Community Forest Fire Management Plan

Sundar Community Forest

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Foreword

Forest fire damages significant quantity of forest and biological resources every year in Makawanpur district. The damage is also noteworthy in most of the community forests within the district. The Community Based Fire Management Plan is an important initiation to safeguard forest and biological resources by reducing fire damages through mobilizing members of community forest user group and local people.

The Community Based Fire Management Plan is prepared with the support of the Foreign Office, Federal Republic of Germany, Office for Humanitarian Assistance and the Global Fire Monitoring Center with close collaboration with the Department of Forests (DoF) and the Regional South Asia Wildland Fire Network (RSAWFNW). The Green Governance has played a crucial role for data collection and analysis. The preparation of the Plan is based on the substantial efforts and assistance from various professionals and local communities. The effort from district forest officials, community forest user group, community based organizations and individual stakeholders is highly remarkable. I would like to express sincere thanks to all those who contributed to this effort.

I am grateful to the plan preparation team of Mr. Sundar Prasad Sharma, Mr. Krishna Prasad Acharya, Mr. Daniel Kraus, Mr. Ananta Ram Bhandari and Mr. Kiran Timalsina for their contributions. Moreover, I am thankful to the district forest officials, members of Sundar community forest user group and local communities for their meaningful cooperation.

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Executive Summary

It is common that forest fire occur every year in Nepal, particularly in the forests of Terai and Churia range. Government of Nepal has given less priority in managing forest fire due to limited resources. Nepal has adopted community forestry as central approach of forest management since 1990s. In community forestry, state control and protected forests areas are being transformed to local people control. Community forest user groups are initiating few fire hazards reduction activities such as fuel breaking initiatives through adopting indigenous systems. Fire management plan is needed to manage forest fire with the active participation of local communities and institutionalizing the best indigenous practices.

The community based fire management plan of Sundar community forest highlights prevention and control of forest fire with the management strategies of ensuring people participation, promoting indigenous knowledge, and emphasizing preventive measures. The management plan is prepared in the spirit of participatory approach. Various participatory tools including transect walk, participatory resource mapping, focus group discussion, key informants survey and observations were adopted combined with training to the users group members.

The CF is divided into two fire zones, *i.e.* fire sensitive zone and fire indifferent zone, based on causes and effects of forest fire. The criteria set for zoning are the occurrence of forest fire in the past, the nature and availability of loads fuel in particular site, distance of the site from the village access trails and settlements.

Proposed fire preventive measures includes increased awareness level of the users and local communities, reducing fire risks and hazards, construction of fire lines, and practice prescribed burning in the fire sensitive zones. Fire control measures proposed in the plan includes development of effective fire detection and communication systems, and proper use of traditional as well as modern tools and equipments in fire suppression. The plan also recommends contingent recovery planning for rehabilitating fire damaged areas. A fire management action plan is prepared for the next five years.

Acronyms

CBFiM	Community Based Fire Management
CBO	Community Based Organization
CF	Community Forest
CFUG	Community Forest User Group
DDC	District Development Committee
DFO	District Forest Office(r)
GFMC	Global Fire Monitoring Center
NGO	Non Governmental Organization
NTFP	Non Timber Forest Products
PRA	Participatory Rural Appraisal
VDC	Village Development Committee

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1. Introduction

In Nepal, Community involvement and participatory approaches (Community-based Fire Management - CBFiM) are receiving increasing interest (FAO 2006).

It is common that forest fire occur every year in Nepal, particularly in the forests of Terai and Churia hills. But, the government of Nepal has paid very little attention in forest fire management (NBS, 2002). There is not a single Community Forest Users Group (CFUG) in Nepal that has a comprehensive fire management plan developed and implemented.

This is the first step towards management of forest fire by local communities. It can be expected that development of an appropriate CBFiM planning and implementation mechanism addresses the contemporary issues on forest fire and institutionalizes indigenous systems of fire management.

The plan is prepared with the members of community forest user group based on training approaches with participatory methods towards community based fire disaster risk reduction.

The plan highlights basic forest fire information, existing practices adopted by local communities in suppressing forest fire, and fire prevention and control strategies to be adopted into Sundar community forest.

The collection of basic information is based on participatory process and participatory analysis.

The major part of information collection was carried out during a fire management training conducted in the community during October 2007.

It can be a model plan for CBFiM planning in the country in terms of methodological approach and the contents of the plan.

2. Objectives of the Plan

The objective of the community based fire management plan is to safeguard forest resources in Sundar community forest by reducing fire damages through mobilizing community-based organizations, CFUG members, and local people.

The community based fire management plan aims to:

- Assess the status and impacts of forest fire in Sundar CF;
- Identify fire sensitive areas and causes of forest fire in the CF;
- Help creating awareness among stakeholders for forest fire management; and
- Prepare a five-year work plan for forest fire management in the CF.

3. Methodology

Participatory approach has been adopted to collect the data. The Participatory Rapid Appraisal (PRA) exercise was executed through the committee members of the CFUGs. The committee members were informed, in advance, about the purpose of the PRA and the methods adopted. PRA tools such as transect walk, focus group discussion, informal interviews and participatory resource mapping were used.

3.1. Participatory Resource Mapping

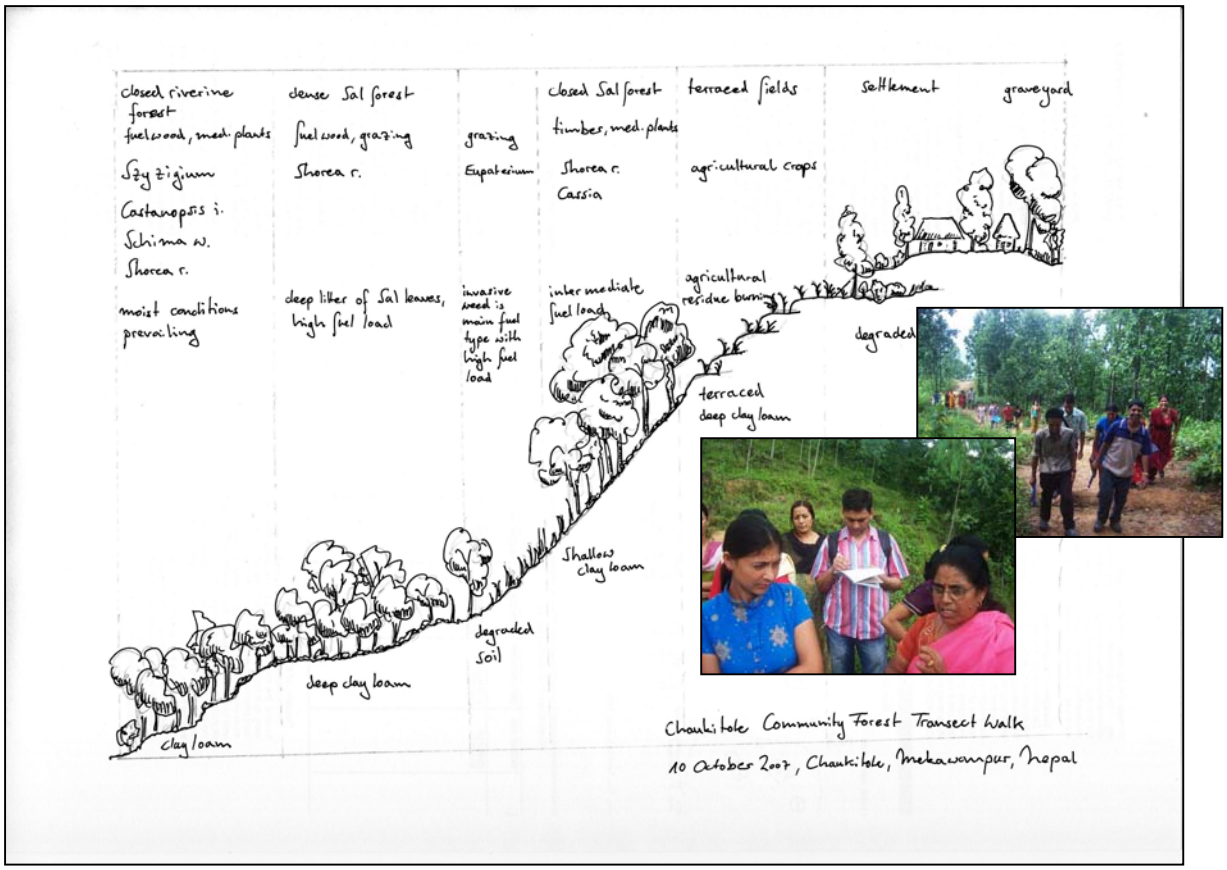
A resource map of the CF was prepared through participatory resource mapping tool. The map shows both the social and natural resources including social setting, forest types, condition, fire hazard areas, fire sensitive zones, water sources, fire lines, etc. The objective was to develop ownership and facilitate fire planning process. Participatory resource map is presented in *Figure 2*.

Fig. 1. Participatory Resource Map of Sundar CF

3.2. Transect Walk

Transect walk is an important technique to collect information in the field. One transect walk, about 5 km, with the CFUG members was conducted to assess the fire hazards and fire sensitive zones along with the geo-physical and biological condition assessment of the forest.

