



Global Fire - A Message from the Global Fire Monitoring Center



Fires in forests and other vegetation - a terminology

Every year fires occur on several hundred million hectares of forests (*forest fires*) and other vegetation types worldwide. Fires in forests and open vegetation (woodlands, brushland, grasslands, savannahs, steppes) are commonly designated as *wildland fires* or *vegetation fires*. Causes of uncontrolled fires (*wildfires*) and reasons for using fire as a management tool in agriculture, pastoralism, and forestry (*land-use fires, prescribed burning*) depend on the local environmental conditions (climate, vegetation type) and the culture with its specific social and economic conditions. Lightning is the most important natural cause of wildfires, especially in the less populated regions of the forests in high northern latitudes and tropical savannahs. Human-caused wildfires, however, play the most significant role in most regions of the world. The major reason is negligence, including escaped land-use fires, and sometimes arson.

Effects of wildfires and land-use fires

Wildfires can have both positive and negative effects on nature. In some ecosystems fires play an ecologically significant role in maintaining biogeochemical cycles. For instance, many savannahs in the tropics and subtropics burn annually or in intervals of several years (short fire cycles of 1 to 3 years). These fires are important to regenerate and stimulate the growth of grass and maintain the habitat structures of important wildlife species and domestic animals. Such “fire savannahs” are highly productive and are home to important plant and animal biodiversity. Similar adaptations are found in the natural northern coniferous forests which have a fire cycle ranging from several years or decades to several hundred years. Useful fires that improve the conditions for sustainable growing of crops are also set by experienced agriculturalists, herdsman and hunters all over the world.

In other ecosystems fires are extremely destructive. The tropical rain forests are most vulnerable during extreme

droughts such as those which repeatedly occur during El Niño years. During such extended dry spells the rain forest trees must protect themselves against the loss of water and shed their leaves. Consequently, the forest canopy becomes more open, sunlight penetrates down to the forest floor where the shed leaves become highly flammable. Fires escaping from agricultural sites or from pasture-burning are now able to spread into the forest and result in reduction of biodiversity and/or to long-term site degradation. During the strong El Niño of 1997-1998 large areas of rain forest were destroyed by fire in Asia and the Americas. A major reason for these detrimental fires was the inappropriate use of fire in converting forest or secondary vegetation to plantations.

In the temperate and boreal forests major damages occur in places where people are living at the interface between metropolitan or other residential areas and the vegetated lands such as brushland or forests. Thus, in almost all regions of the world wildfires burning under extreme weather conditions affect economies, human health and safety, with consequences which are of a significance and severity comparable to other major natural hazards. The vast majority of destructive fires are caused by the carelessness of humans. Thus, unlike the majority of the geological and hydro-meteorological hazards, vegetation fires represent a hazard which can be predicted, controlled and, in many cases, prevented.

Smoke emissions: impact on atmosphere and human health

Vegetation fires produce gas and particle emissions that have impacts on the composition and functioning of the global atmosphere. These emissions interact with those from fossil-fuel combustion and other technological sources that are the major cause of anthropogenic climate forcing. The extended fire and smoke episodes in South-East Asia and South America between 1982 and 1998 have demonstrated that smoke emissions from vegetation fires also affect human health and lead to loss

of human lives. In South East Asia alone more than 40 million people have been exposed to dangerous levels of smoke pollution from forest conversion burnings that lasted for weeks and in some places even for months.



Global climate change and fire

A look into the future shows that more problems are to be expected in a globally changed climate. Scenarios of climate change (based on global circulation models) indicate that changing fire regimes (increase of fire pressure) and other disturbances by humans will lead to more impoverishment of biodiversity and the carrying capacity of vegetation systems due to fire. Degradation and savannization of tropical rainforests, the loss of peat-swamp ecosystems and certain permafrost-dependent forests are the most prominent examples.

We can prevent wildfires!

The prevention of destructive fires is an integral element of land-use policies and fire management strategies. Fire prevention must address a broad range of elements and sectors of society, natural resources and environmental management, land-use planning, and technology development. Fire policies and strategies vary from country to country because of the different ecosystem characteristics and the cultural, social, and economic factors involved. Successful fire prevention must address the underlying causes of wrongful application of fire and other factors responsible for an increase in detrimental fires. For instance, in some regions of the tropics slash-and-burn agriculture is not sustainable because fire leads to impoverishment of soil fertility. Alternatively the combined use of agricultural and tree crop production (*agroforestry*), sometimes combined with grazing (*agrosilvopastoral systems*) and compost production of non-utilized plant biomass instead of wasteful burning will greatly improve the productivity and stability of soils. In the case of the need to convert

