil Nadu	*	**	**	**	**	X	X	X	X	X	*	*
Uttar Pradesh	*	*	**	**	**	X	X	X	X	X	X	*

*Source: FORTECH: FAO: TCP/IND/4452*

(\*\* Peak fires Season;; \* Additional months of fire occurrence; X No fire.)

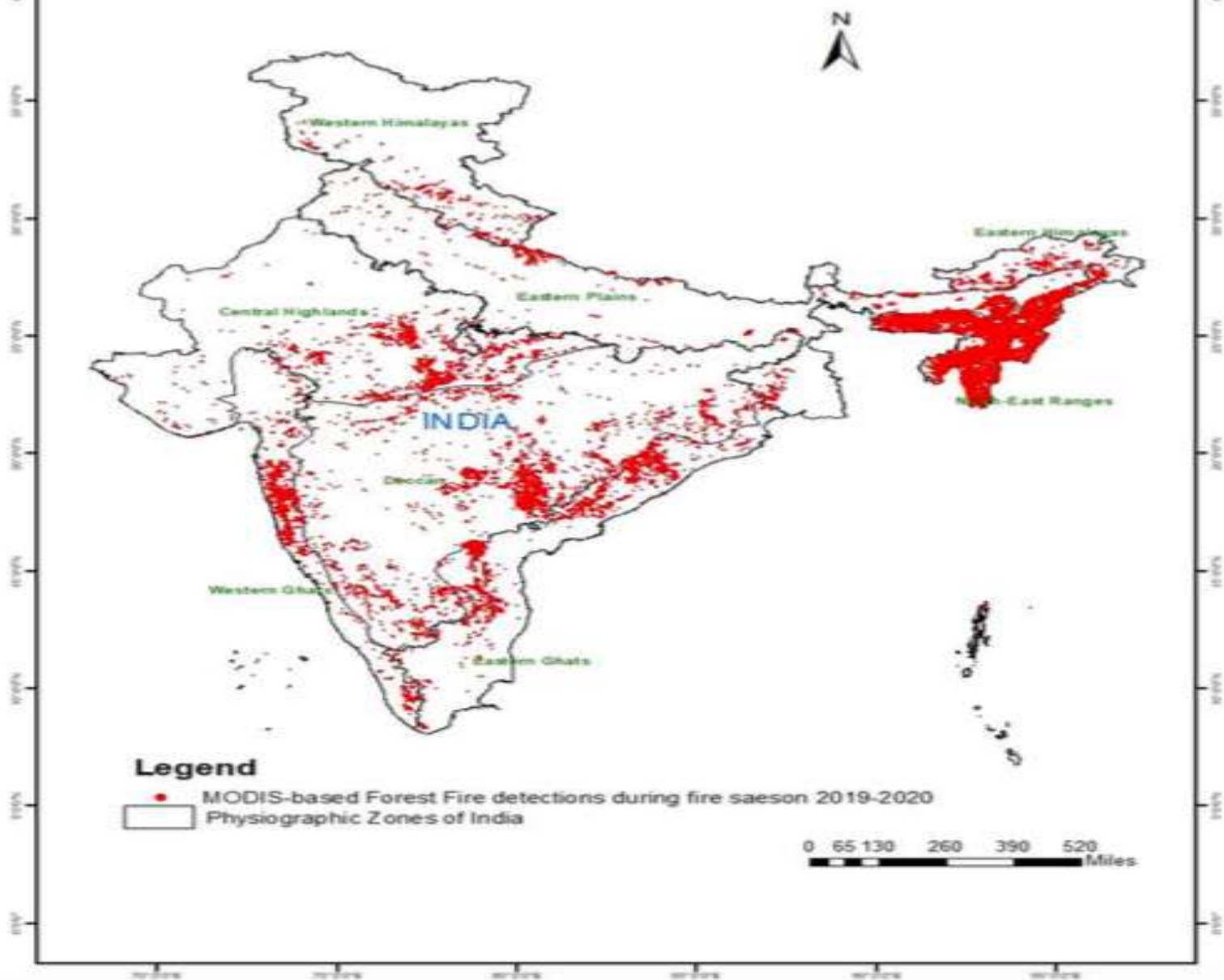
**Table 6: Crucial period for the states.**

Sl. No.	State	Crucial Period of Forest Fire	
		From	To
1	Andaman & Nicobar	1st week of Apr	1st week of May
2	Andhra Pradesh	2nd week of Feb	1st week of Apr
3	Arunachal Pradesh	3rd week of Feb	4th week of Apr
4	Assam	1st week of Mar	3rd week of Apr
5	Bihar	2nd week of Mar	3rd week of Apr
6	Chhattisgarh	4th week of Feb	3rd week of Apr
7	Gujarat	4th week of Feb	3rd week of Apr
8	Haryana	3rd week of Mar	1st week of Jun
9	Himachal Pradesh	2nd week of Apr	1st week of Jun
10	Jammu & Kashmir	2nd week of May	3rd week of Jun
11	Jharkhand	1st week of Mar	3rd week of Apr
12	Karnataka	2nd week of Feb	1st week of Apr
13	Kerala	1st week of Feb	4th week of Mar
14	Madhya Pradesh	1st week of Mar	4th week of Apr
15	Maharashtra	4th week of Feb	3rd week of Apr
16	Manipur	1st week of Mar	1st week of Apr
17	Meghalaya	1st week of Mar	1st week of Apr
18	Mizoram	1st week of Mar	1st week of Apr
19	Nagaland	4th week of Feb	4th week of Mar

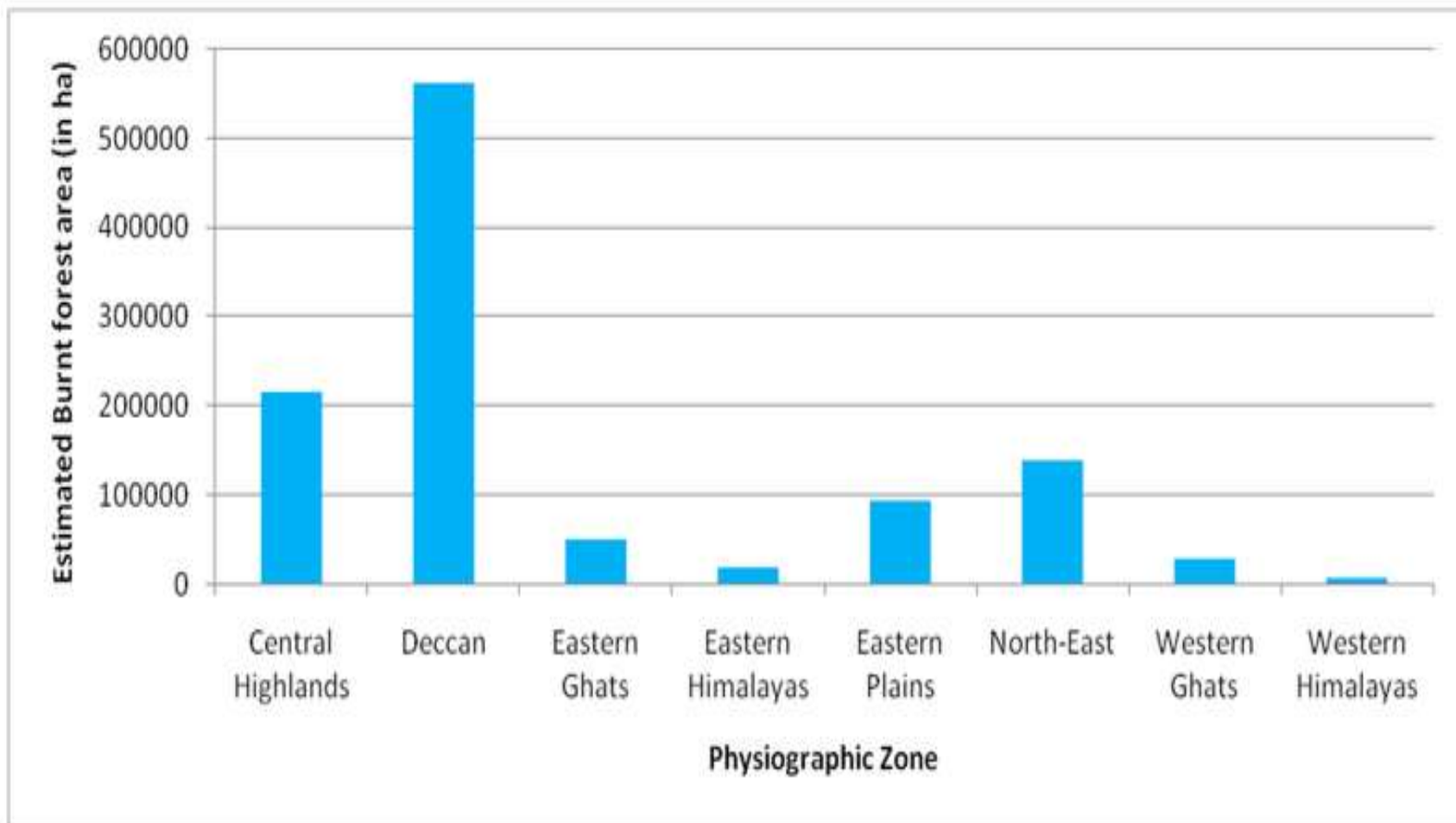
**VULNERABILITY OF INDIA'S FORESTS TO FIRES**

Sl. No.	State	Crucial Period of Forest Fire	
		From	To
20	Odisha	3rd week of Feb	4th week of Apr
21	Punjab	3rd week of Mar	1st week of Jun
22	Rajasthan	2nd week of Feb	1st week of May
23	Tamil Nadu	1st week of Feb	3rd week of Mar
24	Tripura	2nd week of Mar	2nd week of Apr
25	Uttar Pradesh	3rd week of Mar	3rd week of Apr
26	Uttarakhand	1st week of Apr	4th week of Apr
27	West Bengal	2nd week of Feb	3rd week of Mar

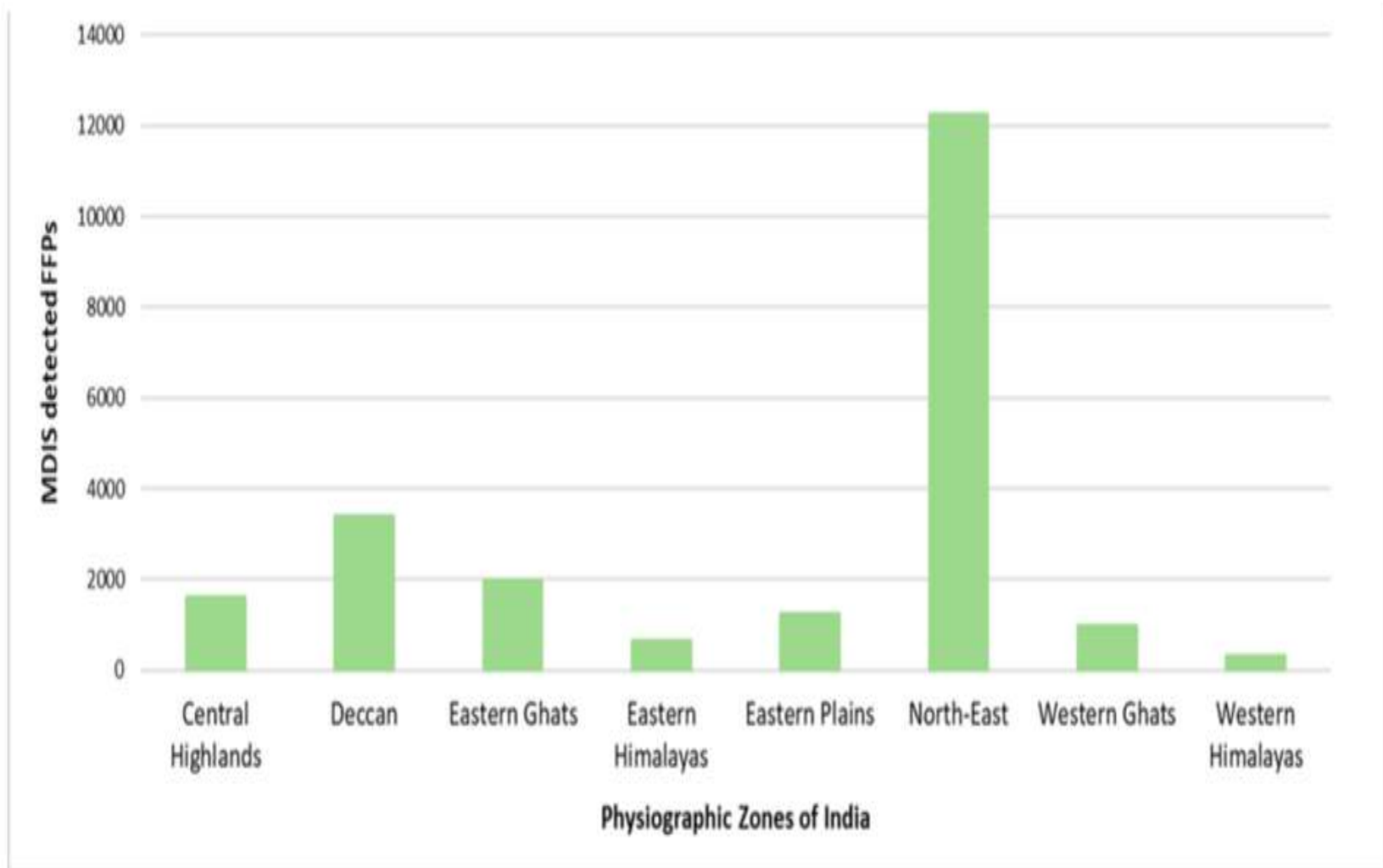
# MODIS-based Forest Fire detections in various Physiographic zones of India during the fire season 2019-2020







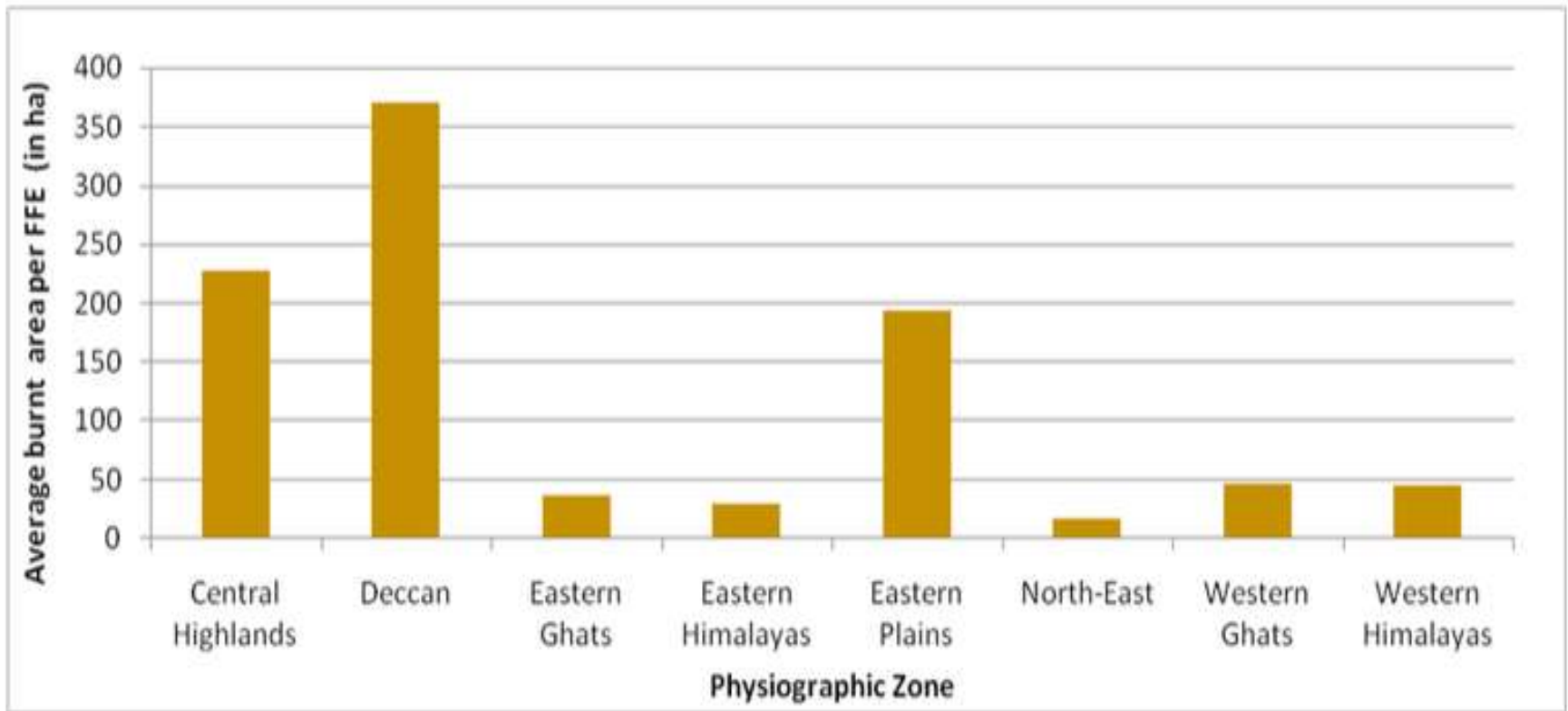
**Figure 5 Graph depicting the estimated burnt forest areas (in ha) in different physiographic zones of the country during the fire season 2019-2020.**



**Figure 1 MODIS-based forest fire detections in the country during the fire season 2019-2020.**

Source:-

[FSI TECHNICAL INFORMATION SERIES Volume 2 No. 2 2020](#)



**Figure 6 Graph depicting the average burnt forest area per forest fire event (in ha) in different physiographic zones of the country during the fire season 2019-2020.**

Source:-

[FSI TECHNICAL INFORMATION SERIES Volume 2 No. 2 2020](#)