Fig. 2. Sketch of the transect walk



3.3. Focus Group Discussion

The focused groups are considered one of the important sources for collecting both qualitative and quantitative information on specific topics of interest. If focus group discussions are handled carefully the participants can provide critical information that ordinary respondents often can not tell in a personal interview. Focus group discussion was carried out with the CFUG members (Photograph #2) to get in-depth information on basic forest fire information, socio-economic and environmental impacts of forest fire, and indigenous techniques that are used in preventing and controlling forest fire. A total of three focus group discussions were executed.

Photograph #2: CFUG members executing focus group discussion during the CBFiM plan preparation

3.4. Key Informants Survey

Key informants are those persons who possess deeper understanding about the objective and expected outcome of the study and are willing to share their ideas and provide valuable information on critical issues of the activity, its strengths, weakness and opportunities. Semi-structured Interview was conducted with the key informants to triangulate the data. Elder persons, ex-members of the CFUG executive committee, social workers, and those who are involved in community based resource management were considered as key informants.

3.5. Observation

Direct observation is a reliable technique to collect data. It is believed that careful observation can bring greater clarity to the ambiguities of particular social surroundings. Observation was made during the field visits particularly on the sources and distribution of fire fuels, fire hazards, fire sensitive zones, and existing methods adopted by the users in preventing forest fire (photograph #3).

Photograph # 3: Field observation during the CBFiM plan preparation

4. Description of Community Forest and User Group

The community forestry program has been implemented in Makawanpur district since its initiation in the country in 1980s. By the end of the year 2007, a total of 318 community forest user groups have been formed in the district so far. Sundar community forest user group is one of them established in 1995.

Box 1
Community Forestry and Fires

Community forestry (CF) is one of the major forest management strategies of Nepal adopted since1980s. In community forestry, forest areas are transformed from state control to local people management. Local people are managing community forests, to meet their forest product needs based on their indigenous knowledge synergized with technical supports from forestry technicians through district forest office (DFO).

Local communities have usufruct right over the forest resources organized as community forest user group (CFUG), a group involving all members of the community that regularly use a forest to meet their household needs. About 21 percent forest area is handed over to the forest user groups as of December 2007 (Sharma 2008).

The Forest Act 1993, Forest Regulation 1995 have legitimized the roles, responsibilities and rights of CFUG as an independent, autonomous and self-governing institution responsible to protect, manage and sustainable use the patch of national forests with a defined forest boundary and user group members. The CFUG prepare users' constitution and forest operational plan describing the condition for the protection, management and sustainably utilization of forest products from community forest. The act is the only one legal provision for fire prevention (it prohibits fire in national forests) but it is still ineffective because of the human behaviour and procedural difficulty to identify the offender (Sharma2008).

The CFUGs are mostly adopting passive forest management where removal of dead and dying trees from the forests is permitted and green felling is not practiced. Such removal helps in reduction in fire hazards from the forest. However, community forests are still in high risk of forest fire. The main reasons are geographical position, forest blocking mechanism, forest species composition and adoption of passive forest management.

The community forests are in contiguous blocks with no physical separation of forest patches and, hence, fire will easily move to adjoining community forests.

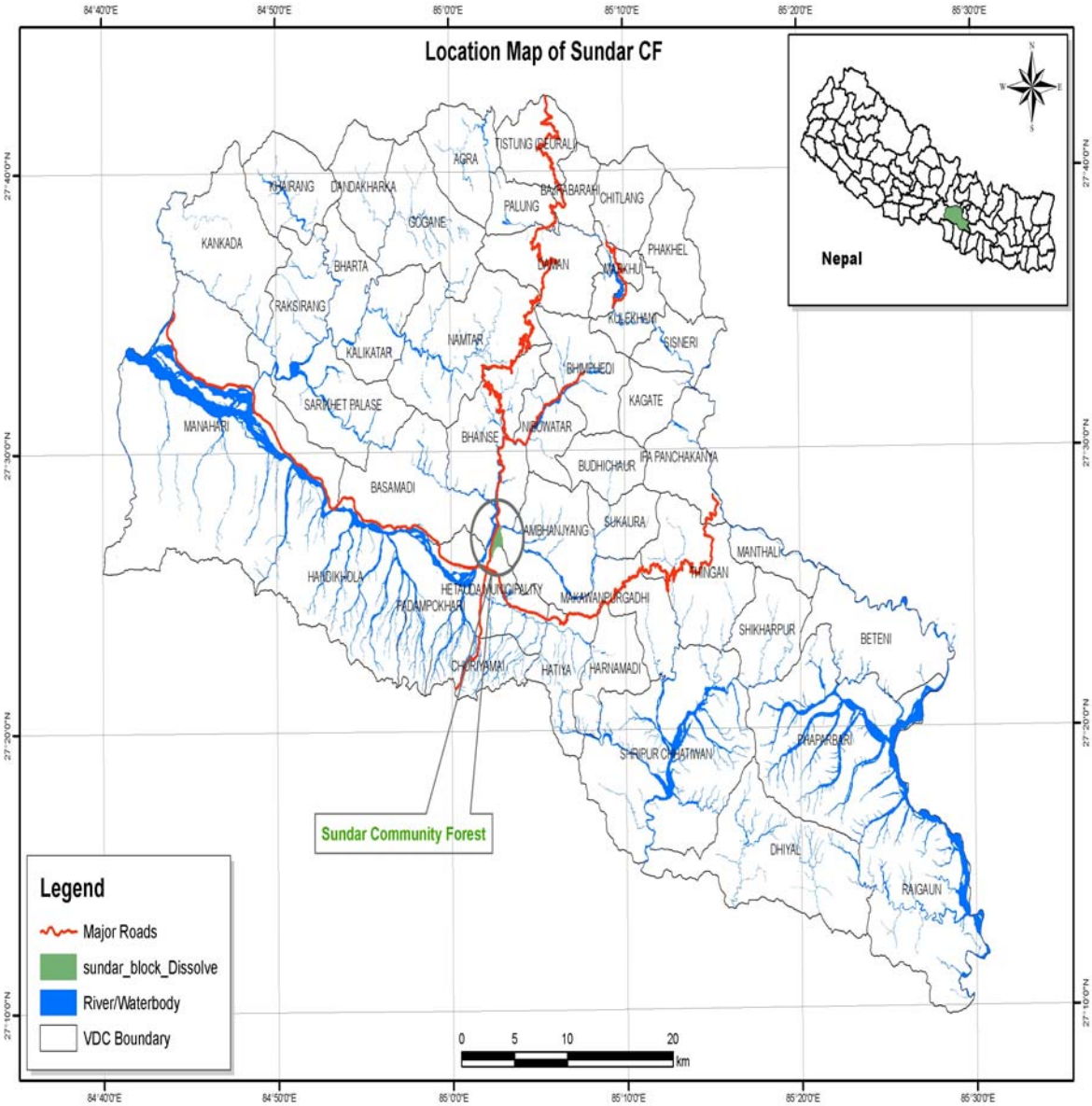
The adoption of fire preventing mechanism such as construction of forest road, fire line is not in existence or is very negligible, and forest fire can spread easily. In addition, the forest is mainly composed of Sal dominated mixed deciduous species. The Sal leaves are not easily degradable in the forests nor are collected by the users in all community forests leading to accumulation of large amount of fire hazards. Besides, the adoption of passive forest management in the CF has resulted in high density forest. As a consequence, trees are closer to each other with increasing threats of fire hazards.

The increasing biomass and volume of leaf each year is also an added threat in the absence of green felling. On the other hand, few community forest users are initiating fire hazards reduction activities such as fuel breaking and prescribed burning, however, the extent is very limited.

4.1. Sundar Community Forest

Sundar Community Forest is located in Choukitole of Hetauda municipality, central part of Makawanpur district, Nepal. This community forest covers an area of 109.5 ha of forests in the south-west aspect of the Mahabharat range. It lies in the east of Rapti River and Tribhuvan Highway. Location map of the community forest is presented in Figure 1.

Fig. 3. Location map of Sundar community forest



The CF primarily consists of Sal *(Shorea robusta)* dominated pole stage natural forest (photograph #1). However, it consists of few scattered large sized matured trees of mainly Sal. About 70% of the forest is covered by Sal followed by Chilaune *(Schima wallichii).* Chilaune is distributed mainly in few patches of the CF but not as pure stand. The CF

consists of other sub-tropical species as well. A list of major species found in the forest is presented in Box 1. Various non timber forest products (NTFPs) are also available in forests and are presented in the Box 2. Local communities use most of the NTFPs for traditional medicines. The existence of higher number of tree species and NTFPs is resulted Sundar CF as an important biodiversity spot within the district. The forest is rich in natural regeneration of various species mainly Sal. The status of the community forest including natural regeneration by strata is presented in Table 1.