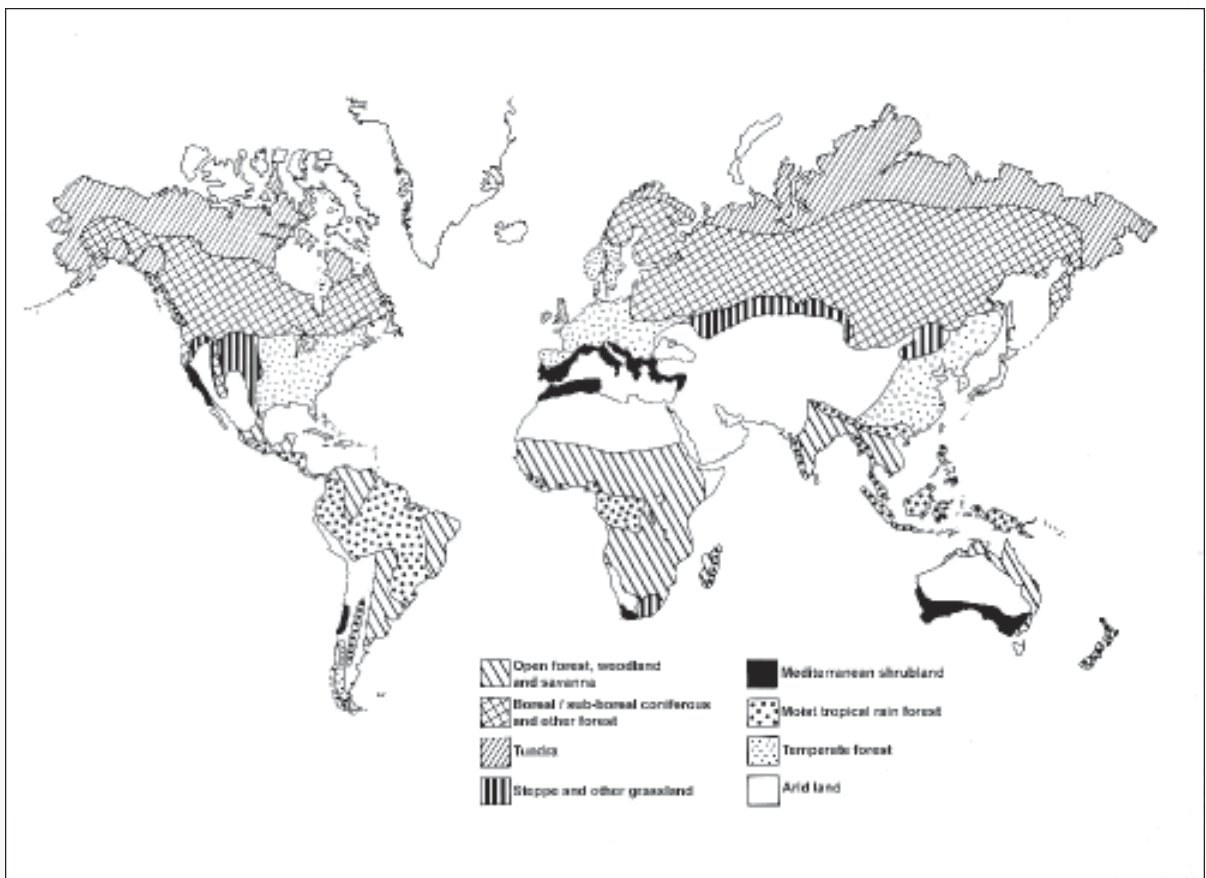
forest and other wooded vegetation to agricultural and pastureland the woody biomass could be better used as an energy source (production of fuelwood or charcoal) instead of wasteful burning with uncontrolled air pollution.

Integrated fire management systems have been developed that are based on the involvement of communities and address fire at its roots. In some countries community-based fire management systems are in place which observe traditional rules of communities or are based on principles of advanced knowledge in sociology and anthropology. The reports from the Integrated Forest Fire Management (IFFN) projects in Indonesia and Namibia are good examples of experience in this regards (see separate reports in this kit).

Early warning for improving prevention and preparedness

Despite the importance of community-based fire management, early warning systems are essential components of fire and smoke prevention and management. They rely on evaluation of vegetation dryness and weather; detection and monitoring of active fires; integrating and processing of these data in fire information systems with other relevant information, e.g. vegetation cover and values at risk; modelling capabilities of fire occurrence and behaviour; and dissemination of information. Early warning of fire and atmospheric pollution hazards may involve locally generated indicators, such as local fire-weather forecasts and assessment of vegetation dryness. Advanced technologies, however, which rely on remotely sensed data, evaluation of synoptic weather information and international communication systems are now also available for remote locations. The Internet system and satellite telephone links are important channels for information flow. In addition, the international community has access to the international information system of the *Global Fire Monitoring Center* (GFMC), where scientists and operators prepare daily global to national early warnings on fire danger and monitor the state of fires throughout the world. Numerous other documents and links to sources in fire information can give the interested reader fast and reliable access to the world of fire. The prevention of destructive fires is the ultimate goal of GFMC which acts as a partner of the *International Strategy for Disaster Reduction* and its international partners in building a global culture of prevention.

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A Global Fire Map

Reliable statistical data on occurrence of wildland fires, areas burnt and losses are available for only a limited number of nations and regions. Instead of an incomplete statistical table the global wildland fire map shows the distribution of distinct fire regions.

1. Open forests, woodlands and savannahs

Tropical and subtropical open forests, woodlands and savannahs which have a distinct dry season cover an area of about 2.3-2.6 billion hectares (= 23 to 26 million square kilometres) worldwide. The combustible materials in these ecosystems are grasses and leaves which are shed during the dry season and are burnt periodically at intervals ranging from one to four years. Many plant and animal species are adapted to regular fire. The fire frequency has increased in some regions as a result of increasing population and more intensive use of rangelands. The global area of savannahs potentially subjected to fire each year is up to several hundred millions of hectares.

2. Boreal/sub-boreal coniferous and broadleaved forest

The world's total boreal forests and other wooded land within the boreal zone cover 1.2 billion ha of which 920 million ha are closed forest. The latter number corresponds to ca. 29 per cent of the world's total forest area and to 73 per cent of its coniferous forest area. The largest piece of boreal forest is on the territory of the Russian Federation. The distinct climatic seasonality with a short vegetation period and low average temperatures leads to the accumulation of organic layers and widespread permafrost soils. Regular natural fires play an important role in promoting the growth of some economically important coniferous species. Recently increasing ignitions caused by human activities are responsible for destructive wildfires, especially in the Russian Federation.

3. Tundra

The tundra ecosystems represent the northernmost (subarctic) vegetation and consist of shrubs growing on thick organic terrain; in the southern parts of the tundra belt scattered trees indicate the beginning of the *taiga* forest belt. During dry northern summers wildfires are mainly caused by lightning and spread over large distances. Such fires which are monitored from satellites are usually not suppressed.

4. Steppe and other grasslands

A large variety of grassland ecosystems in different vegetation zones are subjected to regular fire influence. In some grasslands prescribed fire is used as a management tool to stimulate growth and improve the nutrient quality of grasses for livestock grazing or to prevent growth of undesired bushes and trees. In some steppe ecosystems wildfires may destroy valuable grass resources. The Central Asian steppes have suffered increasingly destructive wildfires since the 1990s. Between 1996 and 1998 more than 27 million ha of steppe and steppe-forest ecosystems were burnt in Mongolia.