## WILDFIRE & FORESTFIRE

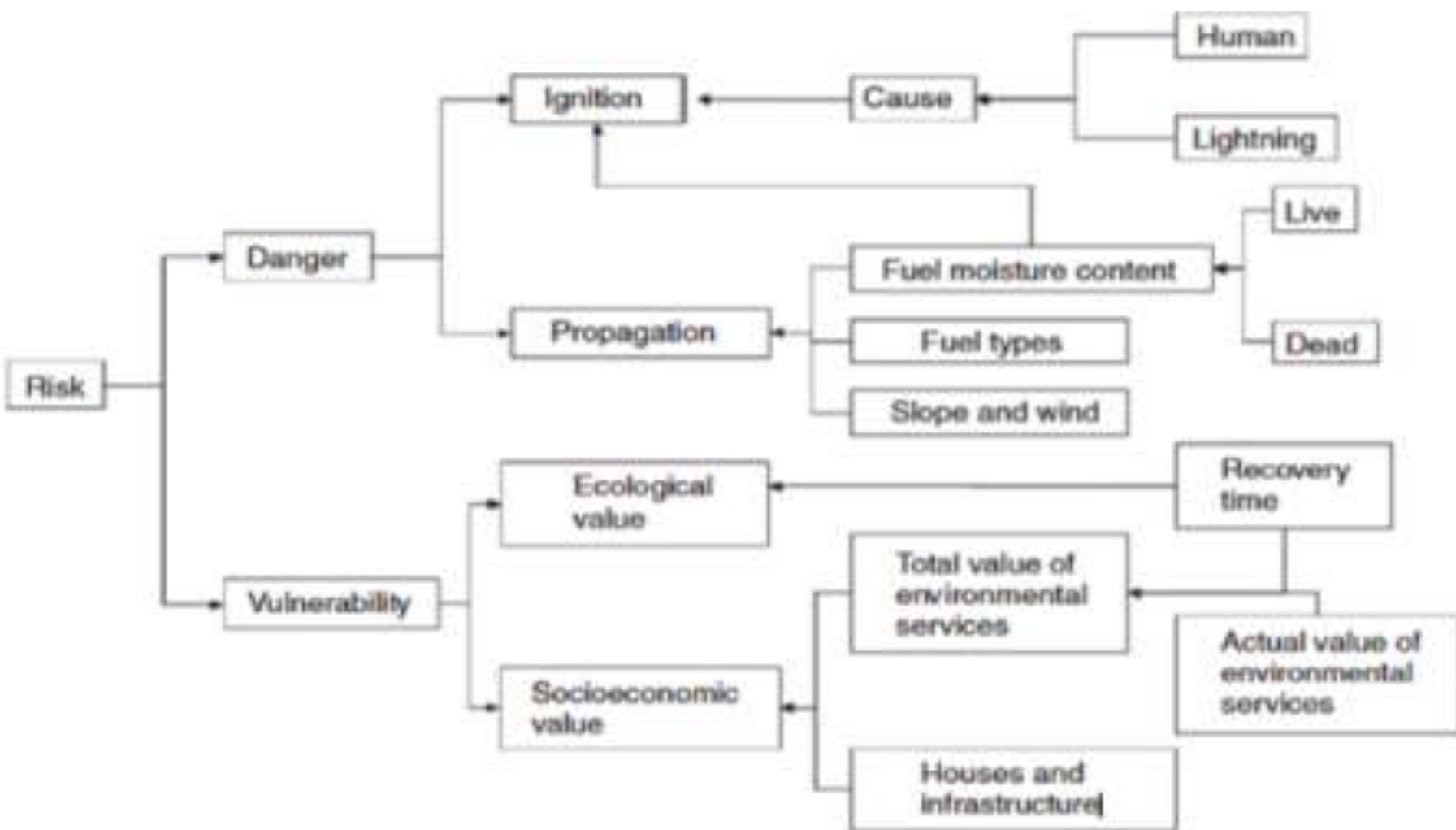
- A **forest fire**, according to EU regulations (EC, 2003) is a fire that starts in any land cover and spreads to affect forest areas, these being forests as defined by the FAO (1998).
- However, the term '**wildfire**' is more general than that of forest fire and includes fires that affect other vegetation types different from forests. This term is thus more applicable to fires that affect grasslands, shrublands and other non-forest land covers.
- [Source:-SCIENCE FOR DISASTER RISK MANAGEMENT 2017 Knowing better and losing less - by EUROPEAN COMMISSION](#)

- **Wildfire risk** has also been defined as ‘**the probability of a fire to happen and its consequences**’ (San-Miguel-Ayanz, 2002), following the general UNISDR terminology of risk (UNISDR, 2009)
- other definitions consider that **fire risk** is ‘**the union of two components: fire hazard and fire ignition**’. In this case, the overall risk depends on the fuel and its susceptibility to burning (i.e. hazard), and on the presence of external causes (both anthropogenic and natural) leading to fire ignition and spread.
- The international standard on risk management, ISO 31000, defines **risk** as the ‘**effect of uncertainty on objectives**’. For this definition of risk, there needs to be a clear objective, for example, avoiding significant human impacts from wildfires.
- Recent studies at the local and global levels describe wildfire risk as being derived from the **interaction of two components, fire danger and vulnerability**. In this case, fire danger is equivalent to fire hazard

- **Fire hazard** can be defined as the combination of the presence of ignition sources, fuel availability and conditions for fire ignition and spread (fire behaviour) (Oliveira et al., 2014). It thus refers to the conditions under which an ignition can result in a wildfire, as a result of the availability of fuels and their condition, and the prevalent meteorological conditions.
- **Vulnerability** refers to the susceptibility of suffering damage. This term is often associated with exposure, as vulnerability exists if a series of assets (such as lives or property) are exposed to damage by wildfires (Galiana Martín and Karlsson, 2012).

**FIGURE 3.47**

Proposed framework for an integrated fire risk assessment system  
Source: adapted from Chuvieco et al. (2010)



FIRE TRIANGLE

ENERGY



**FIRE**

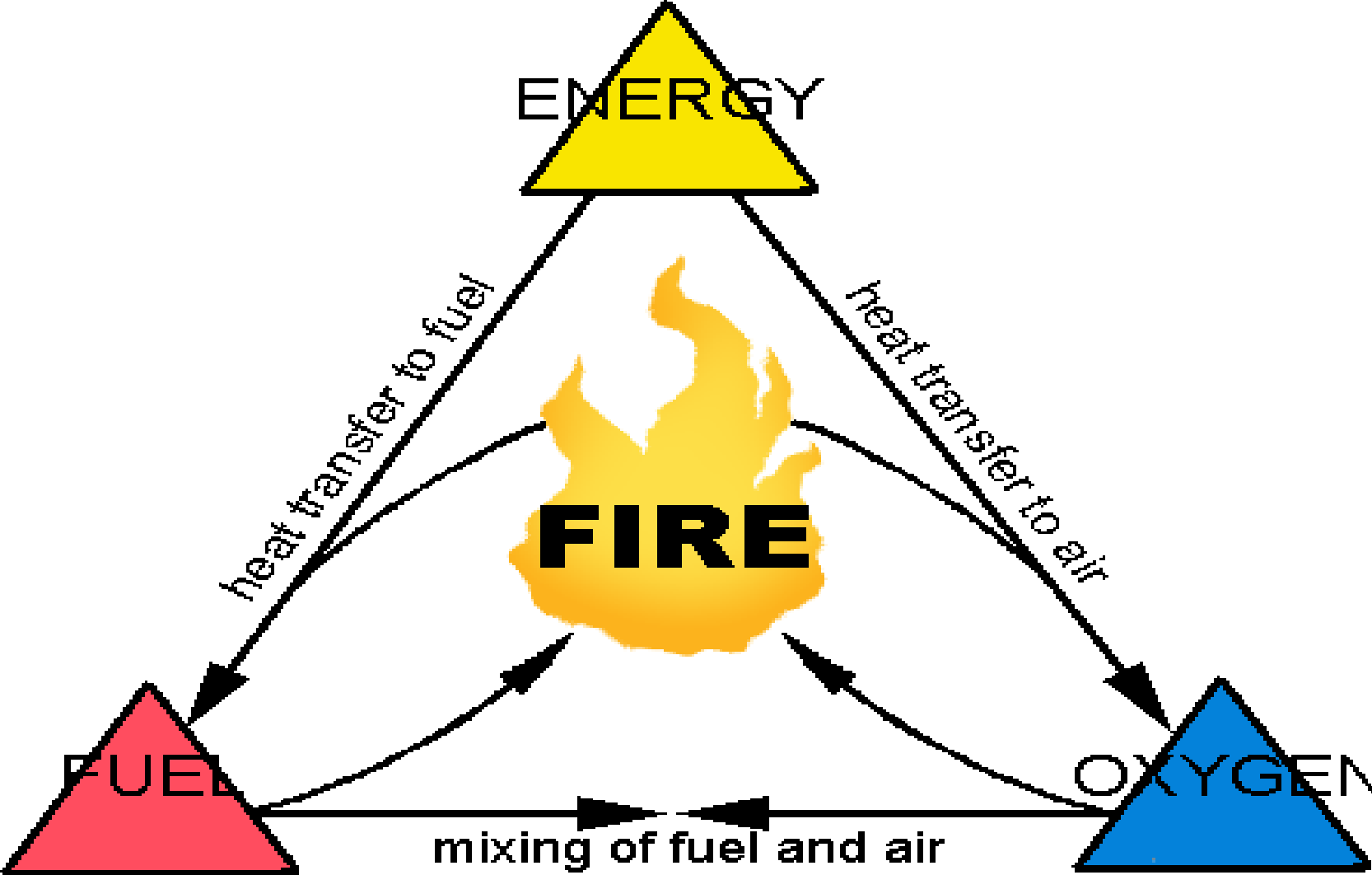
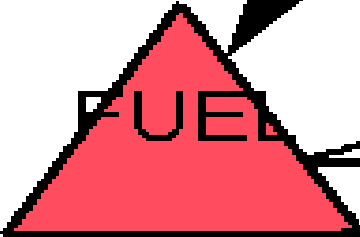
*heat transfer to fuel*

*heat transfer to air*

FUEL

OXYGEN

mixing of fuel and air



## The Fire Triangle

Plants use the energy of sunlight to combine water (hydrogen + oxygen) with carbon dioxide (carbon + oxygen) to form sugar molecules. Surplus oxygen is released into the air. Wood cellulose is a long stringy molecule composed of 20,000 sugar molecules. Fire is a chemical reaction in which cellulose is broken down and reacted with oxygen to release heat, carbon dioxide, and water vapor, plus incompletely burned particles of soot and tar. The Fire Triangle illustrates that a fire must have adequate heat, fuel, and oxygen to burn. Remove any one side from the triangle and a fire can neither ignite nor continue to burn.



**Oxygen:** Oxygen is needed for the chemical reaction of combustion. Oxygen to a campfire can be increased by spreading the fuel apart a little bit, or by raising the fire up on a mound, or by blowing on it. Oxygen to a campfire can be suppressed by smothering it with dirt.

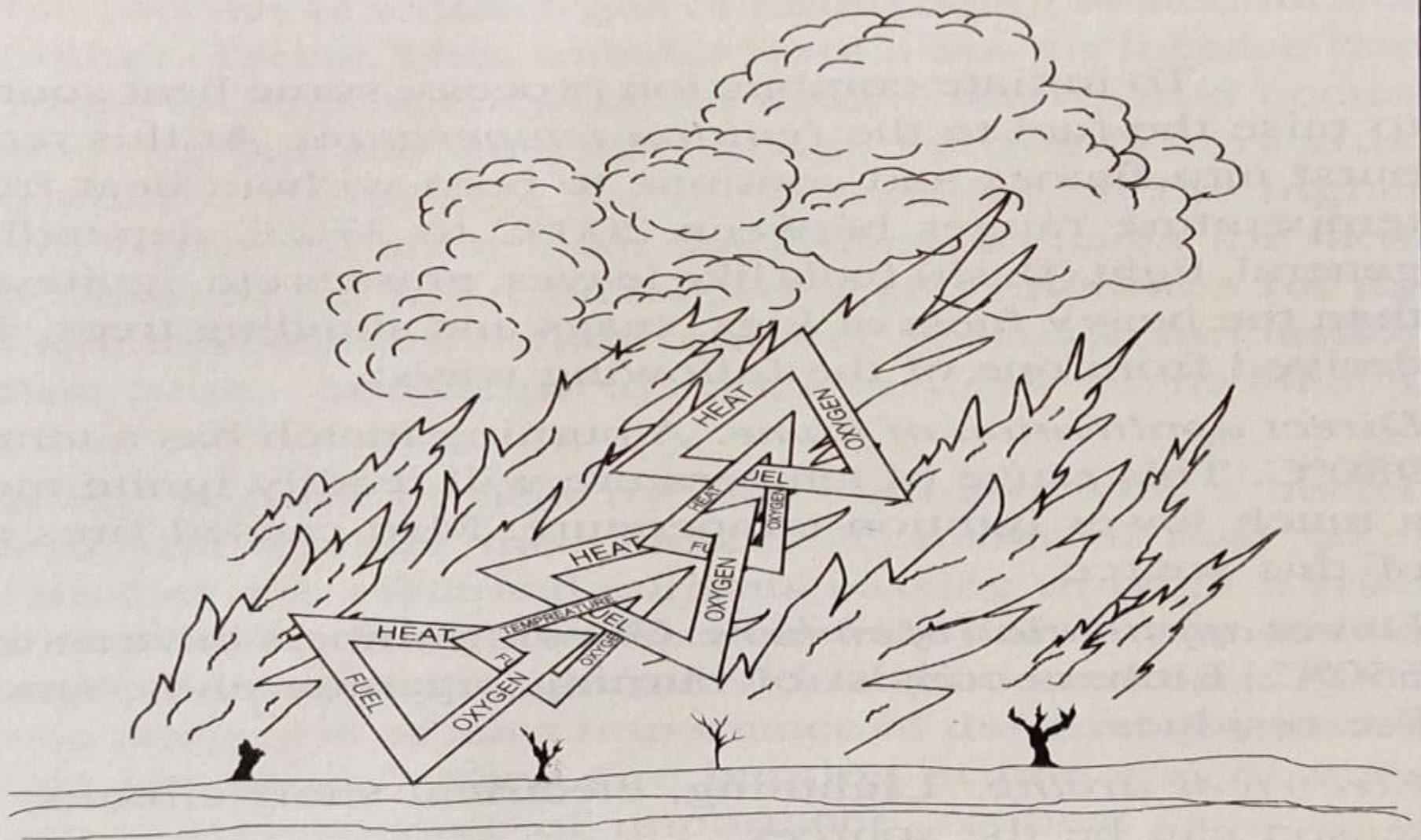
**Heat:** Heat breaks long cellulose molecules down into shorter molecules that can react with oxygen in a process called "pyrolysis." Heat is required to initiate pyrolysis in fuel before the fuel will burn. Smaller pieces of tinder or kindling will heat more easily than larger pieces. Since heat rises, allow the flame to rise up the match or tinder to heat additional fuel. Heat can be suppressed with dirt or water, by spreading the fuel apart, or by adding green or wet wood, which requires more heat to dry it.

**Fuel:** Fuel is also required to have a fire. Look for fuel that is dry enough and small enough to be heated easily. Larger pieces of wood can be added as the fire grows.

**Uninhibited Chain Reactions:** With fuel to burn, adequate heat to break down the molecule chains, and oxygen for combustion, a fire will sustain itself with uninhibited chain reactions until it runs out of fuel or any other factor in the fire triangle.

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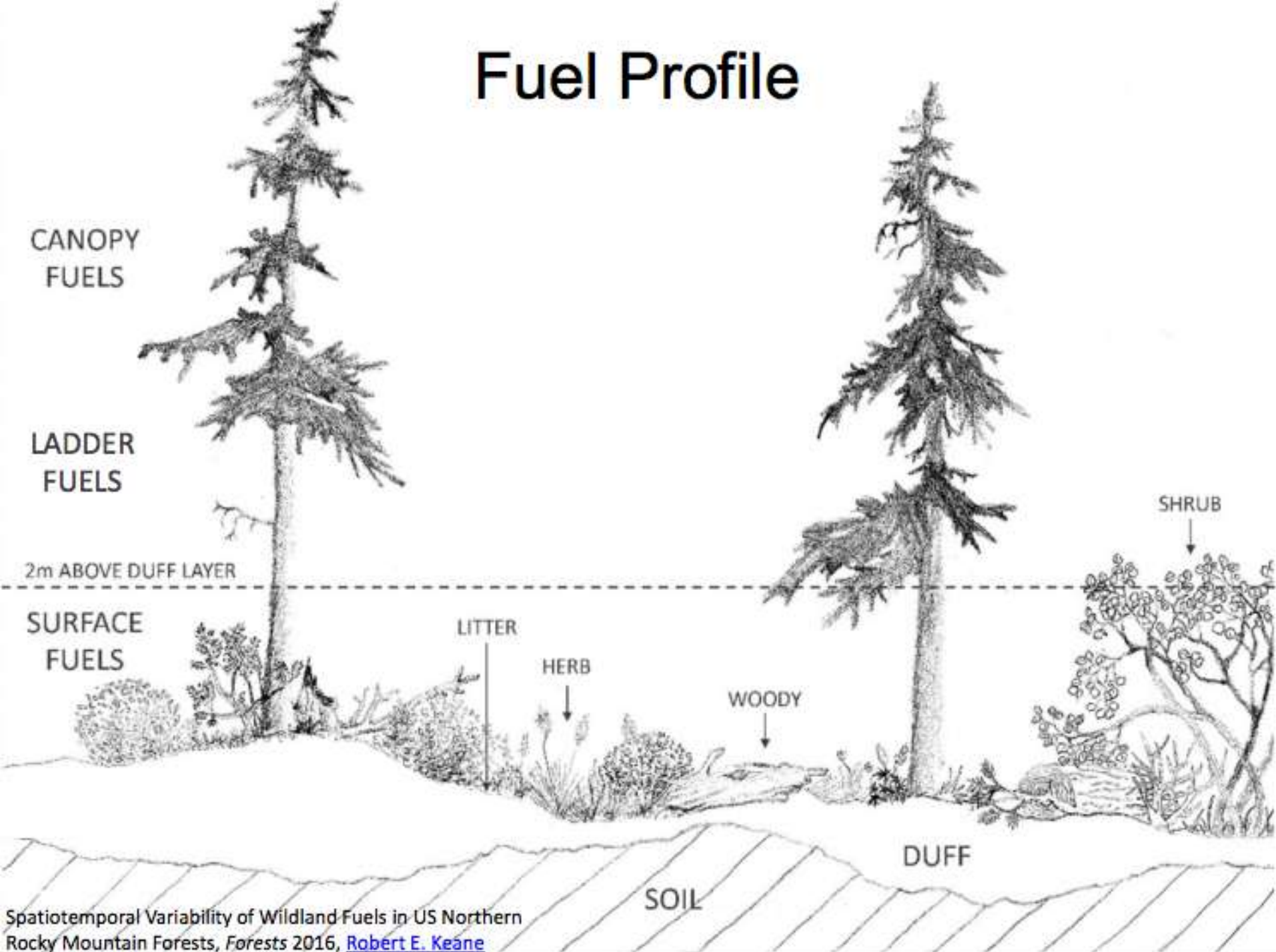
[http://www.hopspress.com/Books/Curriculum\\_Guide/Outdoor\\_Skills.html](http://www.hopspress.com/Books/Curriculum_Guide/Outdoor_Skills.html)



*Figure 4.5 The chain-link of fire triangle to cause combustion (after Byram, 1959).*