Box 2.
Major tree species found in the CF

Asna *(Terminalia tomentosa)*
Barro *(Terminalia bellerica)*
Bhorla *(Bauhania vahlii)*
Botdhagero (*Lagerstromia parviflora)*
Chilaune *(Schima wallichii)*
Harro *(Terminalia chebula)*
Jamun *(Syzigium cumini)*
Kadam *(Adina cardifolia)*
Katus *(Castanopsis indica)*
Kyamun *(Syzygium cerasoides)*
Rajbrikcha (Cassia fistula)
Sal *(Shorea robusta)*

Box 3.
Major NTFPs found in the CF

Amriso *(Thysanolaena maxima)*
Barro (*Terminalia bellerica*)
Bhorla *(Bauhinia vahlii)*
Chiraito *(Swertia chiraita)*
Harro (*Terminalia chebula*)
Kalikath *(Myrsine semiserrata)*
Kukurdaino *(Smilax menispermoides)*
Mushrooms
Sarpagandha *(Rauwolfia serpentina)*
Thakal *(Ciesium wallichii)*

Tab. 1. Development stages and their distribution of Sundar CF

Strata	***Area****	***Species***	***Number***		
			Regeneration	***Pole***	***Tree***
Sal Mixed Tree	37.5 ha	Sal	1,40,650	2,109	2,953
		Asna/Karma/Jamun	2,813	3,516	0
		Chilaune	0	2,109	281
		Others	73,138	2,138	0
Sal Mixed Pole	62.0 ha	Sal	1,87,063	24,446	558
		Asna/Karma/Jamun	22,851	1,860	0
		Chilaune/Botdhagero	0	5,979	27
		Sissoo	0	531	0
		Harro	0	0	27
		Others	6,7491	5,314	0
*Out of total 109.5 ha, 10 ha of the CF is under the control of Nepal Army for a security base camp					

Source: Operational Plan of Sundar CF, 2063

Sundar community forest is divided into 5 blocks for management purpose based on natural features such as slope and streams. The description of main features of each block including the forest structure and condition is presented in Table 2.

Tab. 2. Block wise status of Sundar CF

B N	*Name of the block*	*Area (ha)*	*Aspect*	*Slope*	*Major species*	*Regeneration*	*Crown Density*
1	Thing Khoria Pakho	10.5	Western	10-45°	Sal, Asna, Chilaune	good	40-45%
2	Thulo Tirtire Danda	33	Western	10-35°	Sal, Asna, Chilaune, Botdhagero	good	30-50%
3	Chardhare Danda	24.5	Western	10-45°	Sal, Asna, Chilaune, Botdhagero	good	30-40%
4	Chouki Danda	20.5	South-West	10-45°	Sal, Asna, Chilaune, Botdhagero, Harro	average	30-40%
5	Thanimai Danda	11.75	South-West	10-50°	Sal, Asna, Chilaune, Botdhagero, Harro	average	30-40%

Source: Operational Plan of Sundar CF, 2063

Photograph #1: Sundar Community Forest

4.2. Sundar Community Forest User Group

The Sundar forest was handed over to the local community, organized as Sundar Community Forest User Group (CFUG), in 1995 by the District Forest Office (DFO) to protect, manage and sustainable use. A total of 177 households are involved in the CFUG, which is located in Choukitole of Hetauda municipality-1 and 2 of Makawanpur district. The users includes 546 male and 513 female individuals, who are directly benefited from the CF. The CFUG is heterogeneous in caste and ethnic composition and mainly includes Brahmin, Chhetri, Newar, Tamang, and Magar. The majority of the households (about 78% of the total) depend on farming for their livelihoods. However, about 11% users are engaged in small scale trade and family business, and rests (about 11%) are employed in public and private institutions. The livelihoods options and socio-economic condition of the users is presented in Table 3.

Tab. 3. Composition and socio-economic condition of the users

Socio-economy of the Users		**Percentage**
Major Livelihood Options	Farming/Livestock	77.73
	Small trade/family business	10.94
	Employee	10.76
	Others	0.57
	Total	*100*
Socio-economic Status*	Better Off	19.21
	Middle Class	62.71
	Poor	18.09
	Total	*100*
*socio-economic status of the users is based on the well-being ranking done by the CFUG		

Source: Users' Constitution of Sundar CFUG, 2063

The socio-economic status better off, middle class and poor is divided by the users themselves based on various economic and social criteria that they think important for such classification. The main criteria set for the well-being ranking includes income sources, landholdings, livestock, condition of house and other infrastructures, social and political status, education and employment.

5. Forest Fire in Sundar CF

5.1. Occurrence and Frequency of Forest Fire

The information on the occurrence and frequency of forest fire in the CF was obtained for past 12 years (Table 4). The information shows that the forest fire occurred almost every year in the CF. Commonly it occurs twice a year. But, fortunately, there was no forest fire incident in year 2001 and 2002 in the CF. The user believes that the extent and frequency of the forest fire and its damage is decreasing in recent years compared to the situation when the forest was under government control. It indicates that community forestry contributes in reducing extent of fire disaster.

Tab. 4. Occurrence of forest fire in Sundar CF

Year	***Fire Occurrence***
1995	Yes
1996	Yes
1997	Yes
1998	Yes
1999	Yes
2000	Yes
2001	No
2002	No
2003	Yes
2004	Yes
2005	Yes
2006	Yes

5.2. Fire Season

The CF is affected by forest fire between April and June since the period is very dry. Monsoon wind is the main source of rains in Nepal, which is, generally, active between June and August. Cold season exists between November and March. Generally, fire does not occur during rainy season and winter season. During hot dry season the risk of forest fire is very high.

5.3. Fire Duration

The CF was used to be suffered by a mix of surface and ground fires. However, in recent years the forest is mostly affected by the surface fire. The duration of forest fire depends on the fuel type and direction and speed of the wind. Generally, fire spreads at a speed of 100 mph in the locality. Based on the data collected during the field visit, it is estimated that the duration of fire ranges from 3 hours to 3 days. The duration of burning within a place lasts for half an hour although it depends on the accumulation of leaf litter and other fire fuels in the particular place. The fire took a maximum of 3 days to completely pass the stretched of the community forest in the past.

5.4. Fuel Types

The leaf litters from the tree species, primarily Sal, is the main source of fuel in the CF (photograph #4). Sal- the dominant species in the forest, is a deciduous tree which produce high amount of foliage and shades during the dry season. The slow decomposability of Sal leaves, on the one hand, and no collection of Sal leaf litter by the CFUG members, on the other, promote fire hazards in Sal dominated blocks of the CF. Moreover, the forest is encroached by the invasive species such as Banmara *(Eupatorium odonatum)* in open areas which produce large amount of fire fuels within a short period.

Photograph #4: Litter produced by a Sal tree which is the major source of fire fuel in the CF

5.5. Causes of Forest Fire

There are a number of reasons why the forest is brunt annually. The local people in the locality set fire to the forests in the beliefs of the following benefits:

- Fire increases the fertility of the soils.
- Firewood available after few days when fire dries the pole sized trees and shrubs.
- Fire increases nutritious grass for grazing.
- Fire reduces snakes, scorpions and mosquitoes which are harmful to human beings.
- Fire burns unnecessary dry leaves/leaf litters.

The causes of forest fire in the CF were observed as:

- There is a trail in the forest which connects Gothdada settlement with the Hetauda municipality, a market place. People use the trail to walk to go to the market and district center. Carelessness of trekkers and smokers cause forest fire in the CF.
- Grazing is partly allowed in the CF. Cattle grazers sometimes use fire inside the forest for smoking which spread as forest fire.
- The economy of the locality is based on subsistence farming and they have less capital and income opportunities. Poor socio-economic conditions of the people encourage them to set fire in the forest to get dry firewood for subsistence use and also for sell.
- People in the vicinity of the forests, particularly in the settlement Gothdada, are less aware of the damage from forest fire. Lack of public awareness of the damages of forest fire is one of the major causes of fire in the CF.
- Sometimes users of the forest initiate fire to reduce leaf litters to make clean trail and ground.
- An alignment of high tension electric wire is passed across the community forests. Imbalance on it, sometimes, causes a fire in the forest. There was a fire incident in the CF due to the shot of electric wire in 2003.
- In the belief of Bandevi (goddess of forest), people nearby Saypatri settlement worship and use fire for this purpose. Remaining unattended fire after worship may cause forest fire.

5.6. Impacts of Forest Fire

The forest fire has manifold impacts on economy, society and the environment as a whole. But, It has often been ignored economic, ecological and cultural (values) impacts of forest fire and millions of people who have been entailed with them (Sharma 2005).

It destroys forests and has adverse ecological, social and economic consequences. It does not only destroy timber and non timber forest products but also affects biodiversity at all three levels including genes, species, and ecosystems.

However, The concept that there is ‘good fire’ should be supported and advocated. Fire can be good for habitats, for resources, for reducing threats and for maintaining cultural values. Some sectors that use fire as a tool to enhance output and facilitate land use are agriculture, forest resources management and pastoral and wildlife management (FAO 2006).

All fires are not harmful. Fire is a forest management tool if it is used appropriately. It is important for forest regeneration, in some cases, and maintaining wildlife habitats. Prescribed fire is useful for regenerating Sal *(Shorea robusta)* forest (Amatya and Shrestha, 2002). In several habitats, fire plays a critical role in the health of ecosystems and in maintaining their biological diversity (NBS, 2002).

5.6.1. Environmental Impacts

Forest fire creates various environmental alterations. Some important environmental impacts identified by the local communities are briefly described hereafter.