5. Mediterranean shrublands

A type of climate characterized by hot, dry, sunny summers and relatively cool, rainy winters. In the extreme South-West of Africa the winter rainfall region is dominated by evergreen, sclerophyllous shrublands (*fynbos*), similar to the *macchia* and *garrigue* shrublands in the Mediterranean Basin, or the shrublands of Southern Australia and the *chaparral* in Western North America. The vegetation is quite fire adapted. Fire problems are mainly at the interface between shrublands and the residential areas where wildfires cause high economic losses by burning houses and infrastructures of urban areas. In the Mediterranean Basin an average of ca. 0.6 million hectares of forest and other land is burnt annually.

6. Tropical rainforests

The undisturbed equatorial rainforests are usually too moist to allow the propagation of wildfires. However, extreme drought in association with forest exploitation and encroachment of other land-use systems periodically create conditions of flammability, fuel availability and fire spread in the equatorial rainforests. Such extreme drought events regularly occur in the forests of tropical South East Asia as a consequence of the El Niño-Southern Oscillation (ENSO) phenomenon. The causes of wildfires are escaped management fires from forest conversion and shifting cultivation activities. During the last major ENSO event in 1997-1998 Indonesia experienced land-use fires and wildfires over more than 10 million ha.



7. Temperate forests

Temperate forests are mainly located in the densely populated industrial regions of the world. The European temperate forests are managed by strict fire protection (exclusion of any fire). In North America a large number of different forest ecosystems show a broad range of adaptations to natural and human-made fires. Thus, fire management strategies vary from region to region.

8. Arid lands

Arid lands include non-vegetated regions, e.g. deserts, or sparsely vegetated ecosystems in which the low density and discontinuity of combustible materials do not allow the spread of fire. Some arid lands sometimes become flammable after a (cyclic) wet year during which the growth of vegetation has been extraordinarily stimulated.



The Global Fire Monitoring Center (GFMC)

In order to serve the demands of a large variety of global users of fire information the German Foreign Office in 1998 supported the establishment of the Global Fire Monitoring Center (GFMC) as a contribution to the United Nations International Decade for Natural Disaster Reduction (IDNDR) and its successor arrangement, the International Strategy for Disaster Reduction (ISDR). GFMC is a facility for global early warning and monitoring of forest and other vegetation fires and provides decision support for the United Nations system, international programmes and nations on request. It operates through the Internet and can be visited freely at:

<http://www.uni-freiburg.de/fireglobe>

Recent Major Fire Disasters

Comprehensive reports with final data on losses caused by forest and other vegetation fires (wildland fires), including impacts on biodiversity, are only occasionally available. The main reason for the lack of reliable data is that the majority of both the benefits and losses from wildland fires involve intangible non-use values or non-market outputs which do not have a common base for comparison, i.e. biodiversity, ecosystem functioning, erosion, etc. Market values such as loss of timber or tourism activity have been calculated in some cases. The following documented large fire events reveal the magnitude of losses by wildfires:

- Wildfires in Indonesia 1982-1983
 - Loss of timber and non-timber values and rehabilitation costs: ca. US\$ 9 billion
 - Biodiversity losses not quantifiable
 - Impact of smoke on human health: not assessed
- Extended forest and savannah fires in Côte d'Ivoire 1982-1983:
 - Human fatalities: > 100
 - Burnt land area: 12 million ha
 - Burnt coffee plantations: 40,000 ha
 - Burnt cocoa plantations: 60,000 ha
- Australia's Ash Wednesday Fires of 1983:
 - Human fatalities: 75
 - Burnt homes: 2,539
 - Burnt domestic livestock: about 300,000
- Forest fires in the North-East of the People's Republic of China in 1987:
 - Human fatalities: 213
 - Burnt forest: 1.3 million ha
 - Homeless population: 50,000
 - Annual average of human fatalities in China between 1950 and 1998: 92 people killed and 551 injured
- Fire episode in the Soviet Union during the 1987 drought:
 - Burnt forest: 14.5 million ha
- Mongolia steppe and forest fires 1996-1997:
 - Burnt area 1996: 10.7 million ha
 - Human fatalities: 25
 - Burnt domestic animals: 7000
 - Burnt stables/houses: 576/210
 - Damage assessment: US\$ 2 billion
 - Burnt area 1997: 12.4 million ha
- Wildfires and forest conversion burning in Indonesia 1997-1998
 - Burnt area in Sumatra and Kalimantan: ca. 10 million ha
 - Short-term direct damages: ca. \$US 10 billion
 - People in South-East Asia affected by severe smoke pollution: ca. 40 million



A Brief Forest Fire Terminology

Some selected important wildland fire management terms given in here are taken from the *Wildland Fire Management Terminology* of the Food and Agriculture Organization of the United Nations which is currently updated by the Global Fire Monitoring Center.

Agrosilvopastoral Systems

Land-use system in which woody perennials are used on the same land as agricultural crops and animals, in some form of spatial arrangement or temporal sequence. In fire management agrosilvopastoral systems are planned on fuelbreaks (particularly shaded fuelbreaks) to reduce fire risk by modifying understorey vegetation and soil cover.

Crown Fire

A fire that advances from top to top of trees or shrubs more or less independently of the surface fire.

Early Burning

Prescribed burning early in the dry season before grass, tree leaves and undergrowth are completely dry or before the leaves are shed, as an insurance against more severe fire damage later on.

Firebreak

Any natural or constructed discontinuity in a fuelbed 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 fuelbreak).

Fire Danger Rating

A component of a fire management system that integrates the effects of selected fire danger factors into one or more qualitative or numerical indices of current protection needs.

Fire Hazard

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.

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 pre-suppression, having an adequate fire suppression capability, and consideration of fire ecology relationships.

Fire Prevention

All measures in fire management, forest management and forest utilization concerning the land users and the general public that may result in the prevention of outbreak of fires or the reduction of fire severity and spread.

Fuel

All combustible organic material in forests and other vegetation types, including agricultural systems, such as grass, branches and wood, which create heat during the combustion process.

Fuelbreak

Generally wide (20-300 metres) 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). 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.

Ground Fire

A fire burning in organic terrain, e.g. dried swamps and peat layers.

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.

Pre-Suppression Planning

Activities undertaken in advance of fire occurrence to help ensure more effective fire suppression; includes overall planning, recruitment and training of fire personnel, procurement and maintenance of fire fighting equipment and supplies, fuel treatment, and creating, maintaining, and improving a system of fuelbreaks, roads, water sources, and control lines.