# Fuel Profile





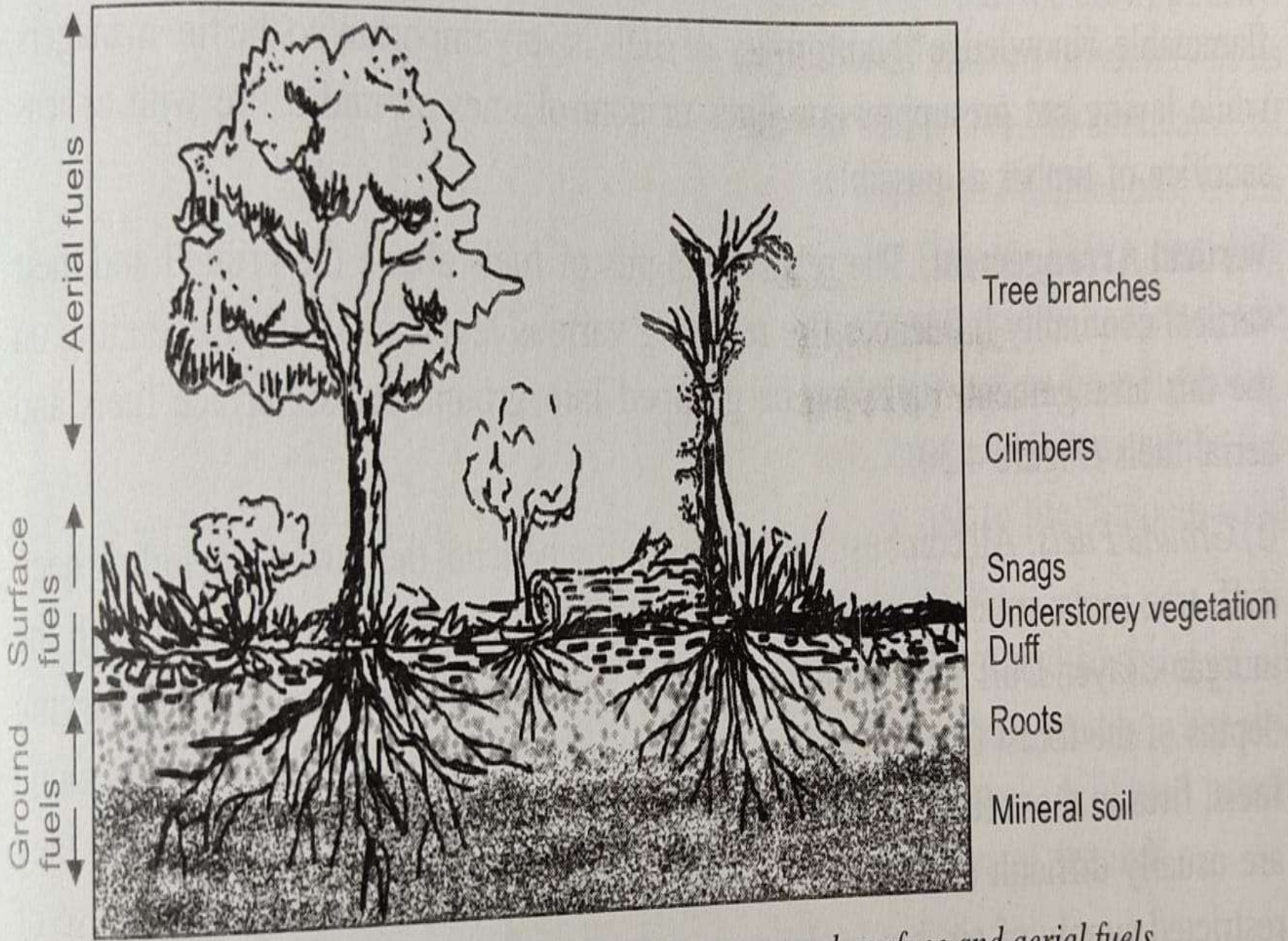


Figure 4.30 Fuel components according to ground, surface and aerial fuels

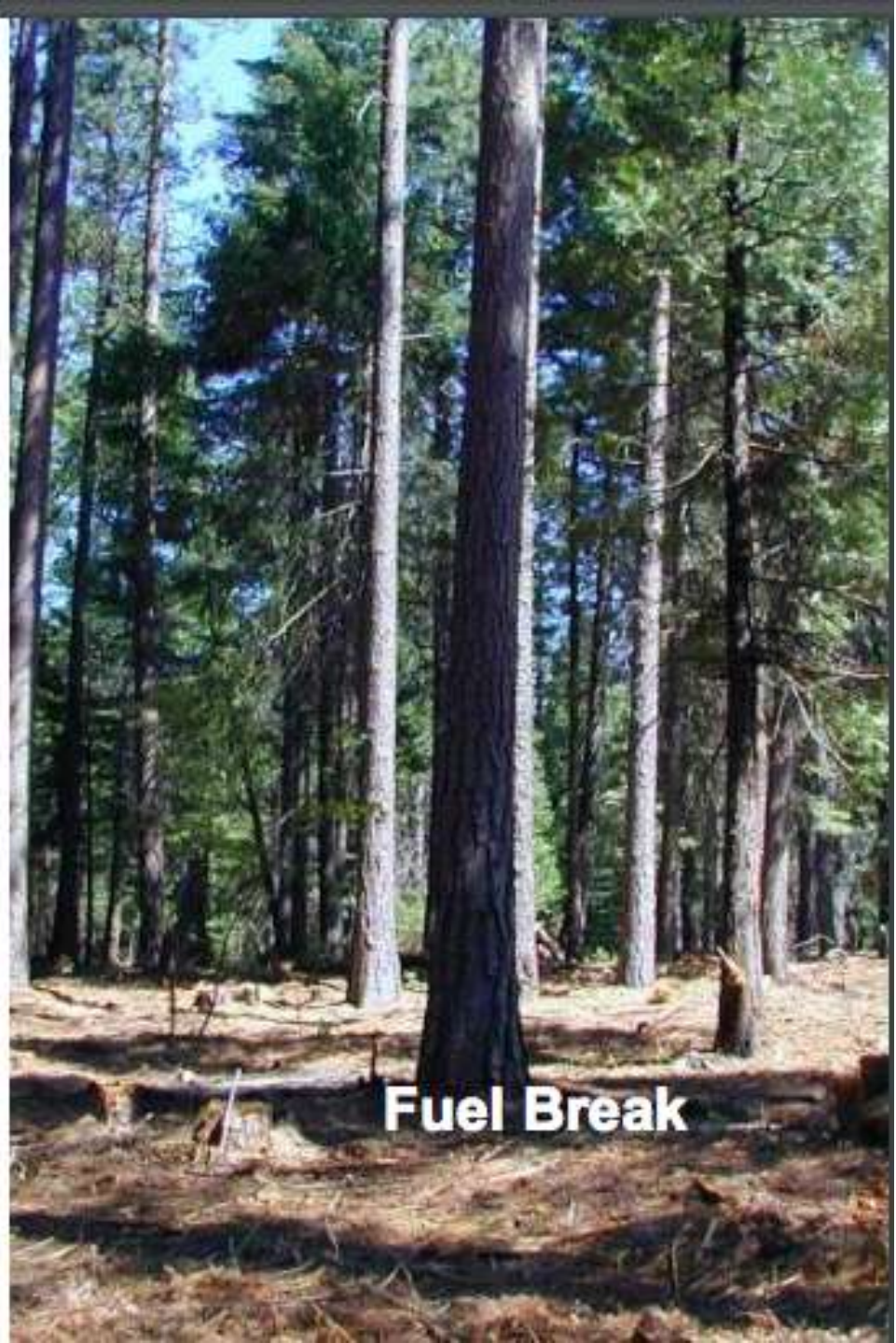




**Crown  
Fuels**

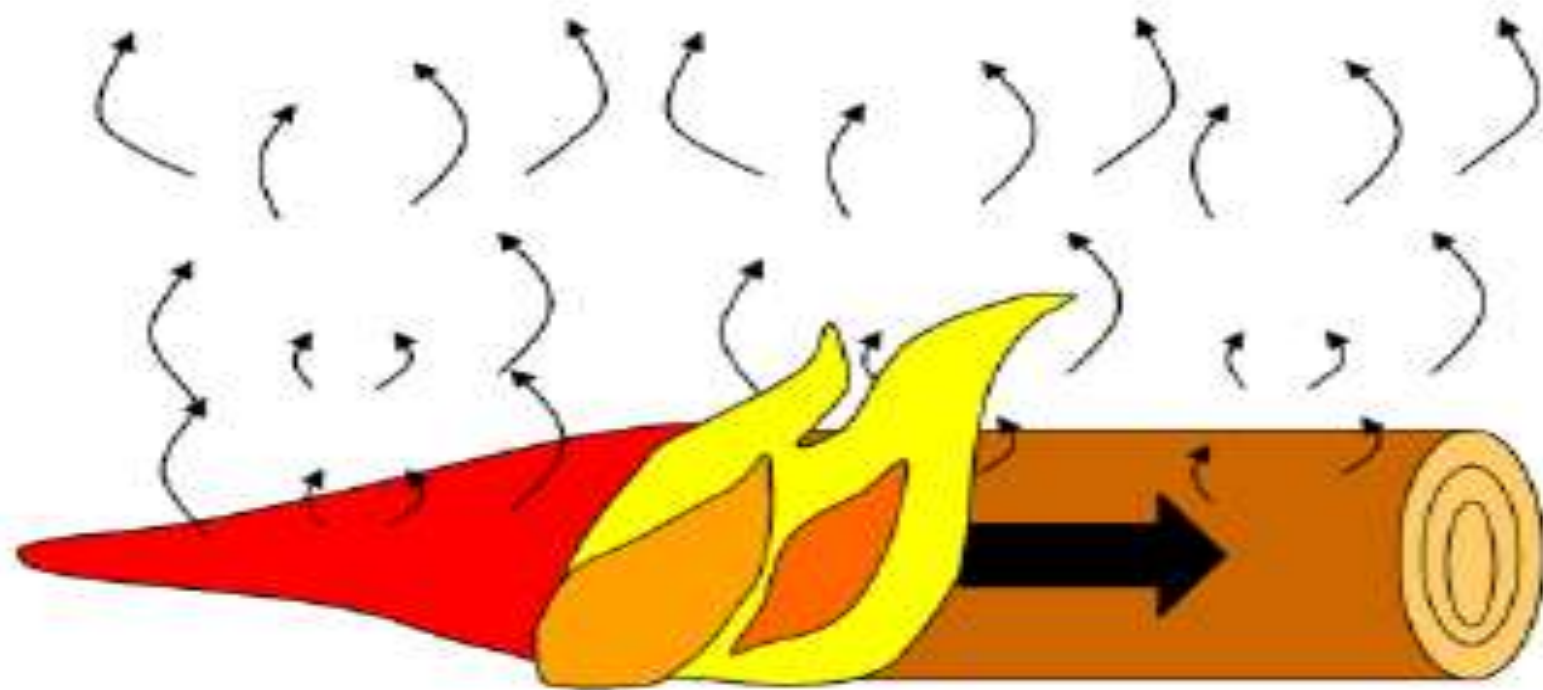
**Ladder  
Fuels**

**Surface Fuels**





combustion products      water vapor



smoldering combustion      flaming combustion      preheating

pyrolysis

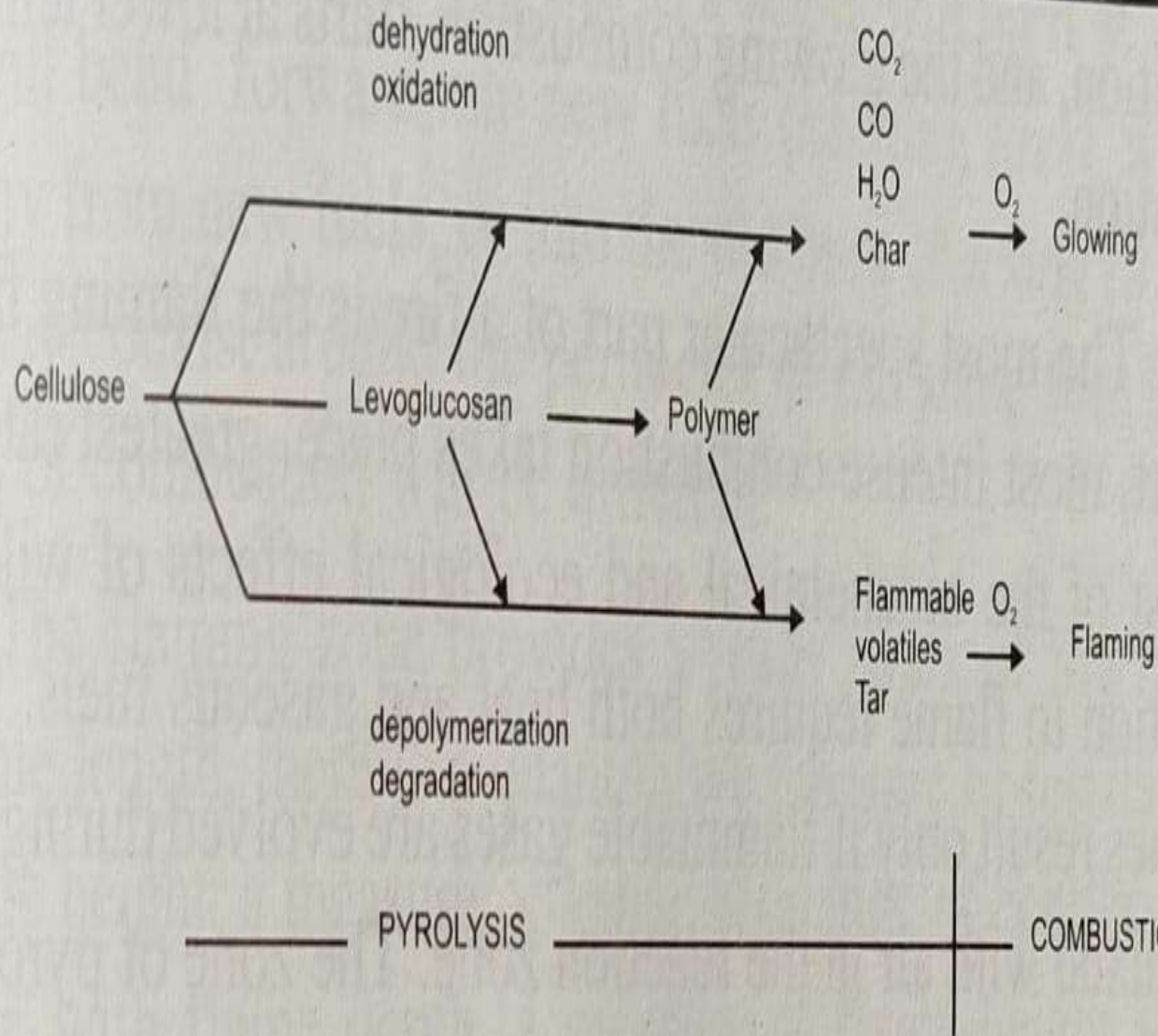
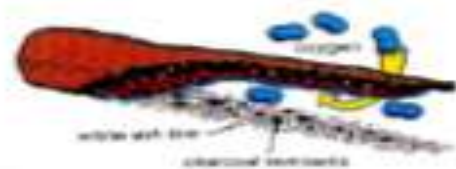
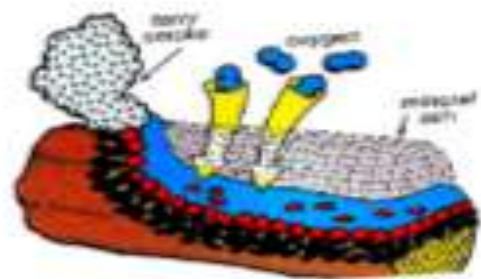
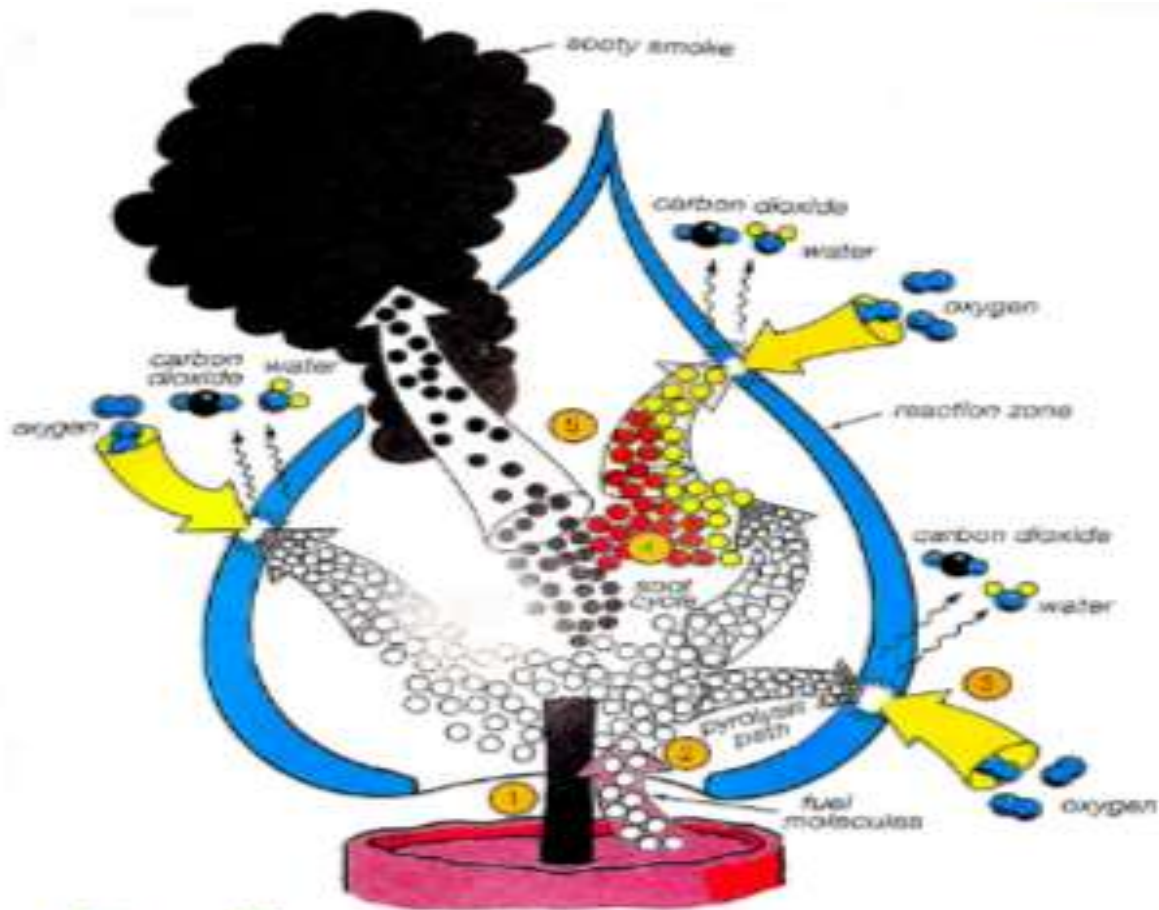


Figure 4.1. Pathways for the pyrolysis of cellulose (after Philpot, 1971)



Example graphics of the pyrolysis path and soot cycle, phases of a burning log, and how a forest burns from William H. Cottrill Jr.'s *The Book of Fire*, second edition.