Loss of Soil and Microorganisms

Most of the micro organisms that sheltered in the surface are damaged by forest fire. Fire burnt area becomes dry and detrimental for the micro-organisms. Most of the areas of Sundar CF are sloppy and when surface materials and undergrowth is consumed by fire, the bare area becomes prone to soil erosion. Few landslides have been observed in the fire affected areas in the CF.

Change in Species Composition and Age Gradation

Forest fire is a threat for the fire sensitive species and it may cause in changing species composition in the long term. Species with the character of fire hardiness survive; on the other hand, fire sensitive species disappear if the area is continuously affected by forest fire. It was observed in the CF that number of Thakal *(Cirsium wallichii)*, a survival species against fire, is in increasing trend. Similarly, Banmara *(Eupatorium odonatum)* is spreading throughout the forest, particularly in open areas, since it can regenerate even in the worse condition that is created after fire. Age gradation is altered due to the effect of forest fire which can be seen in Sal dominated areas within the CF due to dying back phenomenon of Sal. The forest fire is seen as one of the key abiotic factors for dying back.

Environmental Pollution

Forest fires produce atmospheric pollutants. In addition, accumulation of pollutant gases after burning cause the temperature to rise, which contribute in the global warming. Although atmospheric pollutants and their effects in temperature was not assessed in Sundar CF due to limited time and resources availability, users realize that the surrounding atmosphere become polluted when fire incident occurs.

Loss of Biodiversity

Local people around Sundar CF set fire to reduce mosquitoes, scorpions and snakes, which directly affects in the population of insects and herpeto-fauna. Moreover, forest fires in the CF damage undergrowth, as a result, habitat of small wild animals is being lost. Similarly, plant diversity is also affected due to the fire.

5.6.2. Socio-economic Impacts

Forest fire has a detrimental impact in economy and society. Some important impacts caused by forest fire are briefly described hereafter.

Loss of Forest Products

Community forest user groups have usufruct rights in community forestry of Nepal. The physical loss of the matured or semi-matured trees is a high adverse economic impact for the community who depend on it. In Sundar CF, forest fire damages forest products particularly firewood and small sized timber. Firewood is the major source of energy used by the users of Sundar CFUG for cooking and heating. Timber is used to construct and maintain houses, cattle sheds, and different kinds of furniture in the locality.

Loss of Regenerations

Regeneration is highly affected by forest fire since they are damaged even by surface fire. Surface fire is most common in Sundar CF. The loss of regeneration has ecological and economic impacts in the long run.

Loss of Non Timber Forest Products (NTFPs)

Most of the poor people, in Nepal, depend on NTFPs for their livings as well as for medicine and have a very crucial economic role in the rural community. In Sundar CF, the users residing in the villages, particularly far from Hetauda, consume NTFPs for traditional medicines. Kurilo *(Asparagus racimos)*, Sarpagandha *(Rauwolfia serpentina)*, Chiraito *(Swertia chiraita)*, mushroom are some important NTFPs used by the communities in this area. NTFPs are more prone to forest fire since they are damaged by surface fire as well.

Photograph #5: NTFPs distributed in the Sundar CF

Detrimental to Human Health

Forest fire helps in spreading some diseases such as eye diseases in the surroundings during fire season. The members of Sundar CFUG have experience of eye diseases in the past when the forest was damaged by forest fire. Moreover, forest fire creates environmental pollution which affects in the human health and economy.

Loss of Private Property

Sometimes forest fire spreads to the nearby settlements which may lead to loss livestock, human life and property. In the past, few households who reside in the vicinity have lost their houses and cattle shades. However, such loss is very seldom nowadays since communities are being involved in forest management. They remove fire hazards nearby their houses before the commencement of fire season.

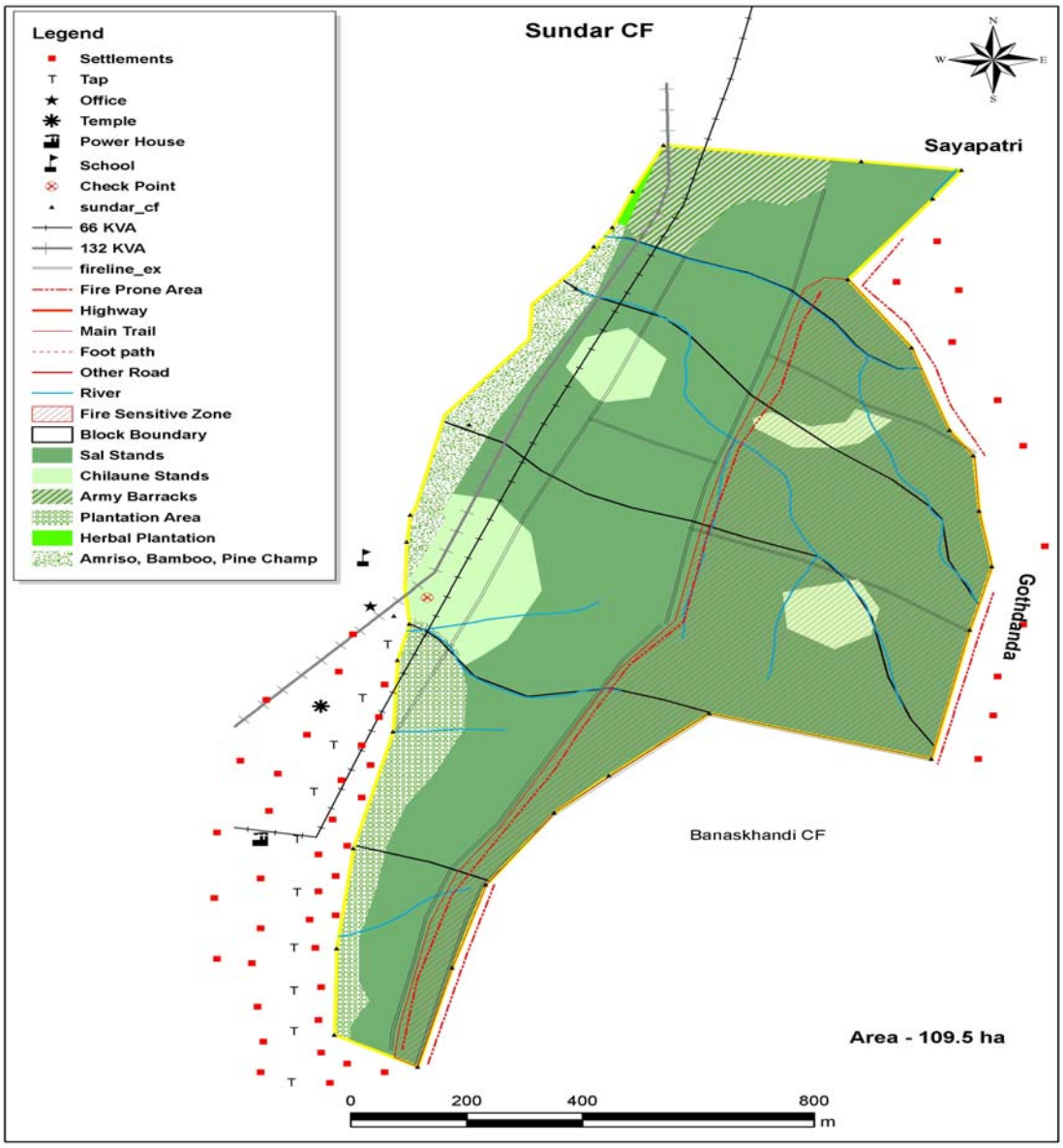
5.7. Fire Zones

The forest is divided into two zones, i.e. fire sensitive zone and fire indifferent zone, based on causes and effects of forest fire. The criteria set for zoning are the occurrence of forest fire in the past, the nature and availability of fuels in particular site, distance from the access trails and settlements. Those areas where forest fire occurs annually, bi-annually, or is attacked by fire during last five years, are categorized as fire sensitive zones. Areas where forest fire has not seen during last five years are categorized as fire indifferent zone. Sal dominated forest patches are more fire sensitive than Chilaune dominated areas. Similarly, the forest areas nearby the settlements, in general, are more fire sensitive than the other areas since there is a high possibility of escaping fire from the settlements. Forest areas nearby Gothdada and Saypatri settlements are classified as fire sensitive zone. Sunder CF is frequently affected by forest fire emerged from the nearby Banaskhandi CF. It is also considered during fire zoning. Eastern and southern part of the forest is delineated as a fire sensitive zone in the CF. Table 5 shows the area covered by each of the zones. The fire sensitive zones are presented in Figure 3.

Tab. 5. Fire sensitive zones in Sundar CF

SN	***Zone***	***Area***	***Percent***
1	Fire sensitive zone	49.8 ha	45.5
2	Fire indifferent zone	59.7 ha	54.5
	Total	109.5 ha	100

Fig. 4. Fire Sensitive Zone in Sundar CF



6. Existing Fire Management Practices

Since forest fire occurs almost every year in Sundar community forest, CFUG has tried to prevent and control the fires based on their indigenous knowledge. The measures adopted by the community to prevent and control forest fire are briefly mentioned hereafter.

6.1. Preventive Measures

CFUG practiced following measures to prevent fire in the CF:

6.1.1. Fuel Breaking

The CFUG members remove Banmara *(Eupatorium odonatum)* and other forest fire fuels nearby the settlements to reduce fire hazards. They practice it before the commencement of hot dry season. The CFUG members take out dead and dying trees from the community forest according to their operational plan which reduces fire hazards in the CF.