Smoke Management

The application of knowledge of fire behaviour and meteorological processes to minimize air quality degradation during prescribed fires.

Surface Fire

Fire that burns only surface litter, other loose debris of the forest floor, and small vegetation.

Wildfire

(1) Any unplanned and uncontrolled wildland fire which regardless of ignition source may require suppression response, or other action according to agency policy. (2) Any free burning wildland fire unaffected by fire suppression measures which meets management objectives (see definition of wildland)

Wildland

Vegetated and non-vegetated land in which development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities; structures, if any, are widely scattered. In fire management terminology this general term includes all burnable vegetation resources including managed forests and forest plantations.

Wildland Fire

Any fire occurring on wildland regardless of ignition sources, damages or benefits (see definition of wildland)

Wildland/Residential Interface

The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.



Integrated Forest Fire Management (IFFM) in Namibia



Satellite imageries of Southern Africa show that more than 100 million hectares of tree, bush and grass savannah are burnt every year. Namibia is a country embedded in the midst of this fire environment. Fire research indicates that the natural fire interval in the forests of Northern Namibia is more than 10 years. This finding is very important because the natural trees of this savannah ecosystem require 5-7 fire-free years before the tree seedlings can survive the next fire. The local population, however, burns between 60 and 85 per cent of their land area each year. As a consequence some valuable forests are lacking regeneration. Some grazing lands degrade due to inappropriate grazing intensity and fire intervals. In order to break the habits of uncontrolled burning a massive fire education campaign was launched. This fire campaign is targeted to all levels of people, politicians, traditional leaders, schoolchildren and their teachers and local farmers.

The *Integrated Forest Fire Management* (IFFM) pilot project in Namibia which covers an area of 1.2 million hectares of forests has shown that the local people can be fully involved in forest fire control activities if properly educated and motivated. The conventional approach to forest fire control (imported from industrialized countries) whereby one develops detection and suppression methodologies, will not work under the sociocultural and economic conditions prevailing in rural southern Africa. Namibia implements the only successful IFFM project in the Southern African Development Community (SADC) and has been able to reduce the annual burning in the pilot area by 40 per cent compared with previous figures in the same area. This has been achieved by organizing a massive forest fire prevention campaign to educate the local population.

The Namibia Forest Fire Prevention Campaign

Background

The Namibia-Finland Forestry Programme (NFFP) and its component on Integrated Forest Fire Management (IFFM) have been operating in Caprivi since April 1996. The NFFP operates within the Directorate of Forestry under the Ministry of Environment and Tourism.

The efforts to reduce unnecessary burning have been carried out through the education of the general public and through the training of people in local communities in prescribed burning of 1,000 km of firebreaks each year. The emphasis was laid on the ability of local people to *use fire as a tool* for land clearing or for improving the grass sward for the purpose of animal grazing or for the production of reeds and thatch for fencing and roofing.

The key element in the success of teaching the local people has been in educating learners in schools about

environmental protection. The programme has involved 84 schools in which 20,000 learners and 700 teachers have been educated about fire. In addition, 17,000 people in rural areas have also received fire education. With the combined effects of education and training, the overall burning has been reduced by more than 40 per cent in East Caprivi.

Fire Drama Play

As a part of the Fire Campaign, a Fire Drama Play has been performed by the Caprivi Drama Group (under the National Theatre of Namibia). This Fire Drama Play has been able to relay the new “fire message” even to illiterate people in rural areas. The Drama Play has also been performed on radio and has been broadcast by the National Broadcasting Corporation (NBC) over the local radio stations.



Fire prevention art

The artists from the *Caprivi Arts and Cultural Association (CACA)* have been producing the educational materials needed for the fire campaign. These activities and the network of CACA handicraft makers, controlling fires in areas where materials for handicrafts grow, have created a linkage between local artists and the National Arts Gallery of Namibia. The fire arts, includes 60 different posters and 24 fire billboards erected along 800 km of the main roads. These campaign materials, produced in local languages, have had a strong impact in educating the rural population and schoolchildren. Six thousand fire posters have been distributed in the regions of Caprivi and Kavango.

Collaboration with countries of the Southern African Development Community (SADC)

Border-crossing fires are a major problem in the Caprivi region of Namibia. Therefore posters and car stickers were distributed to the neighbouring countries of Botswana and Zambia. This initial collaboration should lead to more intensive cooperation between the countries of the SADC region.

Fire booklets and videos

Currently the fire campaign is targeting the households headed by women who often have been deprived of basic education. Many of these women are now engaged in

adult basic and continuing education. The artists working with IFFM have produced special educational material targeted both for schoolchildren as well as for adult learners of whom 68 per cent are women.

Two different fire booklets have been produced: *The Fire Story* (21 pictures in colour) tells a true fire story that took place in a local community. The text produced is bilingual English/Silozi and the booklet has been initially printed in 5,000 copies.

The Fire Cartoon (71 colour pictures) explains possible environmental damages which may be caused by uncontrolled wildfires. The characters in the cartoon are not related to any true story or any living persons, but reflect on how “*once upon a time . . .*” fire was a friend,

and how the fire became an enemy. The text is also bilingual English/Silozi, and this booklet is also printed in 5,000 copies. The story of the cartoon called “*Never Play with Fire*” has also been produced as a radio drama performed by the *Caprivi Drama Group*.

An initial 9,600 copies of these booklets have been donated by the Government of Finland to the Ministry of Basic Education and Culture (MBEC) in Katima Mulilo.

IFFM has also produced a 26-minute video on community-based forest fire management called “*Let us not burn our future*”. The video describes how fire prevention and control work is carried out in local communities in Namibia.

Fire Newsletter

A Fire Newsletter has been keeping the general public abreast with the management efforts in developing community-based forest fire management. The sociocultural adaptation has been carried out together with traditional (tribal) authorities, NGOs and various government agencies.

Campaign results

With the assistance of more than 37,000 people who have participated in the fire campaign since 1996, the fires in East Caprivi have been reduced by more than 40 per cent.