Flame ① preheats very little fuel and may not ignite the scattered ground fuel. Flame ② preheats a lot of fuel and will progress rapidly through the three phases required for fire. This flame preheats unburned wood by radiation and convection.



## HOW A TWIG WITH NEEDLES BURNS

*Pre-ignition phase—dehydration and fuel cloud formation.*

A pilot heat source dries the fuel by boiling off stored water. Then a fuel cloud develops, containing molecules derived from hot sap, resin, turpene, oils, and tar droplets of pyrolyzed cellulose. The twig and needles scorch, producing tar and char.

*Ignition phase.*

The pilot source ignites the flammable fuel cloud. A combustion reaction zone spreads immediately from the ignition point to envelop the entire fuel cloud and establish continuous combustion.

*Combustion phase—flaming.*

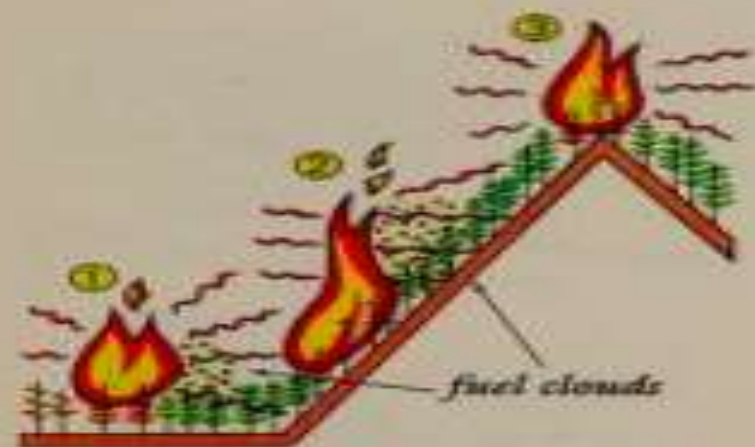
Flaming combustion rapidly depletes the tiny supply of fuel gases released by the twig and needles.



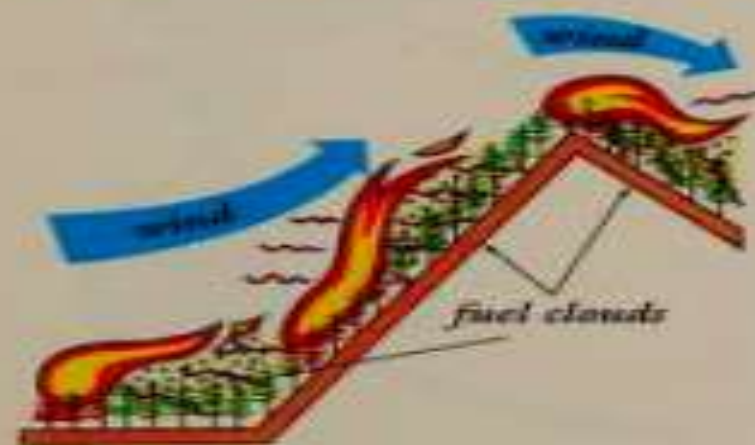
These principles apply readily in a forest setting. In a forest fire, unburned fuels absorb heat from burning fuels. The transfer of heat from burning fuel to unburned fuel occurs by radiation and convection (see paper N-9).

The distance between flame and fuel determines the amount of energy absorbed by radiation. When the flame and fuel are in close proximity to each other, fuel absorbs *much* more energy.

In convective transfer, the flame must reside beneath the unburned fuel so hot molecules can rise from the region of flame to the wood and preheat it.

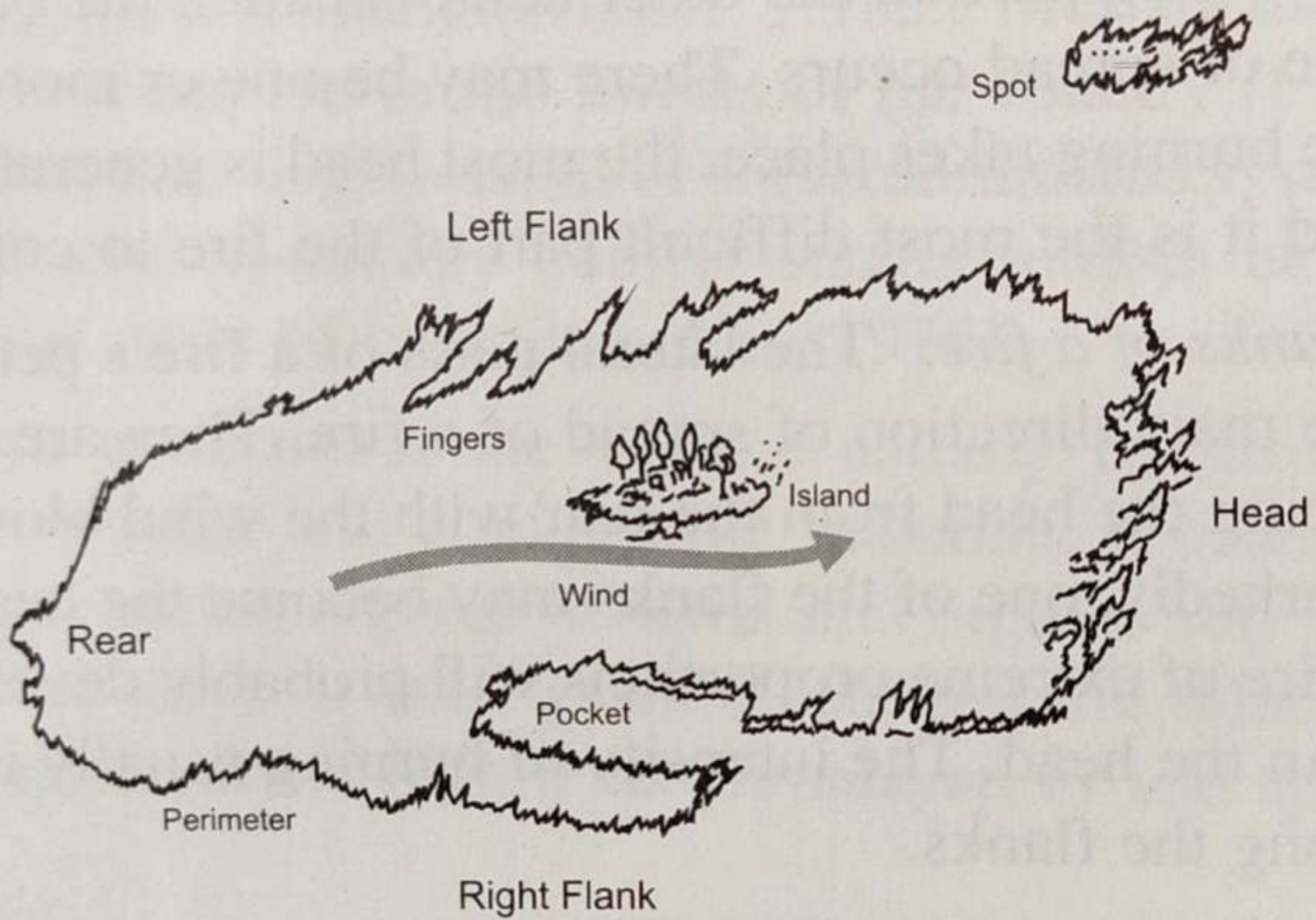


Flame ① preheats (by radiation) only a few trees at any time. The fire spreads slowly. Flame ② preheats many more trees because of its position on the hillside. The fire spreads much more rapidly and "runs" up slope. Flame ③ radiates no trees and rapidly uses up existing fuel and dies out. Many natural fires die on sharp ridges and mountain tops.



Wind pushes the flames closer to the unburned trees, which allows the flames to rapidly radiate and preheat them. Uphill fire movement brings the flames closer still to the unburned trees. Wind encourages downhill fire by bending flames close to fuel that might have escaped preheating.

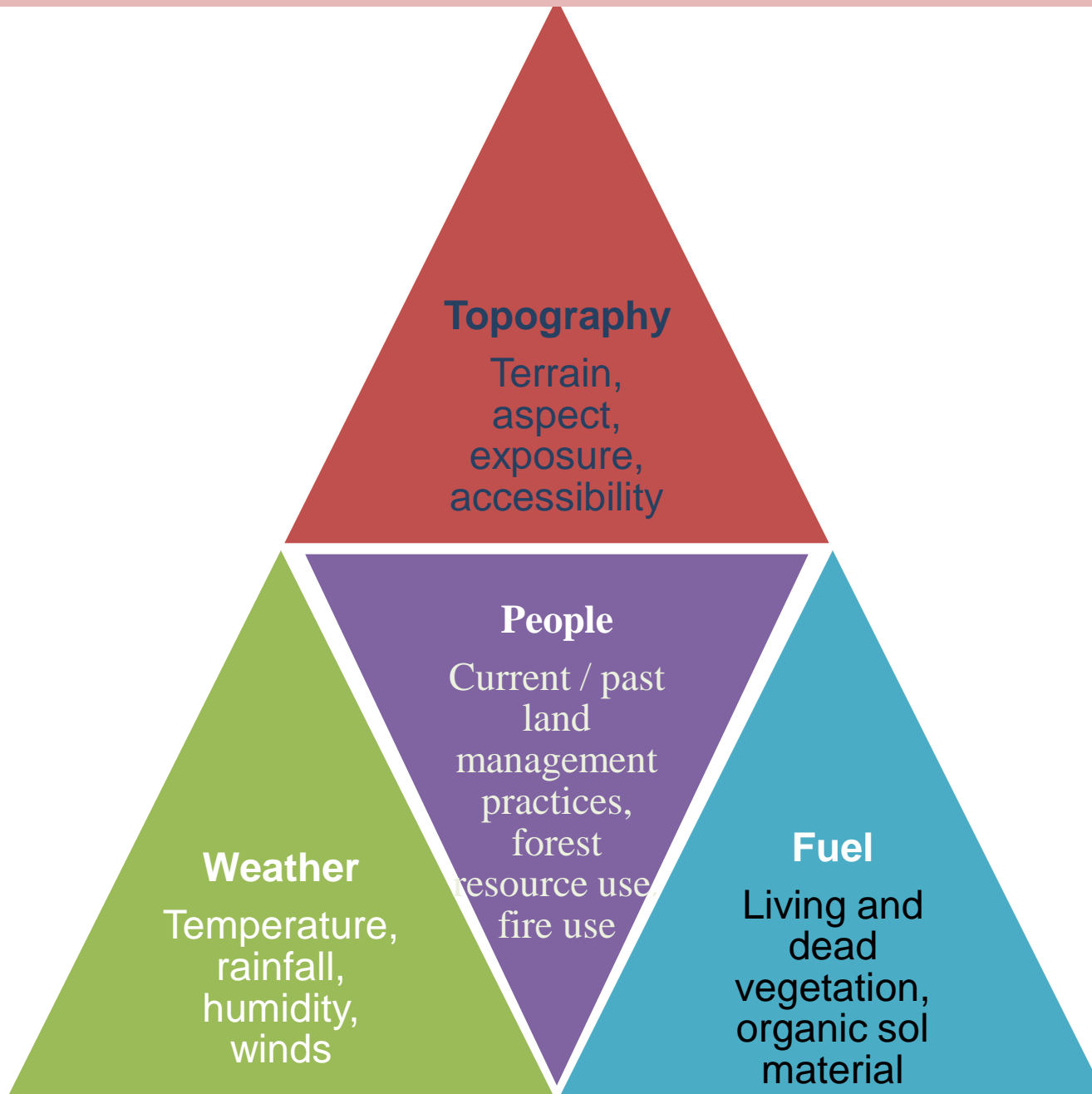




*Figure 4.7 Parts of a fire*



# Fire promoting factors



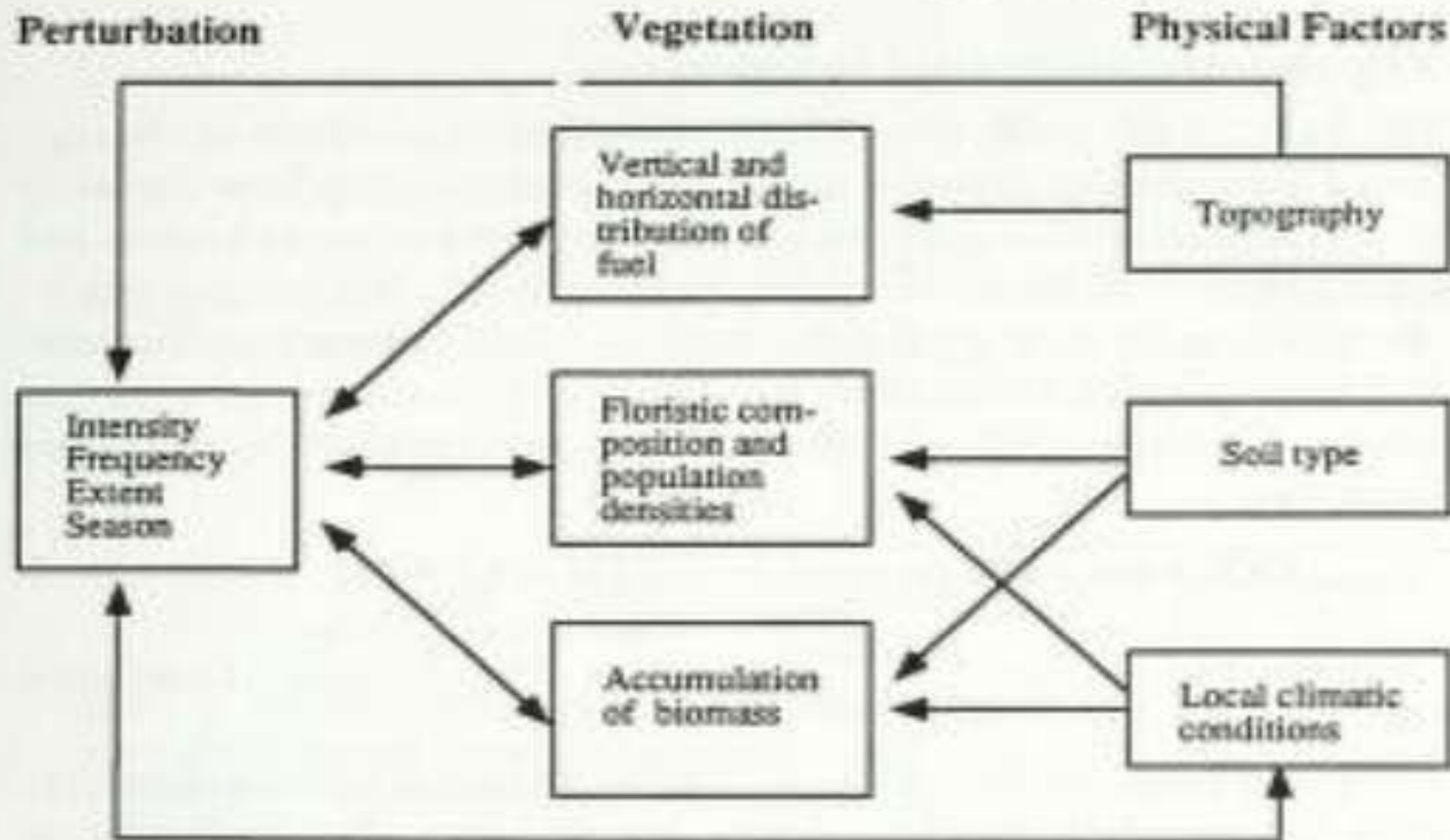
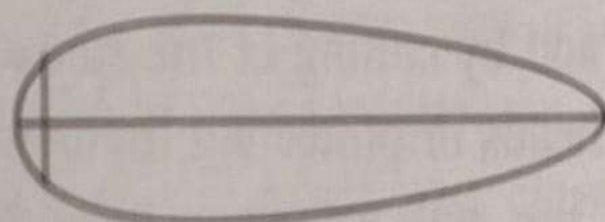
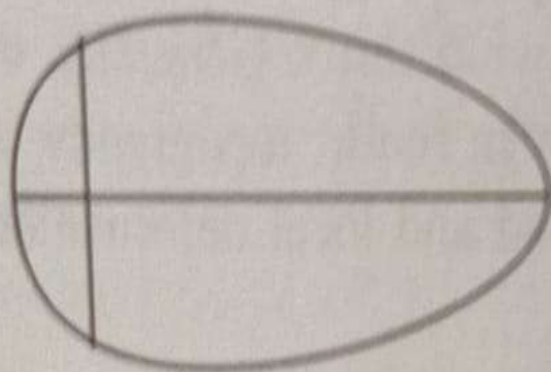
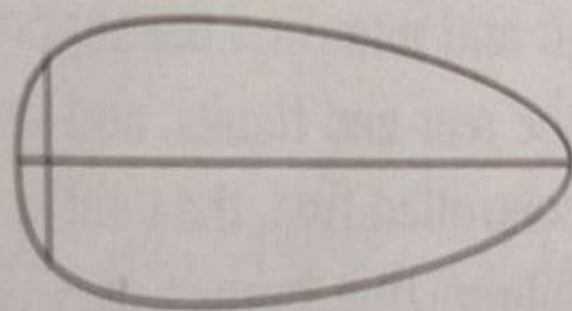
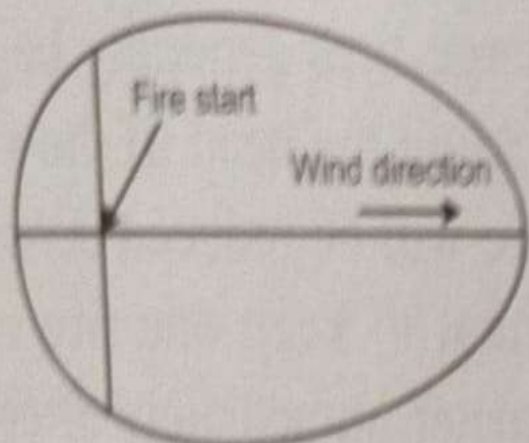


Figure 2.1 Schematic diagram illustrating the interactions between characteristics of fire, the vegetation and physical conditions (modified from Riba and Terridas 1987).