Present forest operational plan of Sundar CF proposed to construct 27 km and to maintain 17 km of the fuel breaking lines inside the community forest during the period of next five year. The CFUG has invested Rs. 12,000 (approximately US$190) last year for fuel breaking lines. However, the investment proposal is limited to length of the fire line and width and other details are not sufficiently considered. The lengths of the proposed fuel breaking lines in the operational plan are presented in Table 6.

Tab. 6. Proposed fuel breaking lines in Sundar CF

Year	Month	Block No	Length in km
Fuel breaking line construction			
2008	April-May	1	3
2009	April-May	2	5
2010	April-May	3	7
2011	April-May	4	5
2012	April-May	5	7
		Total	***27***
Fuel breaking line maintenance			
2010	April-May	2	5
2011	April-May	3	7
2012	April-May	4	5
		Total	***17***

Source: Operational Plan of Sundar CF, 2063

6.1.2. Public Awareness

The CFUG has initiated public awareness activities to reduce fire risk, particularly to the poor people who reside in the hill top who are blamed for initiation of forest fire. The CFUG has also initiated to reward to the first individual informing fire flames inside the CF. Users believe that it helps in detecting forest fire at the earliest. In addition, school students and local residents have also been rewarded by the CFUG for taking part in fire detection and suppression.

6.2. Control Measures

Following control measures have been adopted in the CFUG to control fire:

6.2.1. Fire Detection and Communication System

Fire incidents in the community forest are detected through:

Forest watcher

Two forest watchers are employed by CFUG to look after the forest. They inform to the users if they detected fire in the forests and involve in fire suppression activities.

Cattle Grazers

Grazing is partially allowed in the CF although it is prohibited in the erosion hazard areas within the forest. Grazers inform to the users if they detected fire flames inside the forest.

Adjacent Households

People who reside nearby the community forest are more active in detecting fire since they are at high risk of being affected by forest fire. They inform to the other households and CFUG members when fire flame is detected in the CF.

Patrolling

Patrolling is practiced in the forest mostly by forest watcher. During fire hazard season, users are also involved in the patrolling. Seasonal patrolling team formed by the CFUG in rotation basis inform to the users if they detected fire flames inside the community forest.

6.2.2. Suppression of Forest Fire

Once fire flame is detected in the forest, users gather and suppress the fire based on their own indigenous techniques. The materials and techniques used in the CF to suppress forest fire are:

Using Soil

Soil is one of the most common and widely used materials to suppress forest fire. People dig the earth through domestic tools like spade and shovel to speck fire.

Using Water

Water is used everywhere to suppress the fire. Users in the CFUG utilize water to curb fire when it is available in the surroundings. It is commonly practiced nearby the settlements where water is available.

By Beating

The CFUG members use green branches and leaves to beat the fire. It is the most common techniques adopted in the CF.

Using Traditional Tools

The CFUG members use various types of locally made traditional tools to suppress forest fire. Fire rake is one of them, which is made locally and helpful to remove leaf litters and other fuels. It is used for fuel breaking purpose.

Counter Fire/Back Fire

Local communities usually adopt back fire to retard the acceleration of wild fire. Particularly, people who reside nearby the forest practice back fire to prevent settlements from forest fire.

Fire Breaking/Fuel Breaking

The CFUG members clean dry leaves or other fire fuels to retard the acceleration of fire.

Photograph #6: Fuel breaking line within the CF

6.3. Legal Provisions

Setting fire in the CF is considered as a crime according to the users' constitution of Sundar CFUG. Person who involved in setting fire in the CF is offended between RS 500 to RS 1,000 based on the nature of the damage and loss. In addition, there is a practice of incentives for them who actively involve in suppressing the fire.

Box 4

Legal Provisions regarding wildland fire in Nepal (in the Forest Act 1993 & Forest Rules 1995)

Prevention

In Clause (b), Section 49 of Forest Act 1993, "setting fire, or do anything that may cause a fire accident" in national forests is prohibited. In Clause 1.(b), Section 50 of the Act, any person who commits such offence shall be punished with a fine of not more than Rs. 10,000.00 or with imprisonment for a term not exceeding one year, or both.

Rehabilitation

In Clause (c) of Sub-rule (2) of Rule 9 of the Forest Rules 1995 has provision of construction wood (quantity determined by the District Forest Product Supply Committee) to the fire-victim household for the rehabilitation purpose with royalty price.

6.4 Existing Capacity of the CFUG

A total of 24 members, 12 male and 12 female, of the CFUG have received seven days training on fire management and control. The CFUG is also equipped with fire fighting tools and equipments. Global Fire Monitoring Center and Office of Humanitarian Assistance, Federal Republic of Germany, supported fire fighting tools and equipments to the CFUG. The capacity of the CFUG has been equipped and strengthened for fire prevention and control measures. The fire fighting equipments and tools are stored in the CFUG office which is centrally located with multiple key systems to open the store and use the facilities. In addition, storing in Office of the CFUG will develop community ownership feeling and strengthen community support in fire controlling. Equipments and tools available to the CFUG are presented in annex 2.

7. Community Based Fire Management Planning

7.1. Fire Prevention

The two basic steps in preventing forest fires are reducing risks and reducing hazards. Risk is the chance of a fire's starting as determined by the presence of activity of causal agents, most likely human beings. Hazard is reduced by compartmentalizing a forest with firebreaks (fire lines in which all vegetation is removed) and reducing the buildup of fuel (litter, branches, fallen trees, etc.) by prescribed burning.

Following activities will be implemented to prevent fire:

7.1.1. Fire Risk Reduction

Following public awareness activities are proposed to reduce fire risks by mobilizing CFUG members, school students, community based organizations and other concerned stakeholders.

Awareness and Education

- Aware CFUG members and people residing in the vicinity of the forests. Inhabitants of Gothdada and Saypatri settlements will be given priority for the awareness activities.
- Educate school students regarding short and long term environmental and socio-economic impacts of forest fire.
- Create awareness on forest fire through mass media, an effective means of extension.
- Prepare and distribute information for visitors, campers, collectors, cattle grazers in Nepali language.
- Organize workshops and mass meetings to discuss environmental and socio-economic impacts of forest fire among various stakeholders including CFUGs and their networks and federations, VDC, local NGOs, community based organizations, etc,.
- Periodically organize street theaters, dramas and demonstrations related to forest fire and its consequences.

Information materials

- Prepare and distribute posters, pamphlets and other information materials. Target group will be CFUG members, inhabitants of the nearby settlements of the CF, trekkers, grazers, etc.
- Prepare and mount information boards (sign boards, warning boards, etc) in public places, view points, and resting places. Adequate sign boards will be mounted along the trail that connects Gothdada and other settlements. Similarly, information boards will be mounted along Tribhuvan highway passing across the CF. Moreover, information boards will be mounted in different public places nearby the CF.

7.1.2. Fire Hazard Reduction

Following activities will be implemented to reduce fire hazards in the CF

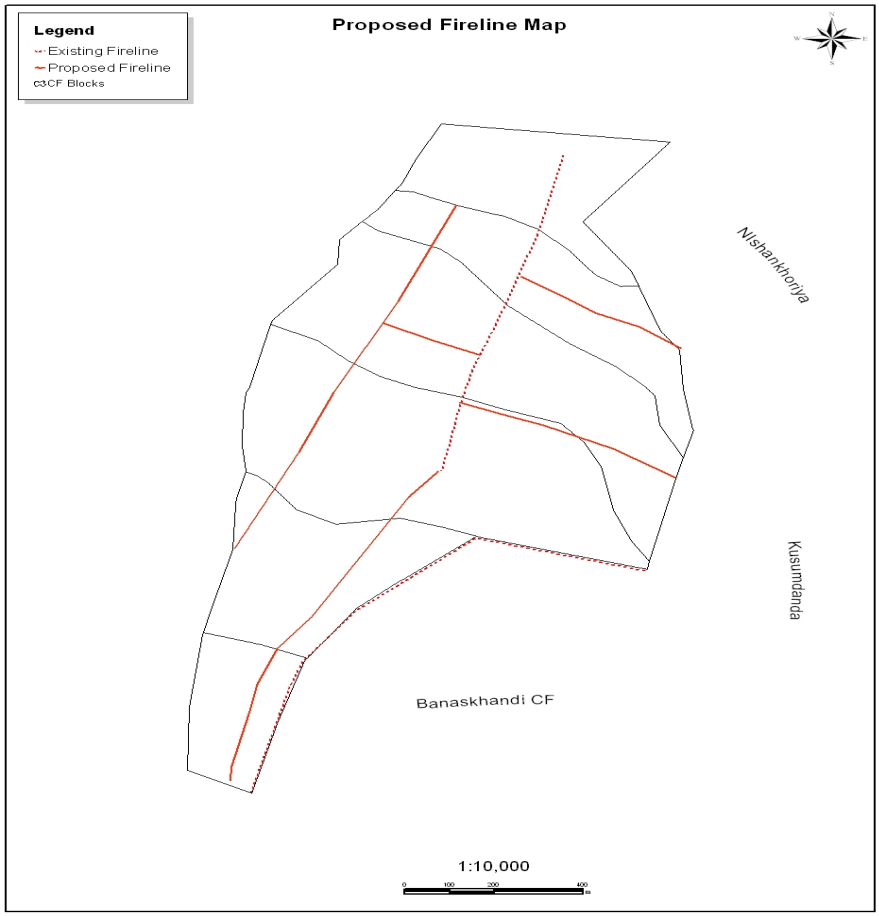
Fire Fuel Reduction

- Encourage CFUG members to collect leaf litters, fallen trees and other hazardous forest products.
- Remove fire hazards from fire sensitive areas before commencement of hot dry season (March to June).
- Initiate fuel breaking belts through removing fire fuels from fire sensitive zones.
- Encourage stall feeding to lessen the number of cattle grazers in the CF.