A National Round Table on Fire: addressing the current and future fire problems

In order to address the fire problem at national level the Directorate of Forestry called for a *National Round Table on Fire* in November 1999. In this participatory meeting all national stakeholders who will play a role in the development and implementation of a national fire prevention and management programme discussed the first draft of a long-term strategy. It is clear that under the present socio-economic conditions of the country it will take some time until an ambitious national programme reaches full-scale implementation. Until then the experience gained in the IFFM approach in northern Namibia must be gradually expanded and transferred to other regions inside the country and to its neighbours.



National fire prevention logo

A national fire prevention logo for Namibia was developed in 1996. The aim was to identify national forest fire management efforts with the problem of fire-endangered wildlife. The *Fire Ostrich* became the national symbol since the last ostrich was killed in East Caprivi in 1988. Car stickers, with the *Fire Ostrich* in various sizes, were produced and 6,000 vehicles are presently carrying the sticker with the text: “*Do not Burn our Environment*”.

The Namibia IFFM project is open for cooperation with its neighbouring countries and other regions in the world. Strong ties have been developed with the international community through regular contributions to the United Nations *International Forest Fire News* (IFFN) and close interaction with the *Global Fire Monitoring Center* (GFMC).

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Initial Steps towards Forest Fire Prevention in East Kalimantan/Indonesia: The Integrated Forest Fire Management Approach



1. Frame conditions and background

The fires within the rural and wild land areas in East Kalimantan are virtually all human-induced. Only in very limited areas, burning coal seams, mostly ignited by previous fires, have some significance in causing wildfires. A large number of all ignitions result from forest conversion activities for industrial plantations and from escaped small-scale agricultural fires. Fire is the cheapest tool to reduce vegetation cover, and for many smallholders the only one available.

After the disastrous fires of 1997/98 particularly in the province of East Kalimantan, it is obvious that approaches towards the prevention of fires face a complex set of constraints, like:

- A general lack of awareness and concern about forest and land fires in all levels of the society;
- Institutional constraints such as lack of clear authority and responsibility, and law enforcement;
- Available budgets at operational level insufficient;
- Overlapping claims to land and forest resources and tenure insecurity for both large companies and smallholders, but particularly for smallholders in indigenous communities;
- Human-induced changes in vegetation cover resulting in the rapid spread of fire-prone vegetation types, which create hazards for future fires over large areas in the province.

Such conditions make the prevention of wildfires a big challenge. Human-induced wildfires, however, are generally preventable. To reduce their occurrence, human resource and institutional development along with general awareness campaigns are the foremost tasks at target group level. Furthermore, in a province like East Kalimantan with yet limited and insufficient technical fire management capacities to reduce the spread of large-scale fire events, the prevention of wildfires from starting at all is possibly the most effective and efficient part of a fire management system.

2. Community Based Forest Fire Management (CBFFM)

Grass-roots approaches are the backbone of fire prevention concepts in East Kalimantan. Many of the local people are upland farmers and use fire as a tool for land clearing. On the other hand, many of them also have experienced damages and losses due to the fires in 1997/98. Therefore, fire management at village level is first of all a self-help-oriented approach.

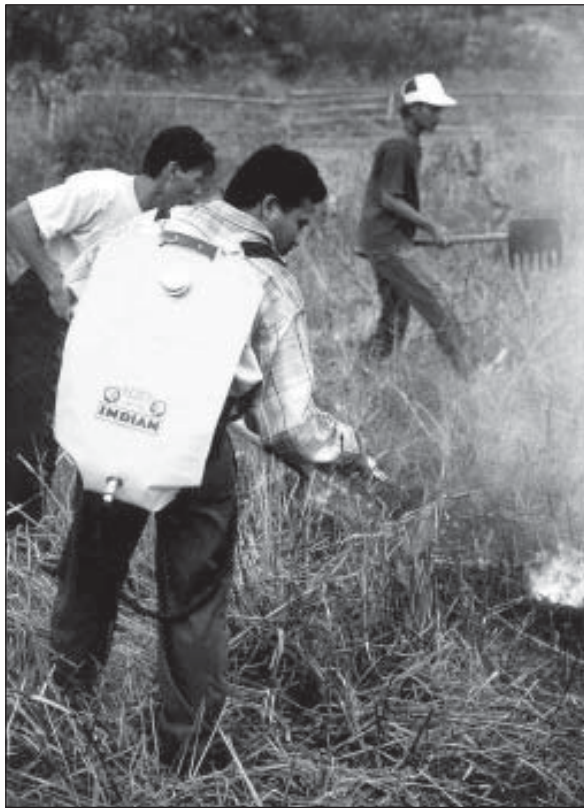
Extension work, which includes village awareness campaigns and the distribution of information materials, is the first essential step to plant “fire prevention seeds” at village level. This is followed by the provision of basic fire management training and fire fighting hand tools. The next step is to form volunteer village fire crews and to institutionalize the approach in planning workshops together with village fire crews, formal and informal community leaders and government agencies involved.

Besides those activities, nature camps for children and “roadside campaigns” are further activities to support CBFFM, developed and carried out by IFFM.

The Integrated Forest Fire Management Project IFFM

IFFM is a technical co-operation project under bilateral agreement between the governments of Indonesia and Germany. It is under the responsibility of the Ministry of Forestry and Estate Crops (MoFEC) of Indonesia, implemented by the two provincial forestry agencies Kanwil Kehutanan and Dinas Kehutanan. The project began in 1994 and is scheduled to last 9 years. With phase II (1997-2000), IFFM has become a co-operation project with the German Development Bank (KfW), which provides financial grant of 10 million DM for the purchasing of fire equipment. GTZ (German Agency for Technical Cooperation), who is in overall charge, provides for necessary training and advice to set up a complete fire management. Indonesia provides the premises, personnel and the budget for operating fire management in East Kalimantan.

For the success of the programme, an incentive system has to be designed benefiting local people who participate in the CBFFM. This further enhances the sustainability of such a programme in general. The following incentives should be part of a CBFFM system along with training and the provision of equipment:



Volunteer village fire crew at work

- Village fire crews should have regular access to relevant fire information (early warning aspect, communication, coordination and cooperation in the field, etc.);
- Career opportunities in fire management within the forestry department but also job opportunities (volunteer fire crews, village trainers, etc.) have to be created;
- Government support of community development (e.g. income generating programmes like the rehabilitation of burnt forest areas, etc.; provision of seedlings in the framework of community forestry; technical support like water supply facilities, further equipment, etc.);
- Awards for outstanding fire prevention performance during high fire danger events given to successful villages.