Windspeed, 10miles/hr

Windspeed, 25miles/hr

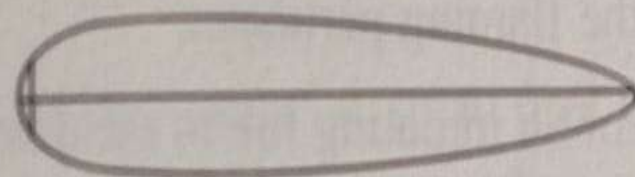


Figure 4.13. Fire shapes under different wind regimes. As the windspeed increases, the backing fire becomes less influential (after Albini, 1976)

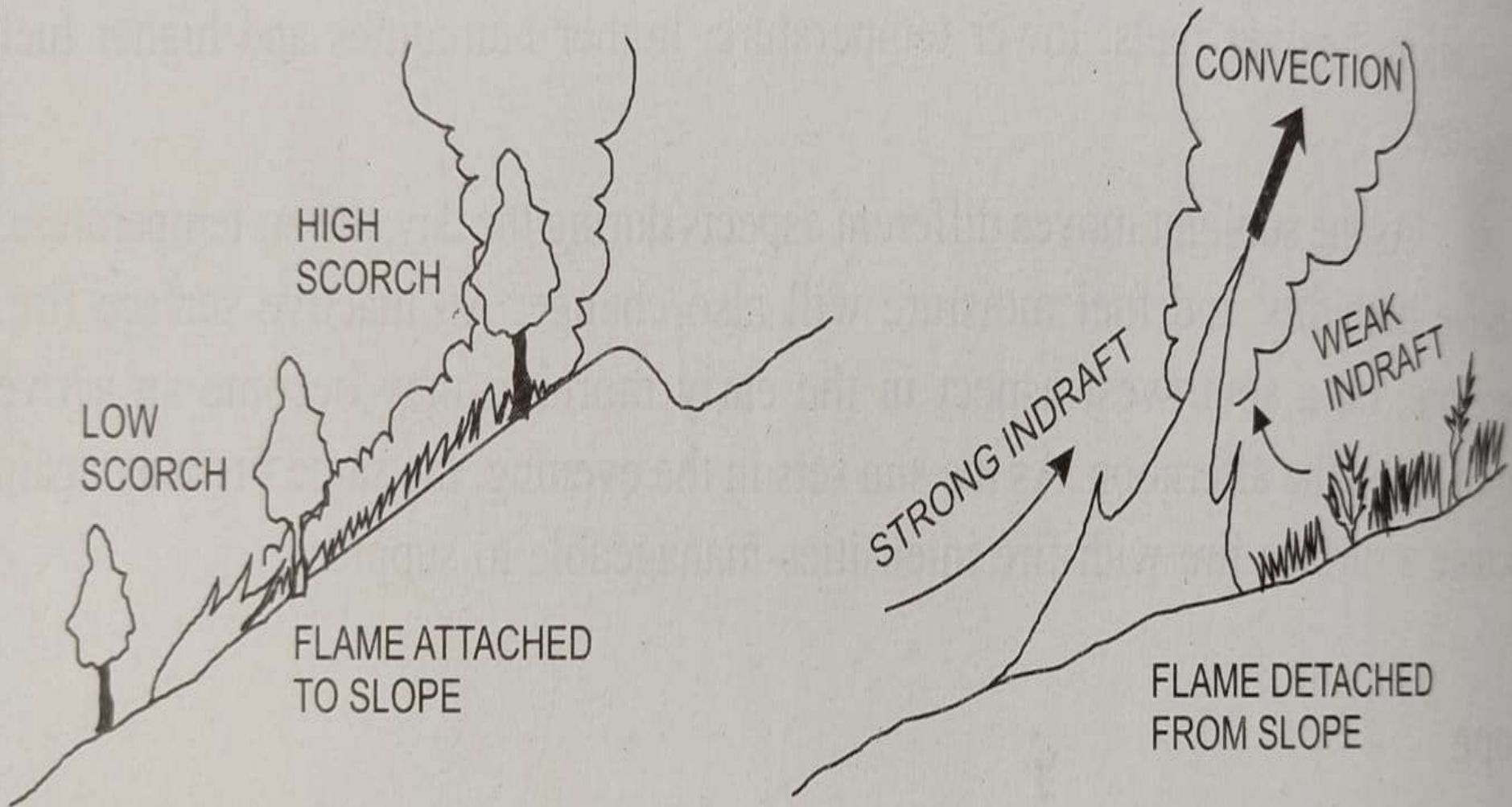


Figure 5.12. Development of convection column and radiation heat on steep and shallow slopes (from Rothermel, 1985)



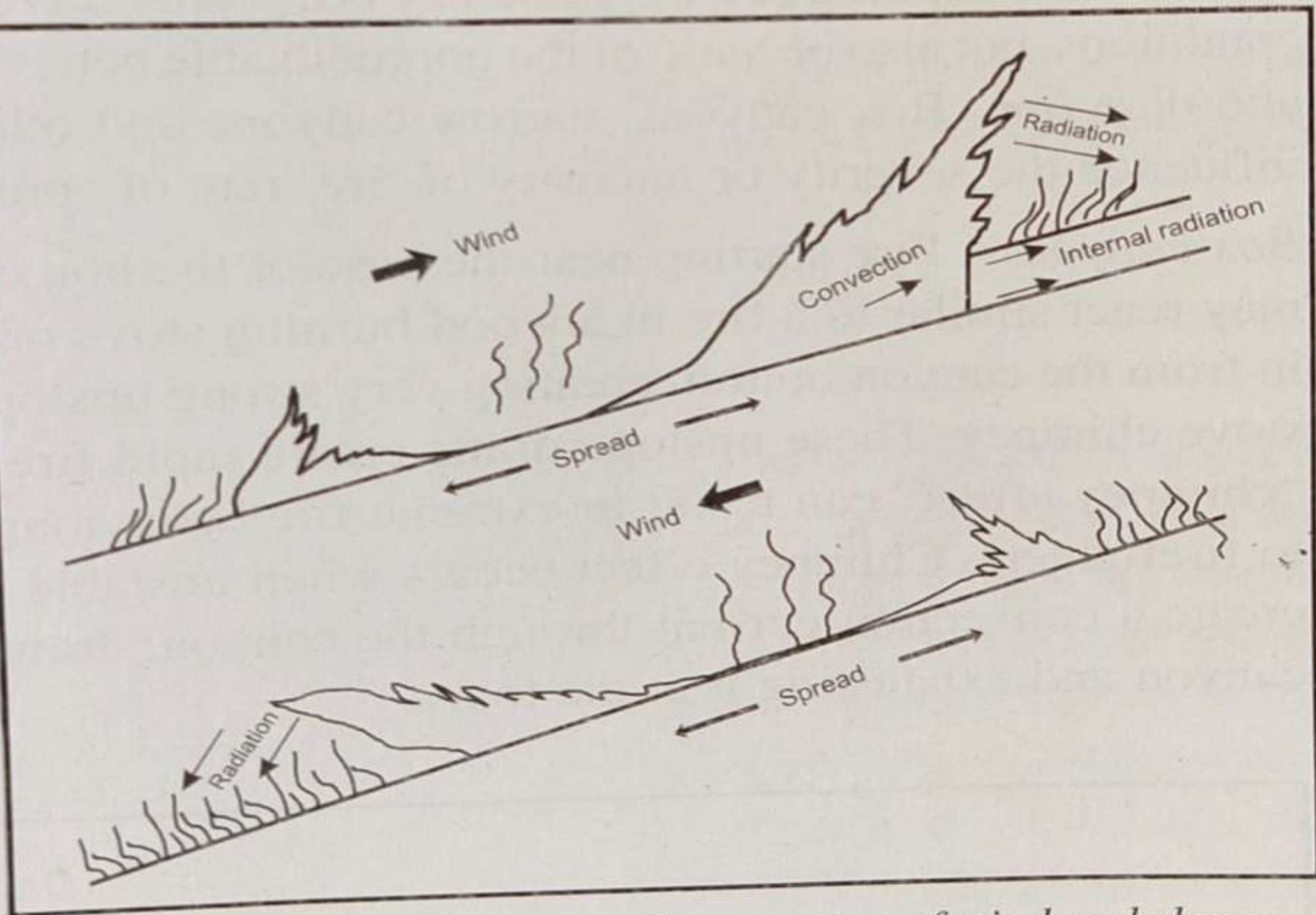


Figure 5.14. The effect of interaction of wind and slope on fire spread (from Pyne et al., 1996)

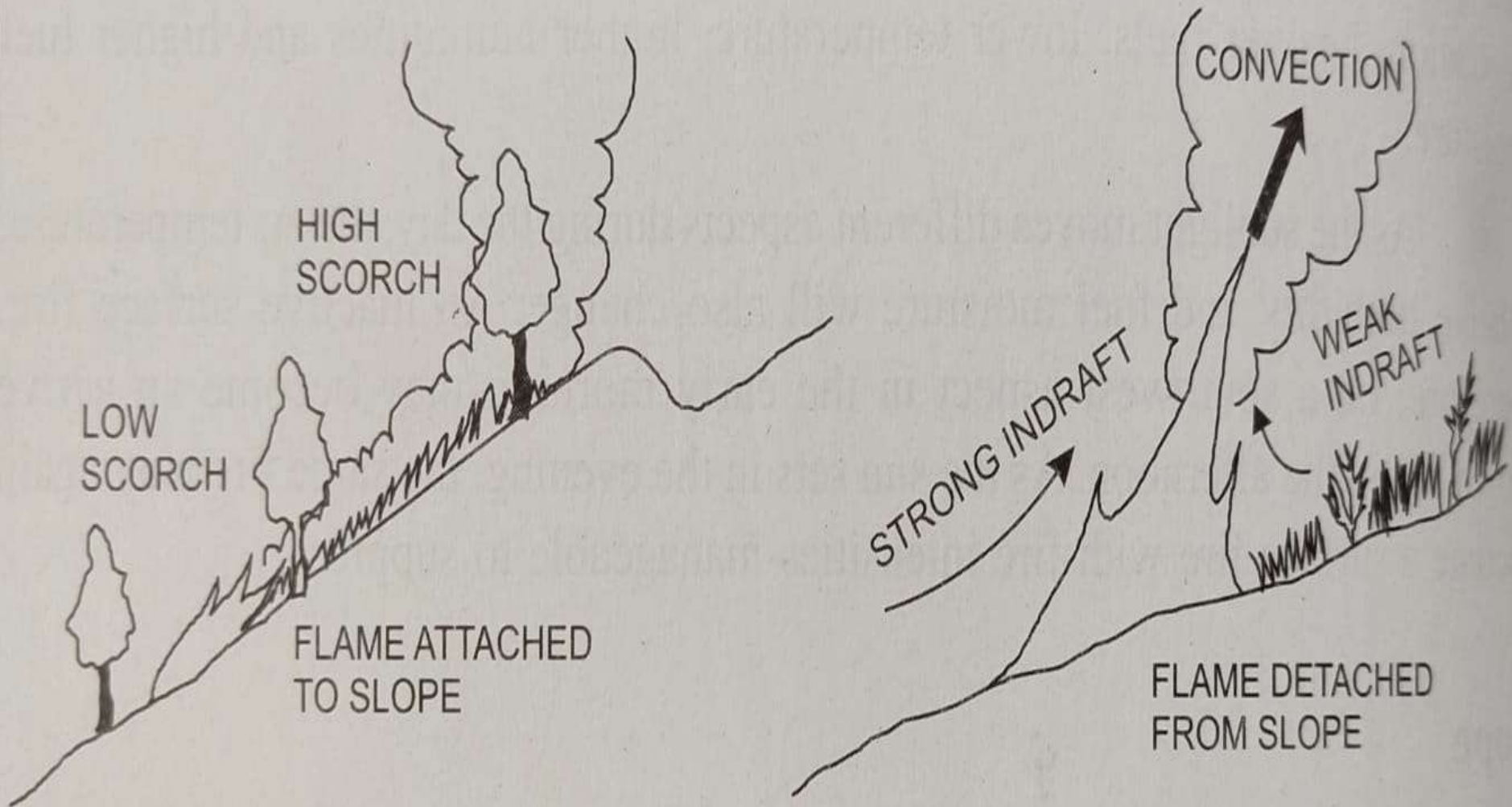


Figure 5.12. Development of convection column and radiation heat on steep and shallow slopes (from Rothermel, 1985)

## Types of Fires

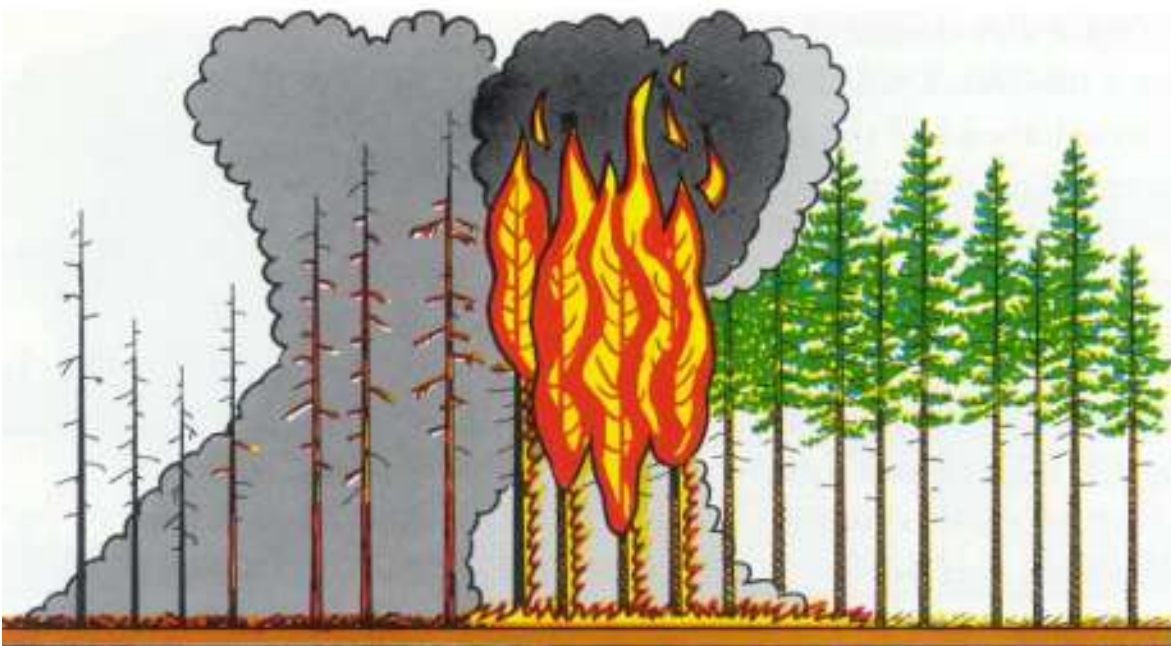
- **Surface fires**- surface fuels, not very severe, common
- **Ground fires**- burn underneath the surface, rare
- (recorded occasionally at High level Himalayan fir & Spruce forests)
- **Crown fires**- burns through top of vegetation, 50-80 km/hr without a connection to fire in surface fuels.
- (Dry deciduous forests-vulnerable, most common – low level coniferous forests in Shiwaliks & Himalayas)
- **Fire storm**- 100 miles/hour