Fire Line Construction

- Construct and maintain networks of fire lines inside the community forests. Proposed fire line to be constructed and maintained is presented in Figure 4.

Fig. 5. Proposed fire line locations



Controlled Burning

Controlled burning will be practiced in the fire sensitive zones particularly nearby Gothdada and Saypatri settlements that are more prone to forest fire.

7.2. Preparedness

Preparedness is an important component of this community based fire management plan. The plan recommends forming active fire fighting crews at CFUG level and equipped them with fire-fighting tools and equipments. In addition, various training and logistic arrangement are recommended.

7.2.1. Fire Crews

Active fire fighting crews including forest watcher and trained CFUG members will be formed before the commencement of fire hazard season. A fire fighting leaders group has been formed within the CFUG with first ten persons available to suppress fire in the CF (Annex 3). The fire fighting group will lead to implement fire suppression activities in the CF. The fire fighting leaders group will be equipped with fire fighting equipments and tools.

7.2.2. Fire Fighting Tools and Equipments

A set of modern equipments is available to the CFUG (Annex 2). Fire fighting tools and equipments will be stationed at CFUG office under the command of fire fighting equipment sub-committee. The fire fighting sub-committee has been formed to handle the maintenance of the equipments to keep them always working. The sub-committee formed in the CFUG is presented in Annex 4. In addition, traditional and locally made equipments and tools will also be used when appropriate.

7.2.3. Capacity Building

Training and orientation program will be organized regarding fire management focusing on fire prevention and control tactics and techniques (e.g. proper use of fire fighting tools and equipments, fire safety, leadership, etc). The training will be provided to the following persons within the CFUG:

- Forest watchers
- CFUG members
- Members of fire fighting leaders group
- Members of fire fighting sub-committee

7.2.4. Cooperation and Networking

- Establish and maintain cooperation and networking with CFUGs and their networks and federations, DFO, Police, Army, VDC, and other concerned stakeholders.

7.3. Fire Control

Effective fire control begins with a field survey and map to identify the areas at risk, delineate them, and define and improve the barriers or firebreaks that may limit fire spread. Natural barriers include rivers, lakes, ridge tops, etc. Artificial barriers include roads, canals, and power-line tracks, but usually extra firebreaks must be cut to link these and provide wider gaps that fire cannot readily jump. Forest roads, access for forest products collection and recreation, are of critical importance in fire fighting.

Detection is the first step in fire suppression. Fire surveillance is essential during seasons of high risk. Once a fire has been detected, the next step is fire suppression. The first job is to stop or slow the rate of spread of the fire, and the second job is to put it out. Suppression is accomplished by breaking the "fire triangle" of fuel, temperature, and oxygen by robbing the fire of its fuel (by physically removing the combustible material or by making it less flammable through application of soil, water, or chemicals); by reducing its temperature (through application of soil, water, or chemicals and partial removal or separation of fuels); and by reducing the available oxygen (by smothering fuels with soil, dirt, water, or chemical substances). Following activities will be taken as an attempt to forest fire management.

7.3.1. Fire Detection and Communication

Fire Detection

- Train and orient forest watchers and CFUG members on fire detection procedures and technologies.
- Initiate rotational patrolling through the users in the community forests and participatory patrolling, including members of CBOs, local clubs and other concerned stakeholders.

Fire Alarm and Communication

Communication systems like hand mike, phone, bell, local FM radio, etc will be established and operated to alarm and communicate fire information within the stakeholders. The proposed communication system and mechanisms established in the community forest is presented in Annex 5.

7.3.2. Fire Suppression

Appropriate planning is a must to control forest fire. Appropriate planning will be done to suppress forest fire in the CF. Well equipped fire crews formed in the CFUG will be mobilize and assisted by the CFUG members as required. Forest fire will be suppressed through the adoption of indigenous methods, traditional tools, modern equipments and tools, and counter fire as appropriate. Fire suppression is generally practiced into three phases. Phase I: attack which includes cut off and restricts forest fire. Phase II: circling around the forest fire with control line. Phase III: mopping up forest fire. Counter fire or back fire will also be practiced to retard the acceleration of main fire.

7.4. Reporting and Monitoring

A monitoring and evaluation sub-committee is formed under the executive committee (Annex 6). The sub-committee will report, monitor and evaluate the actions/activities taken to prevent and control fire and recommend improving the performance in the future. The users planned to perform at least two public hearings each year on fire management activities of the CFUG. One event will be organized during December, before fire season, which will facilitate fire prevention and fire control mechanism. The second event, during July, will provide opportunity to evaluate the fire incidence and the user group response and a chance for improvement.

7.5. Recovery and Rehabilitation

Recovery of fire damaged area is an important task to be planned. Following activities will be undertaken to recover the fire affected areas:

- Clean up debris from fire lines
- Removal of dead or damaged trees
- Regenerate fire damaged site

Fire damaged area will be rehabilitated through natural means or by planting appropriate species. Priority will be given to incorporate NTFPs and fire resistant indigenous species.

8. Fire Management Action Plan

A five year fire management action plan is prepared. The plan is presented in Table 7.

Table 7. Fire management action plan for Sundar CF

S.N	Activity	Unit	No	Where	When					Responsible	Remarks
					2007	2008	2009	2010	2011		
1	Fire Hazard Clearance	Ha.	5	Gadhi-9, Chauki Tole and Saypatri	Nov	Nov	Nov	Nov	Nov	Ms. Ranjana Pariyar	
2	Controlled Burning	Event	2	Along the Fire Line & hazard areas (near Gothdada & Saypatri settlement)	Dec & Mar	Dec & Mar	Dec & Mar	Dec & Mar	Dec & Mar	Mr. Subash	
3	Fire Line Construction	Meter	200	Shown in the Map		Mar/ Apr	Mar/ Apr			Mr. Chha Kumar Dangol	
4	Fuel Breaking Line Maintenance	Meter	300	Existing and newly constructed fire lines	Nov/ Dec	Nov/ Dec	Nov/ Dec	Nov/ Dec	Nov/ Dec	Ms. Padma Devi Acharya	
5	Fire Watcher	No	2	Focus on Fire sensitive area	Apr-July	Apr-July	Apr-July	Apr-July	Apr-July	Mr. Budhi Poudel	
6	Water Source Protection	No.	2	Sundar drinking water and Drinking water corporations water source						Ms. Sushila Sanjel	
7	School Program (Fire Awareness Class for 6, 7 & 8 grades)	No.	2	Shree Jyoti and Devi School for 6/7/8 grades		Jan/Feb				Ms. Tara Lama	
8	Develop and Mount Information Board	No.	7	Chauki Tole-2, Sayapatri CF area-2, Goath Danda- 1 Banaskhandi-1 Samari Bridge-1		Nov	Nov			Mr. Badri Joshi	
9.1	Awareness Workshop on Forest Fire	No.	2	Sundar CF and Goathdada area	Nov & Dec					Mr. Prabhakar kafley	
9.2	Awareness Workshop on Forest Fire	No.	2	Sundar CF and Sayapatri CF		Nov				Mr. Jhalak Gautam	
10	Street Drama	No.	2	Samari and Chauki Tole area		Apr				Mr. Bishow Nath Dhakal	

11	Pamphlet, Poster Production, Distribution			Makawanpur District			Mar			Mr. Jhalak Gautam	
12	Patrolling			In and around the CF	Apr-June	Apr-June	Apr-June	Apr-June	Apr-June	Executive committee	Rotation, as per need
13	Networking for Forest Fire Control									Mr. Buddhi Poudel, Ms. Padma Devi Acharya	
13.1	FECOFUN	No.	2	FECOFUN Office	Oct & Apr						Discuss and develop strategy and action plan
13.2	Range Post (RP) Level Monitoring and Evaluation Networking	No.	2	Harnamadhi and Bhaise RP Monitoring & Evaluation Networking	Oct & Apr						
13.3	Neighbor Community Forest	No.	4	CFUGs	Oct-Apr						
14	Operation of Fire Fighting Tools			Within and Outside CFUG						Mr. Ananda Dhakal	as per need
15	Reporting and Monitoring of Activities			All Activities						Sub Committee	
16	Public hearing	No.	5	Within and outside CFUG						Executive committee	