3. State of implementation of the programme

So far, about 80 villages in the six most fire affected forestry districts and one national park (Kutai National Park) of East Kalimantan have been included into this programme. Extension work and fire prevention and suppression training have been successfully carried out and the villagers in more than 20 communities have established volunteer fire crews. IFFM is currently preparing participatory planning workshops to integrate the approach into the institutional framework of those villages. Main issues to be addressed are responsibilities and coordination, legal aspects, budgets, and communication. Fire-fighting equipment (hand tools) has been purchased in the framework of the financial cooperation with KfW and is ready to be distributed.

4. Public relations work as part of fire prevention

The public awareness of forest fires is still small in Indonesia. Only during ENSO events like in 1997/98, did fire become a “hot” issue. Hence, continuous public relations work is indispensable towards the prevention of forest fires. IFFM has been very active in designing and carrying out fire prevention campaigns in East Kalimantan, often in cooperation with local TV and radio stations and a number of newspapers.

To promote the Indonesian fire prevention mascot, “Si Pongi”, various extension materials have been produced and events organized so far. Since more than a year, the



“Si Pongi” show



Nature camp participants

famous Indonesian TV Star *Kak Seto* and his *Mutiara Indonesia Foundation* have been cooperating with IFFM to help raise the awareness of children about forests and forest fires. In April 1999, Kak Seto presented “Si Pongi” in a big show in Samarinda together with about 3000 children and adults. Since then, Kak Seto and IFFM have together produced a “Si Pongi” video clip for the national TV, which intends to introduce the mascot to a broader

audience and to promote a professionally produced “Si Pongi” music cassette. “Si Pongi” dolls and other items are very much liked by children and “Si Pongi” has of course the potential to become a successful figure on the toy market.

Within the framework of an established environmental education (EE) working group together with local NGOs, a “nature camp” concept has already been designed and successfully been carried out. This programme may become another promising approach to address fire prevention with children in villages as part of the CBFFM programme.

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Six Steps towards Community Based Forest Fire Management

Step 1: Orientation process/identification of villages

- Villages selected particularly in or near fire hazardous forest areas;
- Formal and informal meetings carried out with key resource persons from the local government and communities to discuss fire management approaches;
- Socio-economic studies carried out to identify and assess the motivation, potential and constraints (problems) of local communities in the project areas with respect to fire management.

Step 2: Fire prevention campaigns

- Extension meetings carried at strategic locations/villages with participants from up to 10 sub-villages/hamlets;
- Villagers are encouraged to form volunteer village fire crews.

Step 3: Fire prevention and suppression training for volunteer village fire crews

- Hand tools provided to each participating sub-village/hamlet;
- Crews provide for proper storage and maintenance of hand tools (small warehouse, standard operating procedures, etc.).

Step 4: Institutionalizing of fire prevention work at village level

- Participatory planning workshop at village level (with representatives of village fire crews, formal and informal leaders), which also considers gender issues;
- Workshop results proposed to local and provincial government;
- Provincial government should provide for legal framework as part of the overall fire management system;
- Village fire crews integrated in “village structure”.

Step 5: Training of trainers

- Up to five trained villagers per district appointed by village crews to participate;
- Village trainers to extend village fire prevention programmes in close cooperation with crews of the provincial forestry service and concession crews.
- Job descriptions provided, also compensation for services by local government.

Step 6: Networking

- Regular meetings established between crew bosses of village fire crews, the forestry extension service and other government agencies involved, and concessions;
- Communication established. Early warning information reaches the local level in time, and vice versa.

For further information about fire events, IFFM activities, concepts, and reports, please visit the IFFM website at <http://www.iffm.or.id>.

IFFM cooperates with the Global Fire Monitoring Center (GFMC). Find this page at <http://www.uni-freiburg.de/fireglobe/>



Fire Management in Costa Rica: A Novel Experience



With a population of approximately 300 million inhabitants and a total area of 500.000 square kilometers, Central America is located within the fire belt surrounding the Pacific Ocean, on tectonic plaques that constantly hit one another releasing energy, as well as with a large number of volcanoes permanently active and the continuous presence of hurricanes.

Forest fires represent one of the most important elements that destroy natural resources, which are increasingly becoming stronger within this region, and are being recognized as real catastrophes.

Forest fires and slash-and-burn practices are not uncommon in Costa Rica, affecting the country's rich biological diversity and the quality of life of its citizens. Officials and private individuals dedicated to protecting, conserving, and developing natural resources, have long worried about this.

To deal with the problem, Costa Rica launched in 1997 a National Fire Management Strategy that defines the general guidelines to be followed for establishing institutional programs aimed at reducing forest fires and the use of burning in agricultural ecosystems.

The attendant legislation stipulates that preventing and controlling such fires is a matter of public interest that the authorities must support in every way they can. The law also requires the establishment of forest fire brigades and regional commissions, and encourages the participation of civil society in the entire process.

The Presidency of the Republic also set up by executive decree a National Commission on Forest Fires, as part of the National System of Conservation Areas (SINAC) of the Ministry of the Environment and Energy. Several national institutions of the public and private sectors and civil society are represented at the Commission. It has become the forum where participants can develop, discuss, support, coordinate, and follow up on the actions required to implement the National Fire Management Plan.

A National Technical Committee (COTENA) includes the managers or coordinators of the Fire Management Plan in each of the country's conservation areas. Their main task is to provide technical support for decision-making by SINAC, as well as to coordinate the fire reduction efforts of all the conservation areas, which have their own plans or programs.

An annual National Fire Management Action Plan brings together all the projects developed by the institutions that comprise the National Commission, and is given official backing by the Environment Minister and the President of the Republic.

As a "branding" tool and as a mechanism for effective national and regional dissemination, the official mascot of forest fire prevention and control is *Toño Pizote*, a coatimundi cartoon character whose image must appear in all the materials developed for awareness-raising campaigns. For instance, the International Strategy for Disaster Reduction (ISDR) uses Toño for the current campaign.