# Fire types



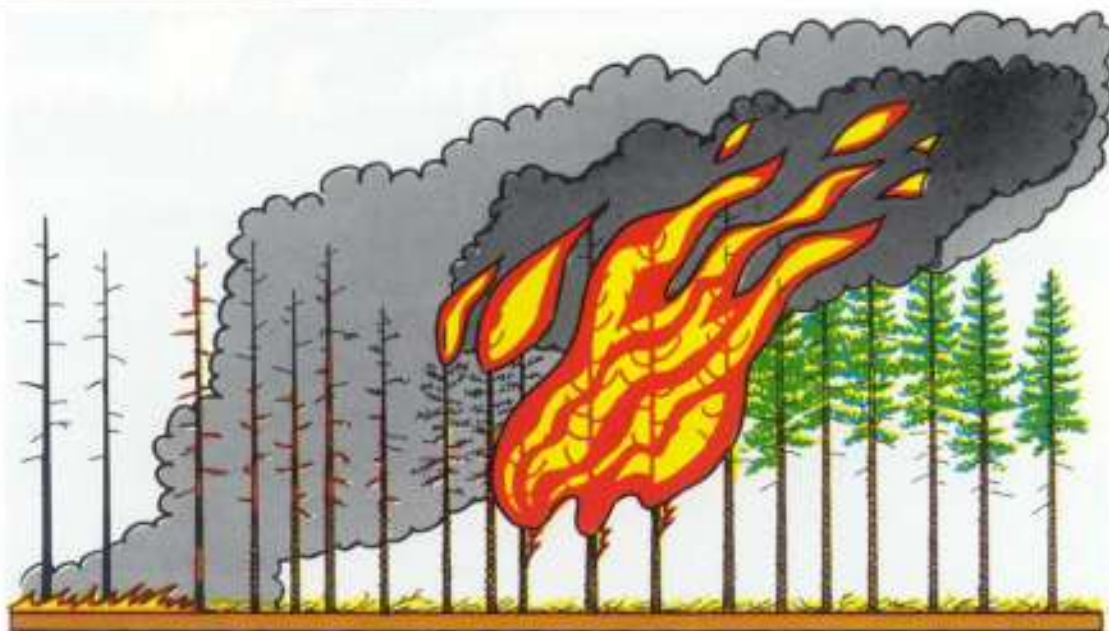




**Crown fire – dependent upon surface fuels, fire**

**Crown fire – independent of surface fuels and fire.**

**Wind, crown biomass.**







**(3) Crown Fire Aftermath**



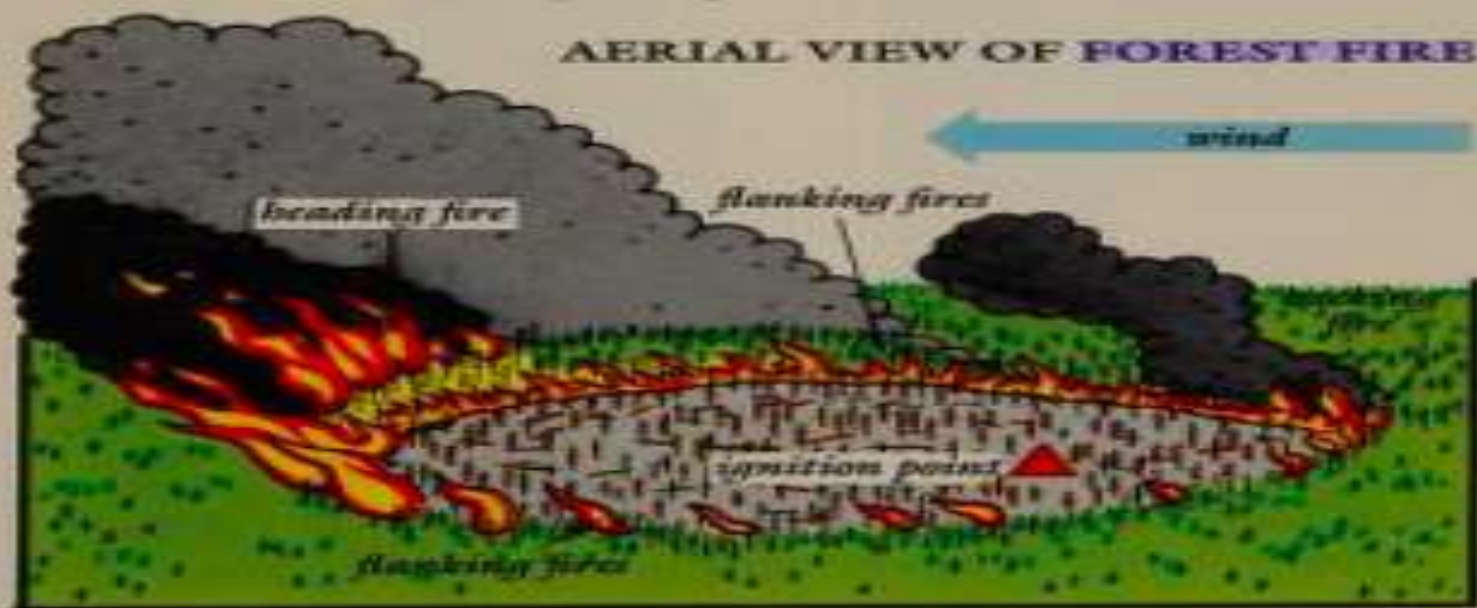
## CROSS-SECTIONAL VIEW OF FOREST FIRE



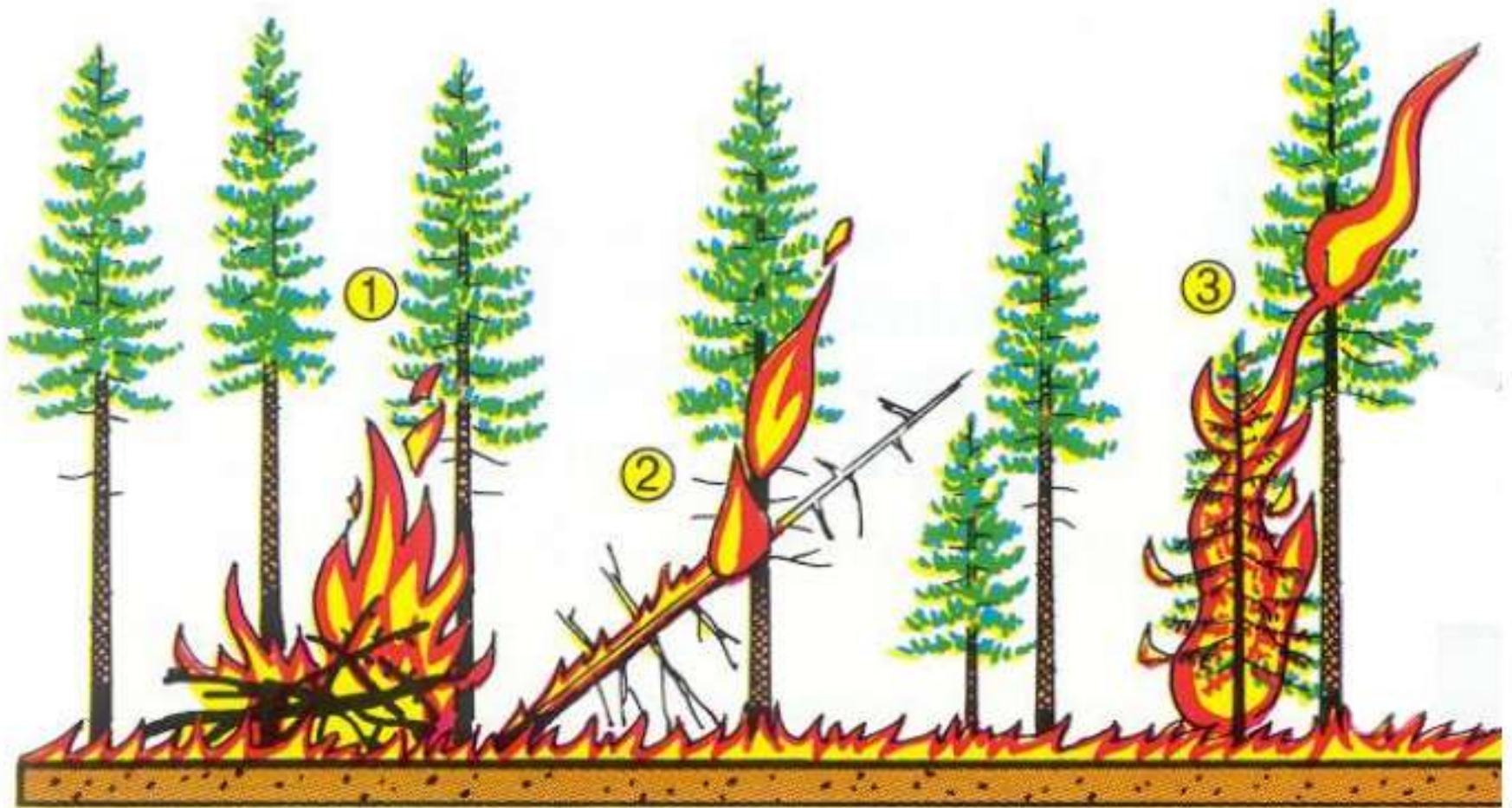
Typical forest fire, showing heading and backing fires, their direction of movement, and their phases of combustion.

- ① pre-ignition
- ② ignition and flaming combustion
- ③ glowing combustion

## AERIAL VIEW OF FOREST FIRE



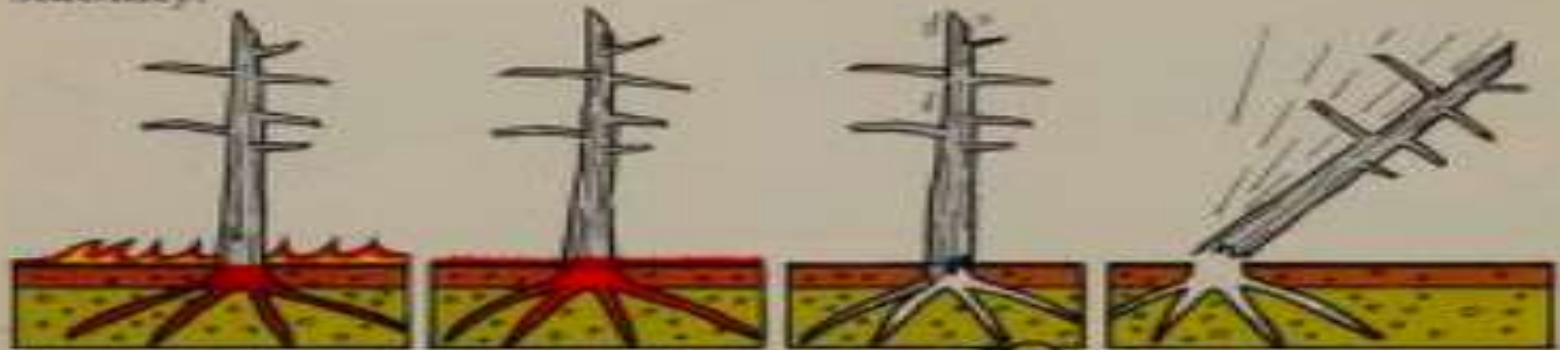
# Exception: Extreme weather (low humidity, high winds)





## SNAGS—WIDOW MAKERS OF THE FOREST

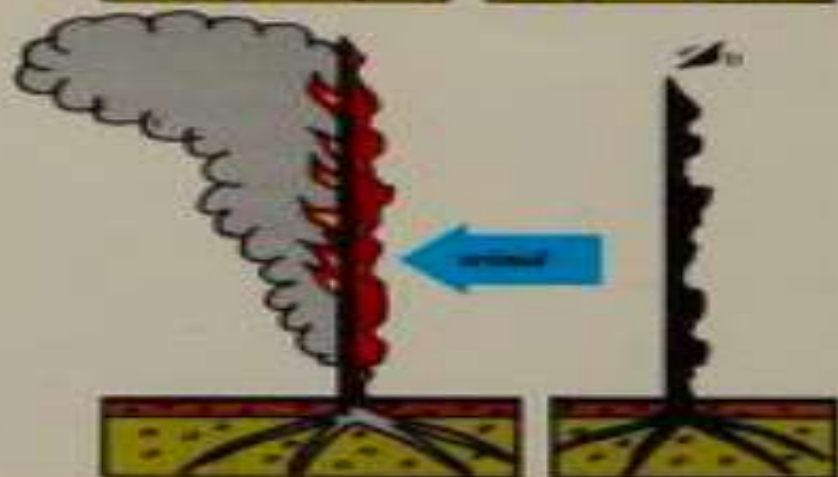
A snag is a dead tree lacking most needles and branches. It burns in several ways. A smoldering ground fire burns out its roots, leaving it teetering, but with no visual clues as to its stability.



If glowing combustion engulfs the white snag and updraft conditions exist, a black pencil snag results.



If high surface winds exist, glowing combustion carves bizarre shapes on the windward side, producing totem snags which reveal wind direction when they burned. The combustion-carved "faces" of totem snags look toward the wind.



# Causes

- State wise reasons ?

Forest Fire Disaster Management -Report by  
NIDM

State wise types of vegetation, causes of forest  
fire and management practices

# Cause of Forest Fires

Natural	Anthropogenic	
	Deliberate Causes	Accidental Causes
<ol style="list-style-type: none"> <li>1. Lighting</li> <li>2. Friction of Rolling Stone</li> <li>3. Volcanic Explosion</li> <li>4. Rubbing of Dry Bamboo Clumps</li> </ol>	<ol style="list-style-type: none"> <li>1. Shifting Cultivation</li> <li>2. To flush growth of tendu leaves</li> <li>3. To have good growth of grass and fodder</li> <li>4. To settle score with forest department, or personal rivalry</li> <li>5. To clear path by villagers</li> <li>6. To encroach upon the forest land</li> <li>7. For concealing illicit felling</li> <li>8. Tribal traditions/customs</li> </ol>	<ol style="list-style-type: none"> <li>1. Collection of Non Timber Forest Produce</li> <li>2. Burning farm residues</li> <li>3. Driving away wild animals</li> <li>4. Throwing burning bidi/ cigarettes &amp; Camp fires by picnickers</li> <li>5. Sparks from vehicle-exhaust / Sparks from transformers /cooking near the forest</li> <li>6. Uncontrolled prescribed burning</li> <li>7. Resin taping</li> <li>8. Making charcoal in forests</li> <li>9. Heating coal tar for road construction in forest.</li> </ol>

# CAUSES OF FOREST FIRES ACCORDING TO SURVEYED FOREST DEPARTMENT OFFICERS, BY STATE (INDEX OF IMPORTANCE, 0-100)

Most important cause of fire

Second most important cause of fire

Category	Cause	Assam	Chhattisgarh	Himachal Pradesh	Jharkhand	Kerala	Madhya Pradesh	Meghalaya	Odisha	Telangana	Tripura	Uttarakhand
	Unknown		3					38				
Natural	Natural, not specified	38		5	8	22		2		4	10	6
	Lightning			1						2	5	
	Other natural			1								
Accident	Accident, not specified				6	36		52	5	2		5
	Electric power			7			6				2	5
	Works											10
	Self-ignition											1
Negligence	Negligence, not specified		3	15	10	64		17			7	35
	Negligence, use of fire	38	32	100	42	100		69	22	36		100
	Negligence, glowing objects	100	18	51	46	19	8	21	1	19	24	33
Deliberate/ incendiary	Deliberate, not specified				8			21			21	13
	Responsible (arson)	58	12	16	19	92	11	2	12	30	10	24
	Not responsible (e.g., fires set by minors)			6								
Resource collection	NTFP collection		100	8	100	72	100		100	100	7	3
	Grazing or fodder		8	73	8	25	22	38	11	64	12	70
Wildlife	Burning to deter wildlife			7	10	39		14	3			17
	Hunting		12	5	4		19	19	14		10	
Other, cultural	Traditional practice, not specified					6	3					1
	Shifting cultivation	85	5					100	45	9	100	6

Source: Strengthening Forest Fire Management in India, MOEF&CC, 2018



## WHAT FIRES CAUSES?

- [Wildfires](#) have significant impacts on humans and on the natural environment.
- Affect human **lives and livelihoods** (Finlay et al., 2012)
- Result in **high social and economic costs** (damages, prevention and suppression )(Biro, 2009).
- Large increases of **atmospheric emissions and pollutants** (Carvalho et al., 2011)
- **Soil erosion** (González- Pérez et al., 2004)
- Reduce the **provision of goods and services** by forest (Mavsar et al., 2013)
- **Change land cover patterns and landscape ecosystem dynamics**  
(Moreira et al., 2011;San-Miguel-Ayanz et al., 2012)

# Economic Impact of Forest Fires

- Loss of timber resources
- Degradation of catchment areas
- Loss of biodiversity, wildlife habitat and extinction of plants and animals
- Loss of natural regeneration and reduction in forest cover,
- Loss of carbon sink resource and increase in percentage of CO<sub>2</sub> in atmosphere and global warming
- Change in the microclimate of the area with unhealthy living conditions,
- Soil erosion affecting productivity of soils and production,
- Loss of livelihood for dependent people

# Impact of Forest Fire on Forest Eco systems

## ➤ Soil Development and Nutrient Circulation

Changing Rates of Soil Organic Matter Formation / availability of nutrients/ Population of Micro-organism /Increase in Soil Erosion with loss of Vegetation

## Water and Water Circulation -

Changed Rates of Evaporation and Transpiration / Permeability sub-Surface Flow

## ➤ Vegetation and Plant Species

**In long Term** - Curtailment of Natural Succession and Regeneration / A Mosaic of Succession Stages Burning Frequency

**Short-Term** - Affecting Plant Biomass, Structures and shape / Affecting Plant Phenology / Affecting Forage Nutrient Level

**Species** - Altering Pattern of Resource Availability-Cover Food Water / Altering Patter of Distribution /Possibility of Mortality

## Studies done in India

- **Timber quality** - affected by scorching from the base of the tree - damages the cambium, leading to defective butt logs.
- **Fungal infection may occur through the damaged tissues** and cause rot.
- The records of timber sold through the Ballarshah depot of the Forest Development Corporation of Maharashtra reveal that the average price received in 1984/85 and 1985/86 for **fire-damaged logs** was 9.8 percent lower than the average price of all logs sold.
- In the Nainital chir pine forests in Uttar Pradesh, **resin tapping** affects the yield of merchantable timber by damaging the lower part of the tree; the **scars enable fires to burn into the heartwood and, in some cases, kill the tree.**



Contd..

- According to a study by Srivastava (1989), during the Sixth Five-Year Plan (1980-85) 17852 fires were reported, affecting **an area of 5.7 million ha**, or an annual average of some 1.14 million ha.
- However, extrapolations of fire data in two representative areas (Chandrapur and Haldwani) indicate that the total area burnt annually may range between **2.66 and 13.95 million ha** (Saigal, 1989).
- Even this range may be regarded as conservative; data collected by the Forest Survey of India indicate that the **forest area that is affected by annual fires may be as much as 37 million ha** (Ministry of Environment and Forests, 1987).
- Rawat (1949) controlled burning in the sal plantations of Bengal, shows that fires significantly **reduced the diameter growth of trees**.

## History of Fire Management

- Brandis started work of protecting forests in Central Provinces- 1860s
- Major Pearson, conservator attempted fire protection measures- Bori Forests- Hot season of 1865
- In 1895 , 17 million acres or 36% successfully protected from fires out of 47 ½ Million acres of RF in British Empire

## Modern forest fire control project

- 1984 - FAO/UNDP-assisted project in modern forest fire control was launched by the Government of India. The underlying thesis of the project is that fire damages and losses can be reduced considerably by using the basic components of **prevention, detection, suppression and communication**
- The project implemented in two-areas which together are considered representative of the overall Indian situation - Chandrapur and Haldwani.
- **Chandrapur (Maharashtra State)** covers an area of 162600 ha with an undulating terrain consisting of natural teak forests and extensive teak plantations. It also includes the Tadoba National Park and is well served by communication and road links.
- **The Haldwani project area** (372700 ha) in Uttar Pradesh State is more diverse and includes mountains with forests of chir pine and sal natural forests. The flat Terai region has been converted largely to eucalyptus plantations for commercial pulp production.
- The demonstrated success of the techniques developed of above project led to an extension of this project into the **second phase to coincide with India's Eighth Five-Year Plan**.
- In phase two, the project was extended to ten states covering some **40000 km<sup>2</sup>** of valuable productive forest equivalent to 75 percent of India's commercial forest.



PAST EXPERIENCE OF INTRODUCTION OF MODERN FOREST  
FIRE CONTROL PROJECT IN MAHARASHTRA

The project was introduced in Chandrapur in 1984 in an area of 1628 sq.km.covering valuable forest,the prominent species being teak. Most modern fire control systems, tools and equipment relevent to the area have been used. On the basis of the experience of the first four years of the project, it can be rated as highly successful. The fire damage data collected during these years is as under :-

Year	Fire incidents	Area burnt in Ha.	Average size of fire(ha.)
1.	2.	3.	4.
1984-85	127	24132	190
1985-86	115	14849	129
1986-87	91	6338	70
1987-88	127	3353	26

From the above data it is evident that the total area burnt has been reduced to 13.89 percent and the average size of fire has been reduced to 13.68 percent in just four year.

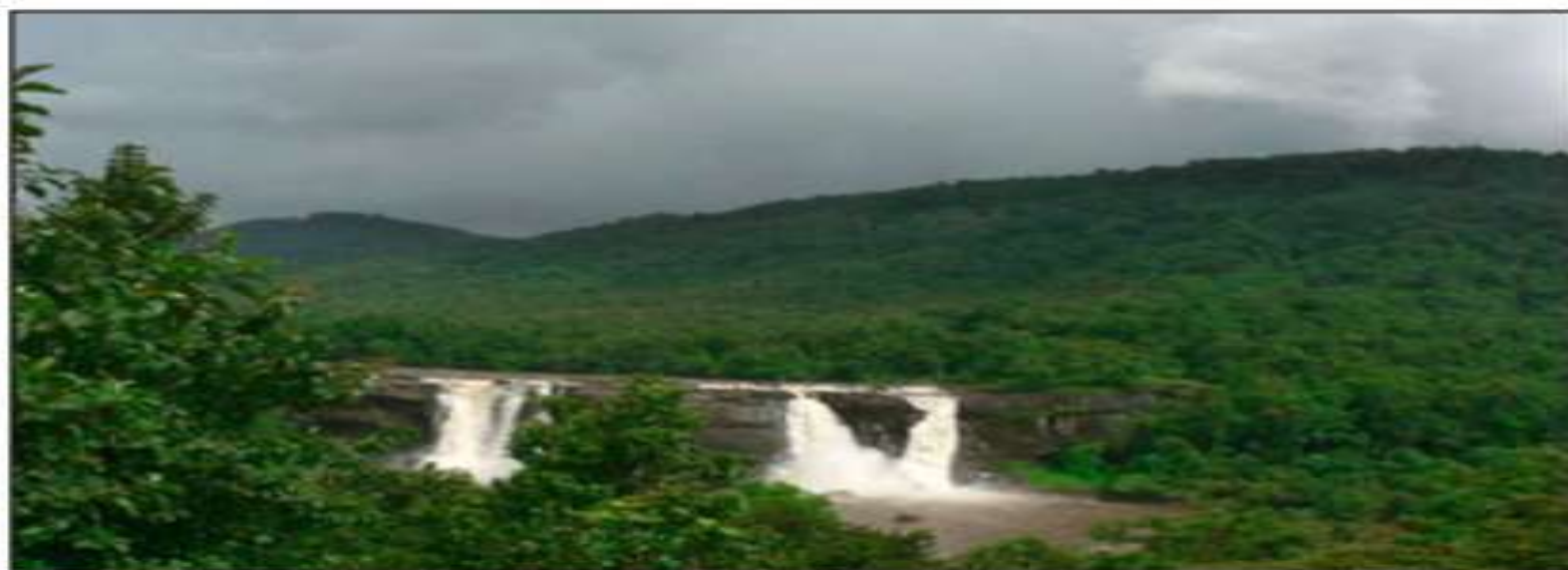
## CONTD...