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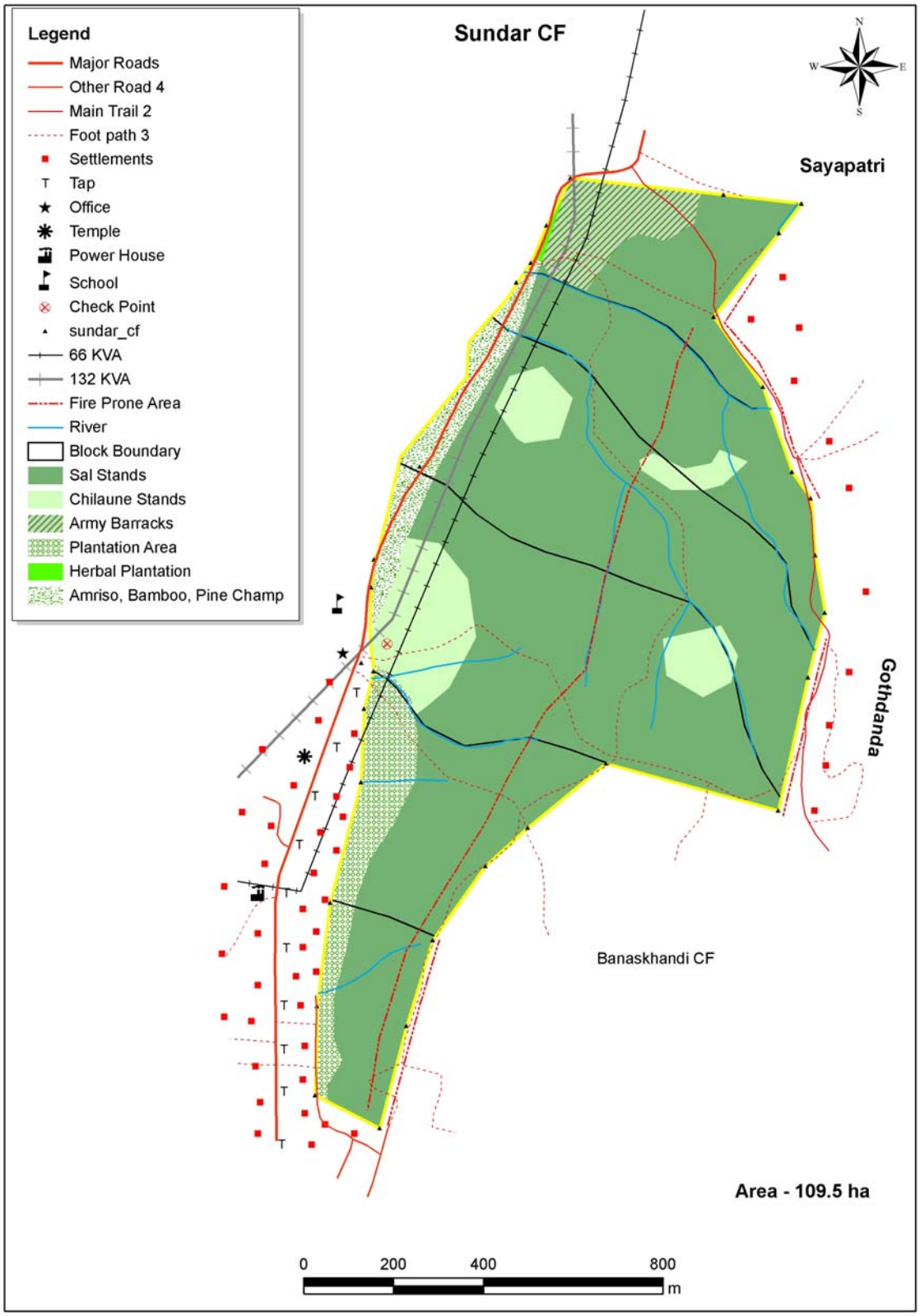
Annex 1. Participatory Resource Map of Sundar CF with GIS Application



Annex 2: Fire Fighting Tools and Equipments Available in the CF

1.	Swatter	12 sets
2.	Shovel	12 sets
3.	Rake	12 sets
4.	Rake-hoe	12 sets
5.	Axe-hoe	12 sets
6.	First Aid Kit	2 sets
7.	Jumpsuit, 9 OZ Indura (Small 11, Medium 6, Large 7)	25 sets
8.	Gloves	24 sets
9.	Helmet	24 sets
10.	Boot	24 sets
11.	Back-pack Pump, Collapsible	12 sets
12.	Drip Torch	5 sets
13.	Water Pump, 3.5 HP	1 set
14.	Hose Reel with Roller	1“ * 100’
15.	Container, 1000 lit.	1 set
16.	Kestrel Weather Station	1 set
17.	Case for Kestrel	1 set

Annex 3: Fire Fighting Leaders Group

(1st ten person ready for fire suppression with the fire fighting equipments)

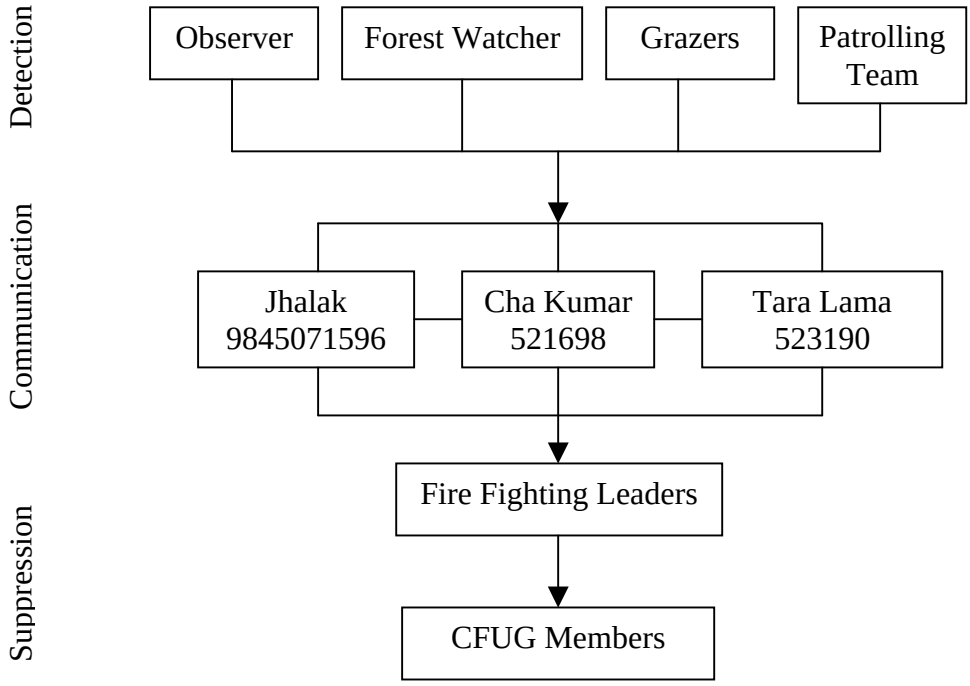
1. Mrs. Uma Devi Regmi
2. Mr. Jhalak Gautam
3. Mrs. Sakuntala Thapa
4. Mrs. Ganga Subedi
5. Mr. Chha Kumar Dangol
6. Mrs. Padma Devi Acharya
7. Mr. Budhi Prasad Poudel
8. Mr. Sanjev Lopchan
9. Mr. Raju Malla
10. Mrs. Ranjana Pariyar

Annex 4: Fire Fighting Equipment Maintenance Sub-committee

1. Mr. Prabhakar Kafley
2. Mr. Ananda Dhakal

Annex 5: Communication Systems to be adopted by the CFUG

Information Flow System



Annex 6: Monitoring and Evaluation Sub-committee

A seven member's fire monitoring and evaluation sub committee is formed for the fire management monitoring process. Women representation in the committee is larger than male that shows a high level of commitments from the women.

1. Mr. Buddhi Prasad Poudel
2. Mrs Tara Lama
3. Mr Raju Malla
4. Mrs Nirmala Gole
5. Mrs Sakuntala Thapa
6. Mr Jaya Ram Pudasaeni
7. Mrs Uma Regmi