Children's Brigades help primary school students to realize that there must be a change of attitude towards fires in natural settings. They learn about the environment, the causes and effects of its alteration by fire, and the measures that can be taken to prevent such destruction.



Toño Pizote

Officials of SINAC receive the invaluable assistance of the Volunteer Forest Firefighters, proof of the commitment of civil society to the reduction of fires in the wild or in farms. So far, the strategy has worked: the number of hectares plagued by fires has fallen significantly, improving the odds for the conservation, rehabilitation, and restoration of biological diversity and a healthy environment.

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Wildfire Prevention in Australia



Australian Wildfires (Bushfires)

Wildfires, or bushfires as they are commonly known in Australia, are a naturally occurring phenomenon in the Australian environment. Before the arrival of humans on the Australian continent, bushfires were often started as a result of lightning strikes or volcanic eruption. While lightning still continues to provide the spark for bushfires, the actions of people (either deliberate or accidental) also contribute to the many bushfires that occur in Australia each year.

Every year, especially in summer, Australia experiences a large number of bushfires that occur as either 'grass fires' or 'forest fires'. Grass fires occur mainly on grazing, farming or remote scrub land country. Although these fires often destroy fences, livestock and some buildings, the nature of the country and its usage, generally mean that heavy losses (particularly human life) are rarely experienced.

Forest fires on the other hand often destroy a greater number of homes that border bushland areas, resulting in larger losses of human life and property. Australia's most devastating bushfires have happened where they have raged through the dense eucalypt forests in the southeast of the continent.

Bushfire Disasters

Most bushfires are not disasters, however, if not quickly detected and contained, even small fires can get out of control and result in a disaster. Thankfully, few bushfires earn the title of 'disaster', but repeated disastrous bushfires near the capital city in the states of Tasmania, South Australia, Victoria, New South Wales and Western Australia have occurred, in which many people have lost their lives, or their homes and property.

The worst of these were:

Victoria (1939)	71 dead
Southern Tasmania (1967)	62 dead
New South Wales (1968)	14 dead
Southern Victoria (1969)	23 dead
South Australia/Victoria (1983)	76 dead

Australian Bushfires – Case Studies

South Australia and Victoria – 'Ash Wednesday', 1983.

Conditions for Disaster - On 16 February 1983, Melbourne was experiencing a very hot, dry day. The temperature peaked at 43°C with relative humidity of only 6%. Drought conditions had persisted in south-eastern Australia for several years with 1982/83 summer being extremely hot and dry. Many small to moderate bushfires occurred in South Australia and Victoria over this period. Fires burned over 100,000 hectares near the New South Wales/Victoria border on 1 February. On 6 February, 95 fires were reported as they flared in hot, strong, north-westerly winds. By 16 February-'Ash Wednesday', South Australia and Victoria were tinder dry and fuel loads in forests were very high.

The Toll – In the twenty-four hours following that morning, a holocaust of bushfires erupted, and in just a few days, burnt over 520,000 hectares across the two States. More than 3,700 buildings were destroyed, including

84 commercial, and about 1,000 farms. A total of over 2,400 families or individuals lost their homes while 76 people died! Many of the total 1,100 injured people required hospital treatment. Livestock losses were very high, with over 340,000 sheep and 18,000 cattle, either dead or having to be destroyed, while 20,000 km of fencing and 1.5 million hay bales were burnt. During that summer of 1982/83, at least 1 million hectares were burnt out across South Australia and Victoria. Insurance losses exceeded \$320 million and total estimated costs were \$950 million in 1997 values.

New South Wales – Eastern Seaboard, 1994

Relentless Westerlies - In early January 1994, hot, dry, westerly winds began to blow from the inland affecting most of the east coast of the State. Several large bushfires broke out in the north. These were soon followed by serious outbreaks all along the coast extending to the south of Batemans Bay. Dangerous winds persisted for about three weeks resulting in over 800 bushfires. The most serious fires were in the Hunter, Blue Mountains and Sydney regions. About 20,000 volunteer fire-fighters (including reinforcements from all states and territories) battled the flames and helped evacuate over 25,000 people from areas under serious threat.



Losses and Costs - About 800,000 hectares burnt, including sections of Sydney suburbs and 40 National Parks. Four deaths (including 3 fire-fighters) resulted, 120 people were injured and 800 people were left homeless after 205 homes and about 20 other buildings were destroyed. Only 200 livestock died but 600 km of fencing and thousands of native animals perished. Insurance losses were \$56 million with total costs estimated at \$165 million (1997 values).

Mornington Peninsula and Dandenong Ranges-Victoria, 1997

Heatwave Conditions - Temperatures soared above 40°C as northerly winds gusted to 70 km per hour contributing to two damaging bushfires near Melbourne between 19 and 21 January 1997. At Mt Eliza two homes burnt and evacuations were required at Mt Martha and Arthur's Seat, also on the Mornington Peninsula. 250 bushfires burnt areas of Victoria on 21 January, a 41.2°C day! Worst-affected were Ferny Creek, Upwey and Kalorama settlements in the Dandenong Ranges where it took 1,500 fire-fighters and 6 water-bombing aircraft to control the 3,700 ha forest blaze.

The Toll - Apart from Mt Eliza, another 41 houses were destroyed and 45 damaged in the Dandenongs. Tragically, three people died (at Ferny Creek) and about 40 were injured throughout the State. Insurance losses were about \$10 million with total estimated costs of \$40 million (1997 values).



Bushfire Prevention Strategies

The raw materials for any potential bushfire are the presence of fuel such as grass, leaves and twigs, oxygen from the surrounding air, and heat or direct flame.

Once a fire is started with these raw materials, the spread of the bushfire depends on a number of environmental factors including:

- the type and size of the fuel,
- the fuel's moisture content and its degree of compaction,
- the weather, and
- topography.¹

Australia's approach to bushfire prevention centres on lessening the possibility of a fire occurring and minimising the spread of bushfires. Fire prevention strategies fall into the following four main categories.

Land Management

Land management strategies are effective in:

- lessening the presence of fuels in forests or grassland area;
- slowing down and sometimes ceasing the spread of bushfires; and
- providing easier access routes for firefighters to reach and extinguish fires.