- Success in Technical soundness and economic efficiencies.
- MoEF introduced CSS on **“Modern Forest Fire Control Methods”** since 1992-93 in the eleven selected States of Andhra Pradesh, Bihar , Gujarat, Himachal Pradesh, Kerala, Karnataka, Madhya Pradesh, Maharashtra , Orissa, Tamil Nadu and Uttar Pradesh.
- The project continued during the first three years of the Ninth Plan period i.e. from 1997 to 2000.
- In 2000 -all the States & UT’s
- In Tenth plan – gains of above project formalised into CSS **“Integrated Forest Protection Scheme”(IFPS)**
- Continued in 11<sup>th</sup> Plan as well.
- Erstwhile IFPS revised as **Intensification of Forest Management Scheme (IFMS)** with addition of 4 new components.
- In 2017, IFMS was revised & replaced as **CSS- Forest Fire Prevention & Management Scheme (FMS)**

- FAO aided TCP project on **Training in Forest Fire Management Planning** started in May, 1995 and concluded in December, 1995
- **Technical Cooperation Project (TCP) :**
- objective - review India's current forest fire problem, Provide **training** in strategic fire planning to key forestry personnel at the State and National levels to enable them to **develop fire plans** based on ecological, economical and social conditions for their respective States and to develop at least one model State Forest Fire Management Plan.
- Since **2005**, FSI **monitoring forest fires** across the country using inputs received from **MODIS satellite system**, a joint collaboration of NASA and Geography Department of University of Maryland.
- In March **2010**, FSI started a system of **sending SMS/email alerts** through its website [www.fsi.nic.in](http://www.fsi.nic.in).

# **INTENSIFICATION OF FOREST MANAGEMENT**

**( A CENTRALLY SPONSORED SCHEME )**



## **OPERATIONAL GUIDELINES AUGUST 2009**

**FOREST PROTECTION DIVISION  
MINISTRY OF ENVIRONMENT & FORESTS  
GOVERNMENT OF INDIA**



## **Components of Scheme:**

### **1. Forest Fire Control & Management**

Creation of fire line.

Maintenance of fire line by

Construction of watch towers.

Engagement of firewatchers.

Assistance to Joint Forest Management Committee (JFMC).

Construction of water storage structure.

Setting up of firefighting cells.

Procurement of firefighting equipments.

Fire mapping and preparation of fire management plan.

Training & awareness.

F. No. 3-1/2017-FPD (Pt.)  
Government of India  
Ministry of Environment, Forests and Climate Change  
(Forest Protection Division)

5<sup>th</sup> Floor, Agni Wing,  
Indira Paryavaran Bhawan,  
Jor Bagh, Lodhi Colony,  
New Delhi – 110003  
Dated: 6<sup>th</sup> December, 2017

To,  
The Principal Chief Conservator of Forests (HoFF)  
Department of Forests  
Government of All states / UTs.

**Sub: Operational Guidelines for the CSS: Forest Fire Prevention & Management Scheme (FPM) – request for submission of APO for the year 2017-18 – regarding.**

Sir / Madam,

I am directed to inform that the erstwhile CSS: "Intensification of Forest Management Scheme" (IFMS) has been revised and replaced as CSS: "Forest Fire Prevention & Management Scheme" (FPM) with the approval of the competent authority to focus mainly on forest fire. In this connection, please find enclosed a copy of the Operational Guidelines for the Centrally Sponsored Scheme of Forest Fire Prevention & Management (FPM).

2. The States/UTs are requested to submit the Annual Plan of Operation (APO) for the current financial year (2017-18) **on or before 22<sup>nd</sup> December, 2017** as per the operational guidelines of the FPM scheme and for the total allocation of the budget to the concerned States / UTs. A copy of the state/UT wise allocation of funds under the FPM scheme and adhoc released made is enclosed. It is requested that the APO should be complete as per the Operational Guidelines.

3. Moreover, it is also requested that UC, Progress report, photographs and geographic coordinates (wherever possible) of the works undertaken against at least 50% of the adhoc release made during the first quarter of the current financial year should be submitted to enable the Ministry to consider release of remaining amount for the year, subject to proposals under the above APO.

4. It is to mention here that, to address the exigencies of fire season in the first quarter of the current financial year, an amount of 60% of the state-wise allocation under the erstwhile IFMS

**Guidelines for utilisation of Imprest Money**

Forest fire, besides being an annual feature of the Indian forests, often involves emergency situations necessitating mobilisation of manpower and other resources at short notice. To handle such situations a readily accessible fund, i.e. Imprest money with the PCCF (HoFF) or any authorised officer of the Forest Department of the state/UT with earmarked fund will be available, so that routine sanctioning processes can be avoided to avoid delay. However, after the expenditure is made, ex-post facto sanction will be taken as per the state's own norms. In the following cases only the expenditure from the Imprest money can be made for:

1. Payment of wages of villagers mobilised for dousing forest fire
2. Transportation of manpower and material to the fire locations
3. Providing medical assistance to the injured while dousing forest fire

An annual statement of expenditure made out of the Imprest money, certified by HoFF, will be submitted alongwith the APO of the subsequent year. The unutilised part of the money will be treated as Unspent balance. Any expenditure made out of this fund, other than the above purposes, will be given adequate justification in the annual statement, for consideration of the Ministry.

**Guidelines for conducting Short term research/study**

The scheme provides for creation of state/site specific knowledge related to forest fire prevention and management and documentation of the same. To achieve this, short term research activities, studies and survey works can be taken up under the scheme. Such activities may be awarded to credible organisations of the state, Universities in the state, research wing of the Forest department etc.

While proposing such activities in the APO, following aspects should be considered:

1. The duration of each activity should be between six months and one year.
2. A concise proposal for each of such activity should be submitted. This should include aim & objective of the study, methodology, agency/persons to conduct the research, cost implication and expected result& its utility.
3. Each proposed research/study should be conducted within an expenditure of Rs two lakhs.
4. A statement of expenditure and the final report in respect of each approved research/study proposal shall be submitted with the subsequent APO.

An indicative list of topics is given as below:

- a. Developing and Improving Danger rating system
- b. Assessment of impact of fire on vegetation
- c. Impact of fire on invasive plants
- d. Assessment of impact on forest fauna
- e. Mapping critical habitats/endangered plants and their vulnerability in Fire Risk Areas
- f. Impacts of fire on soil structure and soil moisture
- g. Evaluation of role of JFMCs in assisting in Forestry activities particularly in Forest fire management
- h. Criteria for laying fire lines and their effective width



**CENTRALLY SPONSORED SCHEME OF FOREST FIRE PREVENTION AND MANAGEMENT (FPM)**  
Annual Work Programme for the year.....

Name of the State/UT:

(Rs. in lakhs)

S.No.	Items	Unit	Unit Cost	No. of Units	Total Cost	Location (Division, Range & Beat)
1	Procurement of fire fighting equipments					
2	Controlled burning, fire line creation and maintenance					
3	Creation of infrastructure (communication system, development of Management Information System, watch towers, forest roads, water storage structures, control rooms at Division & Range level, , FG barracks and inspection huts etc)					
4	Procurement of field vehicles for transportation of resources					
5	Soil & Moisture Conservation (SMC) work in High risk areas					
6	Engagement of fire watchers					

7	Awareness campaign					
8	Pre-fire season workshops for coordination among line departments and elected bodies and NGOs					
9	Training and capacity building on fire fighting methods for Frontline staff, NGOs and village communities					
10	Incentivizing Villages/Communities for protection against forest fire, under the participatory forest management approach					
11	Contingency fund with the Head of the Forest Department of each state/UT or the designated officer for an emergency situation. 5% of the sanctioned amount shall be earmarked for this purpose. Guidelines for utilisation of this fund is given at <b>Annexure-I</b> .					
12	Monitoring and review (guidelines at <b>Annexure-II</b> ). 2% of the sanctioned amount shall be kept for this.					
13	Short term research/survey on forest fire					

	related issues (guidelines at <b>Annexure-III</b> ). 3% of the sanctioned amount shall be earmarked for this purpose.					
14	Any other items considered essential and as proposed in the scheme of the state or central government with the approval of Screening committee.					
	<b>Total</b>					

**No.22-8/2000-JFM (FPD)  
Government of India  
Ministry of Environment and Forests  
(JFM Cell)**

Paryavaran Bhawan, CGO Complex,  
Lodi Road  
New Delhi.

Dated: 24<sup>th</sup>December, 2002

To:

**All the Secretaries**  
Forest Departments (for all the States/UTs)

**All the Principal Chief Conservator of Forests**  
(for all the States/UTs)

**Subject: Strengthening of Joint Forest Management (JFM) Programme.**

Sir,

Attention is invited to the guidelines issued by the Central Government on JFM to the States vide No.22-8/2000-JFM (FPD) dated 21<sup>st</sup> February, 2000. The Government of India has received considerable feedback from the States on various issues contained in these guidelines. To incorporate these suggestions, following guidelines are issued to further strengthen the JFM programme in the field.

**1. Memorandum of Understanding (MOU)**

To ensure smooth working relationship between the forest department and the JFM Committees and also to bring in a sense of empowerment and accountability, a Memorandum of Understanding (MOU) should be signed between the forest department and the JFM committees outlining the short term and long term roles and responsibilities, implementation of work programme, pattern of sharing of usufructs and conflict resolution. In the MOU, JFM Committees should form the basic Forest Management Units to provide them a feeling of empowerment and enable them to effectively protect and conserve the forest resources. The MOU for each committee shall have location specific work programme based on site- vegetation profile and mutual understanding. The MOU should reflect the consumption and livelihood needs of the forest dependent communities, plan for restoration of vegetation and clearly spell out the roles, responsibilities and powers. The MOU should define the procedure for necessary transparent accounting of all types of forest produce (seasonal, annual and periodical) accrued from the forests as per the working plans and micro plan prescriptions, financial accountability and distribution of



sharing mechanism including ploughing back of revenue for the regeneration in terms of Government of India letter No.22-8/2000-JFM (FPD) dated 21<sup>st</sup> February, 2000. All JFM Committees should be assigned specific roles for boundary demarcation, fire prevention and control of grazing, encroachments and illicit felling as well as ensure sustainable non-destructive harvesting of NTFPs including medicinal plants and for this, the Committees should be given authority to act, monetary and other incentives as genuine stakeholders. A provision to assist the JFM Committees has been made under the Centrally Sponsored Plan Scheme 'Integrated Forest Protection Scheme'. Similar provisions should also be made in other State sector schemes. A GIS based map of the JFM area of the States along with village boundaries may be prepared every two years to monitor the performance and to ascertain the status of vegetation. Similarly, the socio-economic changes brought about by JFM should also be monitored by obtaining regular feedback from the committee members. The action programme should also be linked with the State Forestry Plan activities in order to make JFM integral to the overall forestry activities including afforestation on all types of lands. The MOU should also include planning and development of grasslands, other common lands, agro-forestry and water bodies as a reflection of peoples voluntary action for holistic land use planning and management. Agroforestry models developed in various states under different conditions should be studied and adopted. A case in points is the agro-forestry model developed by Nagaland under the Indo-Canadian Environment Project to control shifting cultivation.

## **2. Relationship with Panchayats:**

The relationship between Panchayats and JFM Committees should be such that the JFM Committees take advantage of the administrative and financial position and organisational capacity of the Panchayats for the management of the forest resources. However, the unique and separate non-political identity of the JFM Committees as 'guardian of forests' should be maintained and ensured. The benefits accrued from NTFP sales should be shared with all the members of the gaon sabha including the JFM committees.

In order to achieve a better coordination with Panchayat raj institutions, a committee may be constituted at the district level under the chairmanship of President, Zila Parishad and under Collector in those districts where the Zila Parishad is non-functional for the time being with the DFO acting as Convener and other district level officers as members.

## **3. Capacity building for the management of Non-Timber Forest Products (NTFPs):**

The success of JFM in good forest areas would depend upon the sustainable development and harvesting of Non-Timber Forest Products. The sustainability of



JFM would also depend upon the remunerative prices for the gatherers of NTFPs. This requires a well organised setup and plan of action for the collection, transportation, storage, processing and marketing of Non-Timber Forest Products. For better return to the gatherer and the Committees, State Governments may initiate non-destructive harvesting (in accordance and within the overall prescriptions of the working plans), equity in sharing, institutional reforms and also strengthen the set up of NTFP management based on the experience in different States. The guiding principles should be to first ensure sustainability of the resources and then maximum benefit to the gatherers and value addition. Panchayats and State Forest Corporations should assist the JFM Committees for developing skills for handling the NTFP collection, storage, marketing etc.

This issues with the approval of the Minister for Environment and Forests.

Yours faithfully,

(M.K. Sharma)

Director General of Forests & Special Secretary

*Copy for information and necessary action to:*

1. Chief Secretary, All States/UTs.
2. Addl. Secretary, National Afforestation and Eco-development Board, Ministry of Environment and Forests, New Delhi.
3. Secretary, National Wasteland Development Board, Ministry of Rural Development, New Delhi.
4. Secretary, Department of Rural Development, New Delhi.
5. Secretary, Planning Commission, Government of India, New Delhi.
6. Secretary, Department of Tribal Welfare, Government of India, New Delhi.
7. Chief Conservator of Forests (Central) of all Regional Offices located at Bhubaneshwar, Bangalore, Bhopal, Shillong, Lucknow, Chandigarh.
8. Director General, Indian Council of Forestry Research and Education, Dehra Dun.
9. Director, Indian Institute of Forest Management, Bhopal.
10. Director, Indira Gandhi National Forest Academy, Dehra Dun.

# Format for Registration Certificate of Committee

.....Forest Department

## Registration Certificate

Registration Number \_\_\_\_\_

Date \_\_\_\_\_

It is stated that \_\_\_\_\_ JFM/ED/FP Committee of \_\_\_\_\_ village has been registered as per state order \_\_\_\_\_ dated \_\_\_\_\_ on \_\_\_\_\_ date of \_\_\_\_\_ (month) of \_\_\_\_\_ (year).

( Signature of DFO / DCF)

Seal

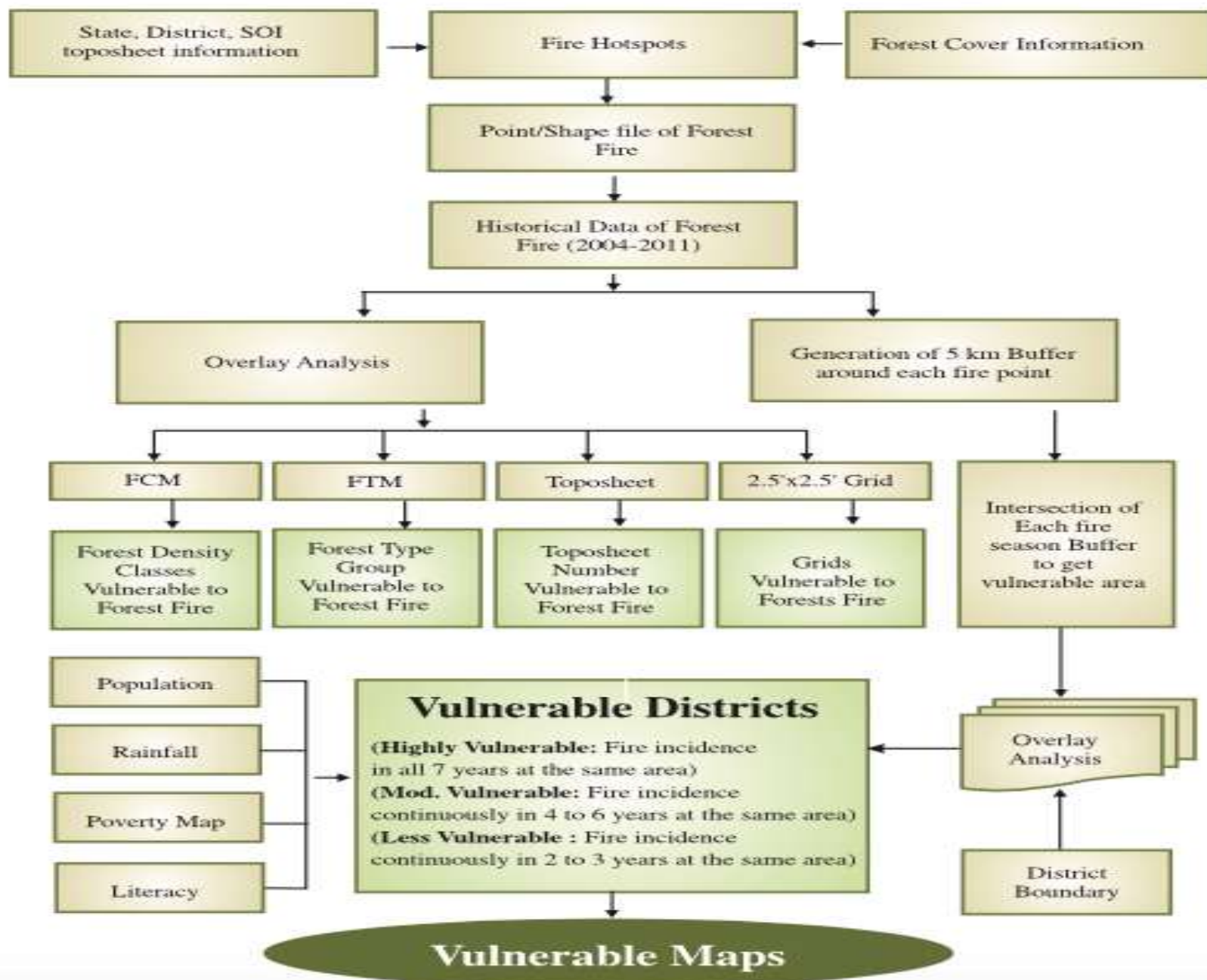
### CONDITIONS TO BE WRITTEN ON THE BACK SIDE OF THE REGISTRATION CERTIFICATE

- This registration certificate is in compliance with section number .....of Forest Act.....and JFM/EDC resolution of Govt. of the .....state, dated.....
- This registered society is authorized to carry out forestry related activities in its area, in association with the state forest department.
- This registration certificate authorizes the committee to coordinate all administrative and financial activities in forestry related activities.
- This registration certificate has to be kept in the office of the President or the Secretary of the Committee.
- After this registration, the committee is responsible for checking of encroachment, illegal lopping, grazing, theft of forest produces and also protection from forest fires in its managed area.
- The registered society, will carry out activities like fodder cultivation, NTFP collection and afforestation, in compliance with the needs expressed by the member of the committee.
- If the committee fails to carry out its responsibilities properly, the DCF/DFO shall have the power to cancel the registration of the committee