Annex 7: Glossary of Fire Related Terms

Term	Description
action plan	Any tactical plan developed by any element of the ICS in support of the incident action plan.
air pollution	The general term alluding to the undesirable addition of substances (gases, liquids, or solid particles) to the atmosphere that are foreign to the natural atmosphere or are present in quantities exceeding natural concentrations.
available fuel	The portion of the total fuel that actually burns or would actually burn under specified burning and fuel conditions.
backfire	A fire spreading, or set to spread, into or against the wind: (1) As used in fire suppression: A fire set along the inner edge of a control line to consume the fuel in the path of a forest fire and/or change the direction of force of the fire's convection column (Note: doing this on a small scale and with closer control, in order to consume patches of unburned fuel and aid control-line construction (as in mopping-up) is distinguished as "burning out, firing out, clean burning"); (2) As used in prescribed burning: designation of fire movement in relation to wind (syn. backing fire, cf. flank fire).
backfiring	A form of indirect attack where extensive fire is set along the inner edge of a control line or natural barrier, usually some distance from the wildfire and taking advantage of indrafts, to consume fuels in the path of the fire, and thereby halt or retard the progress of the fire front
backpack pump	A portable water container equipped with a hand pump and back-pack straps carried on the back of fire fighters; used for applying water or fire retardant, in suppression and mop-up operations (syn. bladder bag, pack pump)
combustion	Consumption of fuels by oxidation, evolving heat and generally flame (neither necessarily sensible) and/or incandescence. Combustion can be divided into four phases: preignition (or preheating), flaming, smoldering, and glowing.
Community-Based Fire Management (CBFiM)	Fire management approach based on the strategy to include local communities in the proper application of land-use fires (managed beneficial fires for controlling weeds, reducing the impact of pests and diseases, generating income from non-timber forest products, creating forage and hunting, etc.), wildfire prevention, and in preparedness and suppression of wildfires. CBFiM approaches can play a significant role in fire management, especially in most parts of the world where human-based ignitions are the primary source of wildfires that affect livelihood, health and security of people. The activities and knowledge communities generally practice are primarily those associated with prevention. They include planning and supervision of activities, joint action for prescribed fire and fire monitoring and response, applying sanctions, and providing support to individuals to enhance their fire management tasks. Communities can be an important, perhaps pivotal, component in large-scale fire suppression, but should not be expected to shoulder the entire burden.
controlled burning	Outdated term which had been used instead of the term Prescribed Burning (cf. prescribed burning)
counter fire	Fire set between main fire and backfire to hasten spread of backfire. The act of setting counter fires is sometimes called front firing or strip firing (syn. Draft fire).
crew	An organized group of firefighters under the leadership of a crew boss or other designated official.
detection	The process of discovering, rectifying, locating and reporting wildfires by ground, aerial, and spaceborne means.
fire	Simultaneous release of heat, light, and flame, generated by the combustion of flammable material.
fire control	All activities concerned with protection of vegetation from fire (cf. fire exclusion, fire prevention, fire suppression).
fire crew	A general term for two or more firefighters organized to work as a unit (cf. suppression crew).
fire damage	Any effects of fire that are detrimental or damaging in terms of the attainment of forest management and other land use objectives (Note: for fire damages in plants and animals use fire Injury).

fire danger	A general term used to express an assessment of both fixed and variable factors of the fire environment that determine the ease of ignition, rate of spread, difficulty of control, and fire impact; often expressed as an index.
fire frequency	The average number of fires or regularly occurring fire events per unit time in a designated area. (cf. fire cycle, fire interval).
fire hazard	(1) A fuel complex, defined by volume, type, condition, arrangement, and location, that determines the degree both of ease of ignition and of fire suppression difficulty; (2) a measure of that part of the fire danger contributed by the fuels available for burning. Note: Is worked out from their relative amount, type, and condition, particularly their moisture contents (syn. hazard).
fire hazardous area	Those wildland areas where the combination of vegetation, topography, weather, and the threat of fire to life and property create difficult and dangerous problems.
fire history	The reconstruction and interpretation of the chronological record, causes and impacts of fire occurrence in an ecosystem in relation to changes of past environmental, cultural and socio-economic conditions. Fire history evidence is based on analysis of charcoal deposits in soils, sediments, and ice, dendrochronology (fire scar analysis), historical documents, and fire reports.
fire impact	The effect of fire on the ecosystem in terms of biophysical alterations (e.g., crown scorch, mineral soil exposure, depth of burn, fuel consumption).
fire incidence	The average number of fires in a specified area during a specified time period.
fire intensity	A general term relating to the heat energy released in a fire (more specific term: cf. fireline intensity).
fire management	All activities required for the protection of burnable forest and other vegetation values from fire and the use of fire to meet land management goals and objectives. It involves the strategic integration of such factors as a knowledge of fire regimes, probable fire effects, values-at-risk, level of forest protection required, cost of fire-related activities, and prescribed fire technology into multiple-use planning, decision making, and day-to-day activities to accomplish stated resource management objectives. Successful fire management depends on effective fire prevention, detection, and presuppression, having an adequate fire suppression capability, and consideration of fire ecology relationships.
fire management plan	(1) A statement, for a specific area, of fire policy and prescribed action; (2) The systematic, technological, and administrative management process of determining the organization, facilities, resources, and procedures required to protect people, property, and forest areas from fire and to use fire to accomplish forest management and other land use objectives (cf. fire suppression plan, preattack plan, pre-suppression planning).
fire occurrence	The number of fires started in a given area over a given period of time.
fire prevention	All measures in fire management, fuel management, forest management, forest utilization and concerning the land users and the general public, including law enforcement, that may result in the prevention of outbreak of fires or the reduction of fire severity and spread (syn. Prevention, cf. Fire Control)
fire rake	Long-handled combination rake and cutting tool, the blade of which is constructed of a single row of three or four sharpened teeth (syn. rake).
fire season	(1) Period(s) of the year during which wildland fires are likely to occur and affect resources values sufficient to warrant organized fire management activities; (2) a legally enacted time during which burning activities are regulated by State or local authority.
fire suppression	All activities concerned with controlling and extinguishing a fire following its detection. (Syn. Fire Control, Fire Fighting).Methods of suppression are:Direct Attack - A method whereby the fire is attacked immediately adjacent to the burning fuel.Parallel Attack - A method whereby a fireguard is constructed as close to the fire as heat and flame permit, and burning out the fuel between the fire and the fireguard.Indirect Attack - A method whereby the control line is strategically located to take advantage of favorable terrain and natural breaks in advance of the fire perimeter and the intervening strip is usually burned out or backfired. Hot Spotting - A method to check the spread and intensity of a fire at those points that exhibit the most rapid spread or that otherwise pose some special threat to control of the situation. This is in contrast to systematically working all

	parts of the fire at the same time, or progressively, in a step-by-step manner. Cold Trailing - A method of determining whether or not a fire is still burning, involving careful inspection and feeling with the hand, or by use of a hand-held infrared scanner, to detect any heat source. Mop-Up - The act of extinguishing a fire after it has been brought under control.
fire suppression plan	A document containing the essential elements of actions necessary to save human life and property, and minimize fire damage(s). May apply to an overall fire suppression program for a broad area but most often it is for site-specific situations (cf. fire management plan, preattack plan).
fire triangle	Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease (cf. fire Behavior triangle, fire environment triangle, fire fundamentals triangle).
firebreak	Any natural or constructed discontinuity in a fueled utilized to segregate, stop, and control the spread of fire or to provide a control line from which to suppress a fire; characterized by complete lack of combustibles down to mineral soil (as distinguished from fuel break). (cf. control line)
firefighter	Person whose principal function is fire suppression
fireline	(1) A loose term for any cleared strip used in control of a fire; generally that portion of a control line from which flammable materials have been removed by scraping or digging down to the mineral soil; (2) a cleared, permanent firebreak. (cf. control line)
fuel break	Generally wide (20 - 300 meters) strips of land on which either less flammable native vegetation is maintained and integrated into fire management planning, or vegetation has been permanently modified so that fires burning into them can be more readily controlled (as distinguished from firebreak). In some countries fuel breaks are integrated elements of agro-silvopastoral systems in which the vegetative cover is intensively treated by crop cultivation or grazing. Some fuelbreaks contain narrow firebreaks which may be roads or narrower hand-constructed lines. During fires, these firebreaks can quickly be widened either with hand tools or by firing out. Fuelbreaks have the advantages of preventing erosion, offering a safe place for firefighters to work, low maintenance, and a pleasing appearance (cf. control line, agrosilvopastoral system, buffer strip/zone).
hazard reduction	Treatment of living and dead forest fuels to reduce the likelihood of a fire starting, and to lessen its damage potential and resistance to control (cf. fuel treatment).
human-caused fire	Any wildland fire (usually in the context of wildfire causes) caused by human carelessness or malicious use of fire (syn. people-caused fire, person-caused fire; outdated term: man-caused fire).
ignition	The initiation of combustion.
incident	An occurrence either human-caused or natural phenomenon (in this terminology incident means wildfire), that requires action or support by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources (element of the Incident Command System [ICS]).
lookout tower	Structure that elevates a person above nearby obstructions to sight for fires; generally capped by some sort of house or cupola (syn. fire tower, tower cupola; cf. lookout house).
preparedness	(1) The state of being ready to cope with a potential fire situation (syn. readiness). (2) Mental readiness (awareness) to recognize changes in fire danger and act promptly when action is appropriate (syn. readiness).
prescribed burning	Controlled application of fire to vegetation in either their natural or modified state, under specified environmental conditions which allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to attain planned resource management objectives (cf. prescribed fire). Note: This term has replaced the earlier term "Controlled Burning".
rehabilitation	The activities necessary to repair damage or disturbance caused by wildfire or the wildfire suppression activity (cf. restoration).
risk	(1) The probability of fire initiation due to the presence and activity of a causative agent. (2) A causative agent. (3) A number related to the potential of firebrands to

	which a given area will be exposed during the rating day element of the U.S. NFDRS) (syn. fire risk).
smoke	Suspension in the atmosphere of small particles (solid, liquid) produced by combustion, thermal decomposition or thermal evaporation.
uncontrolled fire	(1) Any fire which threatens to destroy life, property, or natural resources, and (a) is not burning within the confines of firebreaks, or (b) is burning with such intensity that it could not be readily extinguished with ordinary tools commonly available.

Source: http://www.fire.uni-freiburg.de/literature/show_complete.php