Fuel reduction is paramount to bushfire minimisation. By taking away the fuel, fires cannot start, nor can they continue to spread². One of Australia's strategies to reduce the build-up of fuels in forest and grassland areas involves the deliberate burning off of these fuels by various fire and land management agencies.

Not only do these 'fuel reduction burns'³ lessen the potential for future fires in these areas (especially during the dry hot summer months), if a fire does start or enter into such an area, the flame height and intensity will be reduced and the spread of the fire retarded.

The deliberate creation of fire lanes or firebreaks is another land management strategy. These firebreaks are generally areas of land that have been cleared of vegetation (and maintained) in order to provide 'strategic corridors'³ that act as fire suppression barriers and assist firefighting operations.

Land management strategies for fire prevention also require a community-based approach. People living in rural areas or those who live in urban areas which are next to bushland have a responsibility both to themselves, their neighbours and the wider community in the prevention of bushfires. Fire agencies across Australia have developed programs, such as 'Community FireGuard', which emphasise individual and shared responsibilities for the prevention of fires.

Residents in these areas too are required to undertake similar land management strategies, which includes removing as much fuel as possible from around their house or property and the creation of suitable firebreaks particularly for properties that are situated next to bushland.

Building Management

The findings following the 'Ash Wednesday' fires showed that the sparks and embers emitted from the fires were what caused houses to catch fire. As such, building guidelines and standards are now being developed that are specifically aimed at making buildings more resistant to these fire emissions.

In some communities, local government authorities have regulations controlling home siting, design and the use of building materials in bushfire prone areas. These controls serve not only to minimise the damage to homesites and reduce losses from fires, they also assist in the prevention and spread of bushfires.

Community Education

People and their actions (whether deliberate or not) are responsible for the majority of bushfires that occur in Australia. Some of the more common causes of bushfires in Australia have resulted from deliberate burning-off that gets out of control and fires escaping from burning rubbish heaps¹.

However it can also take only a single spark from machinery such as welding equipment, a campfire or outdoor cooking facility not properly extinguished or children playing with matches for a fire to begin.

With such a high bushfire incident rate resulting from the actions of people, community education in Australia is particularly important. Education takes on a number of forms and is generally designed to provide people with a better understanding of the risks they face from bushfires and the measures the community can take to minimise these risks.

A range of information brochures are made available to the general public which cover such issues as what measures people (particularly those living in bushfire prevalent areas) can take to minimise the spread of a bushfire and the protection of their property and lives before and during a bushfire. The type of advice provided includes:

Preparation before the Bushfire Season

- Where possible, prepare a firebreak around the home.
- Trim branches so that they are well clear of the house.
- Clear roof gutters of leaves and twigs.
- Store wood, fuel and paints etc well clear of the house.
- Remove rubbish, leaf litter and plants that are close to the house
- Keep grassed areas (especially those around the house) short/ green.
- Fit wire screens to doors, windows and vents (to prevent burning embers from entering the house).
- Enclose any gaps, roof eaves and the under area of the house.
- Keep a ladder nearby for roof access (both inside and out).
- Have water hoses available and ensure they will reach all parts of the house and garden. Where water is not connected, obtain a high pressure pump.
- Decide on a household plan to either leave early or stay to protect the **properly prepared** home during the bushfire.

If a Bushfire Approaches

- Phone the bushfire brigade – do not assume they know about the fire.
- Fill baths, sinks, buckets etc with reserve water and turn off any gas and power.
- Remove curtains and move furniture away from windows.
- Wear protective clothing that covers the body area, solid boots or shoes, a hat or woollen balaclava and gloves.

- Plug downpipes with rags and fill all roof gutters with water. Hose down walls, garden etc on the sides of the house facing the 'fire-front' and watch for spot fires.
- Inside, close all windows, doors and block crevices and gaps. When the fire front arrives, **stay inside**, away from windows, while it passes (usually 5-15 minutes).
- Quickly **extinguish** any fires, which may have started in, on, or under the house and check **inside** the roof cavity as well.
- If the house is alight and can't be extinguished, move away to safe **burnt** ground. **Don't** leave the area, wait for help. Listen to the battery radio for official information.

There are even information brochures available on how to select the least vulnerable home site (and suggested layout) for people who are intending to move into bushland areas. For example, the New South Wales Department of Bushfire Services brochure 'Everyone's Guide to Rural Homesite Selection and Layout' provides advice such as:

When Choosing a Homesite

- Flat ground is safer than sloping ground
- Gentle slopes are safer than steep slopes
- The bottom of the slope is safer than the top.
- Slopes facing east are safer than slopes facing north, northwest, west or south.
- Establish fire breaks (preferably ploughed) between any unmanaged grass or bushland/forest if a natural firebreak (such as a road or river) does not exist.
- The firebreak should encircle the homesite and the wider it is the better.
- Minimise grass fuel and fuel in timbered areas within 60 meters of the homesite by controlled burning and slashing.
- Position the homesite so that any forested areas are to the south and east of the site.
- Position high-moisture content trees on the hazard prone side of the site (between the hazard and the homesite) to act as a shield against radiated heat and flying sparks and embers.
- Put sheds to the south and east of the homesite and ensure the entrances face east.
- Isolate inflammable fuel from the homesite and hay shed ⁴.

Fire Danger Warnings

For the general public, television and radio broadcasts are an especially effective means of educating people regarding their responsibilities in relation to fire prevention. These fire prevention and safety campaigns are generally broadcast right throughout the year, however they increase in intensity particularly in the lead up and right through the summer months.

These campaigns provide simple advice in relation to such issues as campfire safety, the conduct of fuel burn-offs, burning of rubbish in outdoor fires and even educating people regarding the disposal of cigarette butts.

Australia also has a fire danger rating system which forecasts the potential for a forest or grassland fire and

is based on seasonal drought, recent rainfall, temperature, relative humidity, wind speed and the amount of fuel on the ground. The categories of the rating system are as follows:

- Extreme Fire Danger
- Very High Fire Danger
- High Fire Danger
- Moderate Fire Danger
- Low Fire Danger

This rating system is used Australia wide and is designed to control the general public's use of fire during the bush fire season in order to lessen the potential for fire outbreaks.

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