(This Registration Certificate need to be in Printed Form, two copies of it will be kept in the DCF's Office and Range Office. It will be mandatory to provide information regarding registration to senior officials of the Forest Administration of the State as well as District Administration/Police Administration of the district with request to SP to provide Police assistance when needed by Committee to abate forest offence in the best interest of the Government)

# VULNERABILITY OF INDIA'S FORESTS TO FIRES

## Methodology

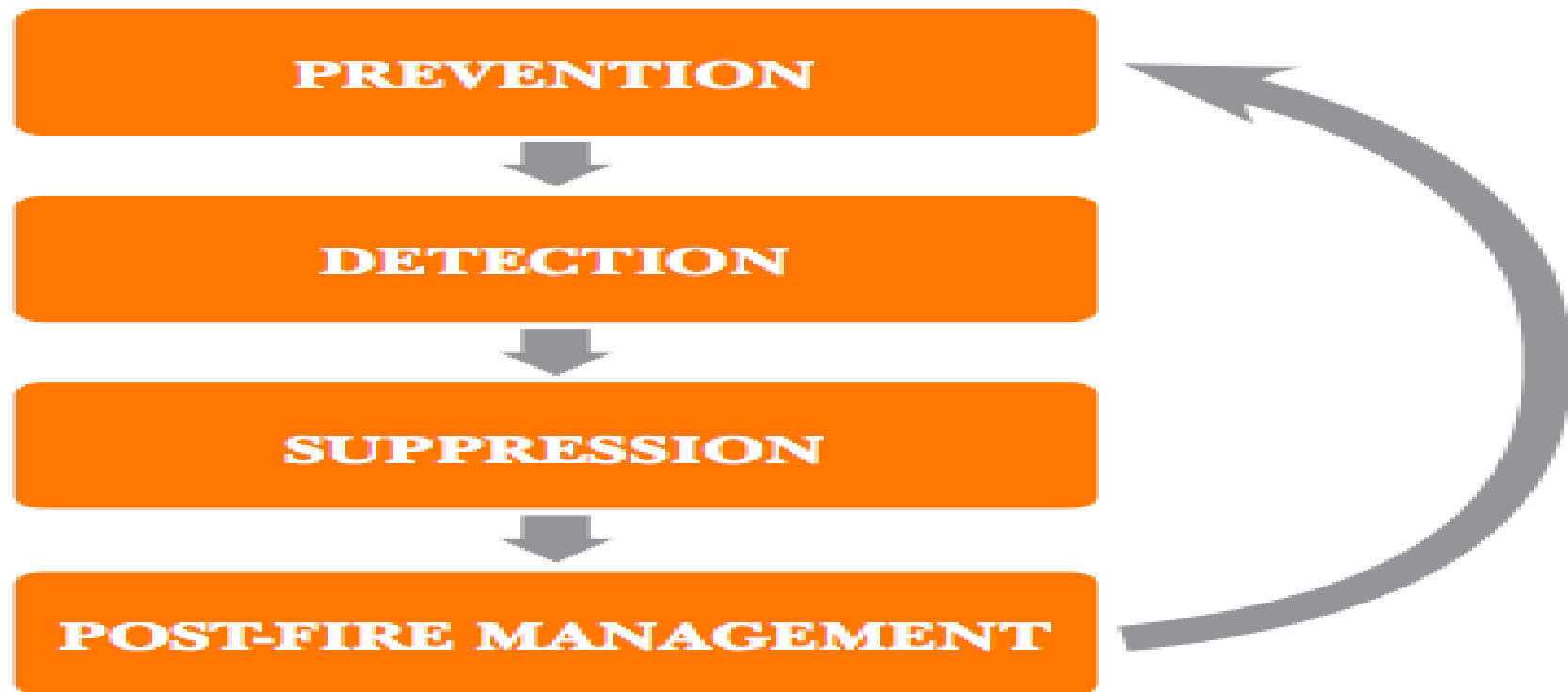






**Box-1 : Forest fire monitoring at national level from 2012**

**FIGURE ES.2: THE FOREST FIRE PREVENTION AND MANAGEMENT (FFPM) CYCLE**



**Source:** Authors

# Recent Landmarks

- Uttarakhand forest fires 2016
- 293<sup>rd</sup> report by Standing committee DST in Rajya Sabha in Dec 2016
- NGT Judgement in Rajiv Dutta vs UOI ,August 2017 (Original Application No. 216 of 2016 (M.A. No. 397 of 2017))
- National Action Plan on Forest Fire

### Region-wise summary of 2020 Fire Incidents Reported Till Date 23-06-2020

SNO	Region	Incident No. In RF	Incident No. In Civil Soyam / Van Panchayati	Total Incidents	Affected RF Area (Ha)	Affected Civil Soyam / Van Panchayati Area (Ha)	Total Affected Area (Ha)	Plantation Affected Area (Ha)	Total Affected Plantation Sapling	Leesa ghao Affected	Total No Affected Trees	Evaluation of Losses (In Rs.)
1	Garhwal	23	25	48	24.25	45.9	70.15	-	-	-	-	176325
2	Kumaon	35	36	71	35.92	56.96	92.88	-	-	-	-	258980
3	Admin, Wildlife	15	1	16	8.16	1.5	9.66	-	-	-	-	8830
	Grand Total	73	62	135	68.33	104.36	172.69	-	-	-	-	444135

3. वर्ष 2020 एवं विगत 5 वर्षों में अग्नि घटनाओं का तुलनात्मक विवरण तालिका में दिया गया है:-

Fire Year	Incidents No. in RF	Incident No. in Civil Soyam/ VP	Total Incidents in State	Affected RF Area (Ha)	Affected Civil Soyam / VP Area(Ha)	Total Affected Area (Ha)	Total Losses (In Rs.)	Human Death	Human Injury
2020	73	62	135	68.33	104.36	172.69	444,135.00	2	1
2019	1641	517	2158	2202.35	779.2	2981.55	5,592,587.5	1	15
2018	1498	652	2150	2657.136	1822.9	4480.036	8,605,374.5	-	6
2017	490	300	790	718.14	509.90	1,228.04	2,124,563.10	-	1
2016	1327	742	2069	2,822.85	1,600.50	4,423.35	4,629,825.00	6	31
2015	327	79	406	576.30	115.96	692.26	672,165.00	-	-



# PARLIAMENT OF INDIA RAJYA SABHA

DEPARTMENT-RELATED PARLIAMENTARY STANDING COMMITTEE  
ON SCIENCE & TECHNOLOGY, ENVIRONMENT & FORESTS



## TWO HUNDRED NINETY THIRD REPORT

**“FOREST FIRES AND ITS EFFECT ON ENVIRONMENT, FORESTS,  
BIO-DIVERSITY AND WILDLIFE AND REMEDIAL/PREVENTIVE MEASURES”**

(Presented to the Rajya Sabha on 16<sup>th</sup> December, 2016)

(Laid on the Table of Lok Sabha on 16<sup>th</sup> December, 2016)

# National Action Plan on Forest Fire

- Implementation in Melghat Tiger Reserve
- Planning
  1. Using GOI guidelines
  2. Tiger Conservation plan prescriptions
  3. Fire Management plan
  4. Using GIS maps for fire vulnerability and fire risk
  5. Melghat Firecell

# Planning stage

## Analysis of previous Fire occurrences/sensitive areas- Sipna division of Melghat Tiger Reserve

Fire season	No of incidences	Area burnt	% of area burnt
2015	15	126	0.15
2016	220	6480.704	8.16
2017	224	3156.867	3.97
2018	265	4803.627	6.05
2019	218	2206.939	2.78

Retaliatory fire threats were expected in fireseason 2020 due to stringent action against graziers in last 6 months

Awards of 50,000 Rs per village announced for zero fire incidence in fireseason announced during EDC meetings

Street plays/ pamphlets/meetings planned

# While planning..

- Difficult terrain, no network coverage
- **FSI SMS alerts if no network?**
- One of the top 20 districts (Amravati district ) where large areas have burnt upto 10,000 ha in 2008 fire season
- **Extensive touring** to understand the area/terrain/topography/road networks/fireline status/vulnerability/Ground truthing/mobile network points/wireless network penetration/sensitive areas
- **Previous fireseason** (Feb 2019-June 2019) **experience**- shortcomings/failures
- **Creation of paratwada firecell at Division level**
- Decision support system
- **Assets mapping** on GIS/ Google Earth
- **Map at office, home, vehicle , phone**– Always for identifying shortest route to firepoint; nearest village for mobilising local; nearest watchtower/Protection camp



# Planning to get Local people support

- INVOLVING LOCALS
- INCENTIVISE
- MONEY ?- Unspent EDC money and Imprest money of CSS-FMS
- CFR areas
- Tendu leaves /Mahua flowers collection season
- Identification of risk prone areas for grazing
- Regular meetings of JFMC/EDC prior to fire season communicate
- Intelligence network- reliable sources to be cultivated
- Helpline number – Toll free no 1926
- Public consultation meetings during Critical Wildlife Habitat helped in understanding their concerns (Allowing grazing, movement through Tiger reserves, Employment as firewatchers, pending payments, allegations against staff)

# Do remember to..

- Repairing of fireblowers/watchtowers
- New watchtowers temporary basis
- Staff shortage ( not staying in headquarters/Antipoaching camps)
- Fireline creation and maintenance- TCP Prescriptions
- Resource crunch for fireline creation and maintenance
- Verification on field the fireline- Quantity and quality of firelines
- Assign task to ACF and RFOs for cross checking fireline works
- **How to verify above have verified?**
- Training and Sensitisation of staff
- **Registration in FSI van agni portal 3.0**
- Coordination with District Administration/Police/Fire Dept/District Disaster committee/Electricity dept

# Planning for Infrastructure/Equipments/Vehicles

- Include in APO for CSS IFMS/ State plan/District plan proposals/ Project Tiger
- Purchase of fireblowers and other equipments
- Local usage of resources like bamboos for brooms
- Construction of new watchtowers( concrete or wooden or bamboo)
- Strengthening of wireless network
- New watchtowers temporary basis
- Training firewatchers in using leaf blowers
- Firefighting teams
- Uniform and Mock drills for usage
- If previously trained – retain for future fireseasons too as it will reduce expenditure on again training

- Petrol and Diesel requirements for Leaf blowers and Vehicles
- Funds?
- How to minimise expenditure
- Road maintenance
- Drone usage
- Purchase or to hire?
- For deterrence as well as detecting offenders setting on fire
- Stationing continuously with provision for vehicle in rest house for deployment
- Interdivision and Interstate coordination



# Planning for deploying manpower

- Fire season – No of firewatchers , Funds?
- JFMC/EDC/Voluntary basis – **Involvement of locals**
- Protection duties @ watch towers/Antipoaching camps/ Range headquarters
- Waterhole checking
- Antipoaching during Holi
- Wildlife census during Buddh purnima
- Vehicle related ( Drivers on rotational basis , since 24\*7 vehicles MUST be on standby)
- Wireless personnels
- **Field staff- 24\* 7 duty (Leave requests during fire season)**
- **Contingency plan for staff where vacancy exists and for sensitive areas**
- **CONTACT Nos with alternative nos upto Drivers/wireless operators/ Firewatchers/Daily wage labourers and all permanent staff**
- **Multiple locations fire?**
- **Adjacent divisions coordination and help**

# Summer management

- Fireline cutting and burning
- Fireseason from 15<sup>th</sup> Feb to June 15<sup>th</sup>
- Control room & Firecell monitoring, review and feedback
- 24\* 7 wireless communication & walkie talkies usage
- SMS alerts and Whatsapp group-dissemination
- Firewatching towers
- Employing trained firewatchers
- Fireblowers usage for fire fighting
- Artificial Waterholes creation and maintenance
- Cleaning natural waterholes
- Preventing poisoning attempts
- Waterhole checking by litmus paper for Ph

# Forest Fire Management –MELGHAT FIRECELL under control of APCCF & FD,MTR



## Ground Staff:

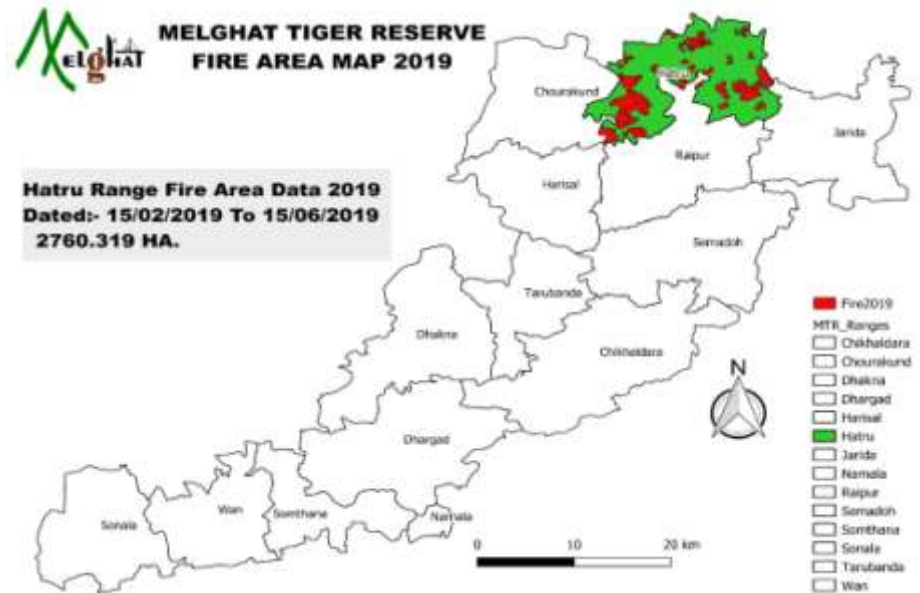
- Every year before fire season local youth are trained in fire fighting and then they are deployed as fire watchers.
- **One month training is compulsory in MTR to work as fire watchers.**
- All fire watchers has been **trained** by experts from National Fire Institute, Amravati
- Fire watchers are equipped with **250 fire blowers**



## Control Room:

- **Special team of trained staff at HQ monitor** forest fire alerts received from satellite.
- **Mapping of the GPS locations of fire incidences** received from Satellite done with the help of GIS software.
- **Fire alert messages** are also given to field staff through **wireless and whatsapp**

•**Source: MTR**



# PREVENTION

- FIRELINES MAINTENANCE
- **DRONE SURVEILLANCE**- Hired (tendered well in advance) –**DETERRENCE FACTOR**
- REWARDS TO EDC- **ZERO FIRE INCIDENCES**
- **INCENTIVES** TO CORE & BUFFER –Different
- Phased manner- 3 phases in core 15<sup>th</sup> (8 villages)
- 2 phases in buffer (33 villages)



# PREVENTION-other efforts

- STAFF/firewatchers/Daily wage labourers /wireless staff- Sensitised , motivated, trained
- Availing of **leaves- discouraged**
- Headquarters presence
- **Wireless** stations increased and wireless sets fitted in all vehicles
- Every one hour wireless attendance from watch towers
- All MUST compulsorily **carry WALKIE TALKIES**
- **SURPRISE CHECKING OF WIRELESS DUTY** between 0100 hrs to 0400 hrs
- Movement restrictions inside Tiger Reserve(Interstate and intervillage) through Nakas/checkposts using MHA Lockdown orders for COVID-19

CONTD..

- Regular posting of selfies from watchtowers, Antipoaching camps( Especially 2300 hrs selfie to be shared in Whatsapp groups)
- Ensuring presence of personnels all times with alternative plans in case of emergency
- Inter range , Inter Division, Inter state coordination – **Melghat firecell , Paratwada firecell**
- **Police dept coordination** – Amravati SP, SDPO Dharani , PSI chikaldara

## DETECTION

- **NASA FIRMS email** alerts 24\* 7 vigil
- **FSI** Webportal and SMS alerts
- **STRATEGIC LOCATIONS Watchtowers** - 24 \* 7 (19 places in Sipna division)
- Field detection --→Walkie talkie→ control room→DCF phone call
- DCF – remain connected with wireless (Office,Home, vehicle-Wireless sets) rest of times- walkie talkie ON.

## DETECTION –CONTD

- Watchmans at DCF bungalow trained to use walkie talkies and **inform DCF ANYTIME** as and when any fire incidence is reported
- Similar instructions for ACF and RFOs **ENFORCED**
- NASA FIRMS Email alerts – high volume beeping tones to check for any new alerts
- **Melghat firecell and Paratwada fire cell**- Trained and motivated persons Disseminating alerts, following up with fire control operation, post fire reporting
- Wireless communication- - BACKBONE
- **Whatsapp dissemination**
- Villagers and passerbys informing
- **Staff during patrolling**



# Control

- Faster dissemination by wireless
- Melghat Firemap in few minutes- rules out Forest/Non forest/Agricultural field
- **Relay time of message after alert- target**  
**Maximum time 5-10 minutes**
- Nearest landmarks conveyed
- Presence of river/roads/fire breaks informed
- Deploying fire fighting team stationed at range headquarters in vehicles with sufficient blowers/walkie talkies/water /food/emergency medical kit
- Alerting nearest range fire fighting teams/poaching camp staff
- Nearest division staff for backup
- Alerting STPF (Special Tiger protection force) for backup

# Control- contd..

- Depending on location of fire – EDC Members/ villagers mobilisation
- Range forest officer(RFO) compulsorily to lead the time for fire fighting
- Regular updates from fire fighting team through walkie talkie the requirements
- Drone Deployment- immediately (assess manpower requirement, extent of damage, burnt area measurement)
- After control of fire- patrolling the area again to douse off fire for next couple of hours and keeping vigil for any further spread

# POST FIRE

- **APPRECIATING THE TEAM**

(Discussion regarding the shortcomings and field difficulty faced)

- **REPORTING**

(Real time updates through whatsapp to Melghat firecell/paratwada firecell)  
Fire incidence Briefing in Forest Fire monitoring group- State level group with NODAL Officer)

- **Instant update** to Melghat firecell in prescribed format. Keeps Field Director updated about each instance
- **Daily /weekly/Monthly reporting in prescribed format**

# Post fire-contd....

- **Field verification by ACF** in all burned areas to assess damage and investigate the cause
- **Drone assessment**
- Paratwada Firecell- Use of GIS tools to measure burnt area
- Usage of SAGA tool and checking the area burnt from freely downloadable sentinel images
- Field visit by DCF to assess the damage and restorative measures if needed
- Briefing Field director in case of large area burnt and good work done by the team
- **Motivating measures:**  
**Certificates of Appreciation** issued by DCF immediately without delay  
Individual recognition if deserving



## Rewards to ZERO FIRE VILLAGES

- Rs one lakh to core villages
- Rs 50,000/- to Buffer villages
- Press note issued

## PAR –Self Appraisal

- QUERIES?