Geo Factsheet

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WILDFIRES
- a quasi natural bio-hazard?

Introduction

Wildfires - commonly known as bushfires (Australia) or brush fires (N America) - are a natural process in many ecosystems; indeed they are frequently used in conservation areas such as wildernesses (in New South Wales) or remote National Parks (Yellowstone) as a necessary and beneficial tool of ecosystem management. This is a controversial technique as it can in itself be a major cause of wildfire hazard.

Wildfires can be classified as **biohazard** as they can result from spontaneous combustion from lightning strikes but as *Table 1* shows there is widespread support for the view that wildfires are frequently induced either directly or indirectly by human actions, as it is humans that provide the source of ignition, hence the classification as a quasi natural hazard.

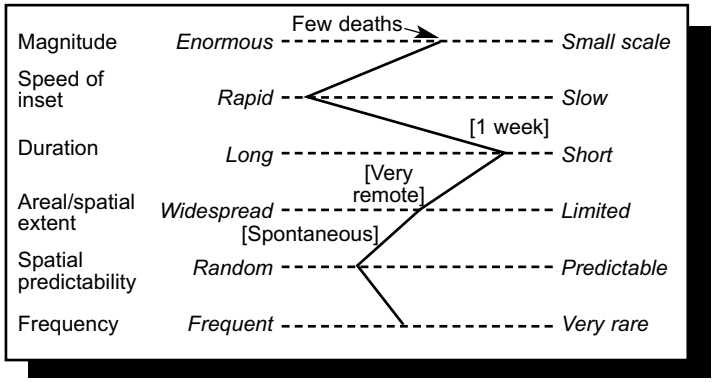
Table 1 Principal causes of bushfires

Cause	% of fires	Cause	% of fires
Burning off – legal	12.3	Campers	1.7
Burning off – illegal land clearing	15.3	Domestic, children	4.3
Industry e.g. forestry mismanagement	0.3	Lightning	5.6
Power lines	1.8	Smokers	1.5
Rubbish tips	3.2	Arson	8.4
Miscellaneous, known	9.7	Sawmills	0.3
Miscellaneous, unknown	27.5	Transportation	8.1

Source: Average of data held by the NSW Dept of Bushfires Services

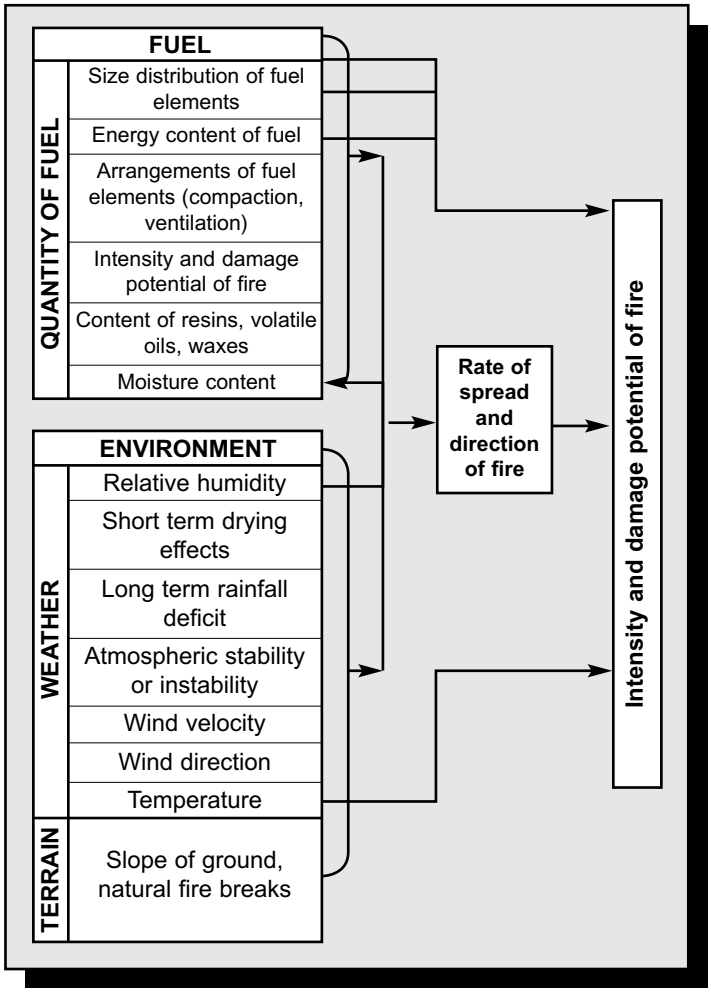
The nature, intensity and rate of spread of a wildfire will depend on the types of plants involved, topography, and the strength and direction of winds, as well as the relative humidity of the atmosphere. Some fires are ground fires, whereas others spread via the canopies of tree crowns. For this reason it is unusually difficult to create a standard profile for wildfire. *Fig. 1* shows a wildfire hazard profile.

Fig. 1 Profile of a wildfire.



In terms of **distribution** wildfires are particularly associated with areas experiencing **semi-arid climates**, enough rainfall for vegetation to grow to provide **fuel**, yet with a dry season to promote **ignition** conditions *(Fig. 2)*.

Fig. 2 Factors contributing to a bush fire



Wildfires are therefore concentrated in parts of Australia (NSW/Victoria), Canada (British Columbia), USA (California/Mountain West and Florida), South Africa and Southern Europe (in Mediterranean vegetation areas of Portugal, Greece, Southern Spain and Southern France). Traditionally wildfires have not been associated with tropical rainforest areas, because of the high humidity and all year round rainfall, but a combination of burning for forest clearance as well as forest mismanagement by logging companies, combined with El Nino events leading to unusually dry conditions has revised this.

Case Study 1 – Regional Scale Fires

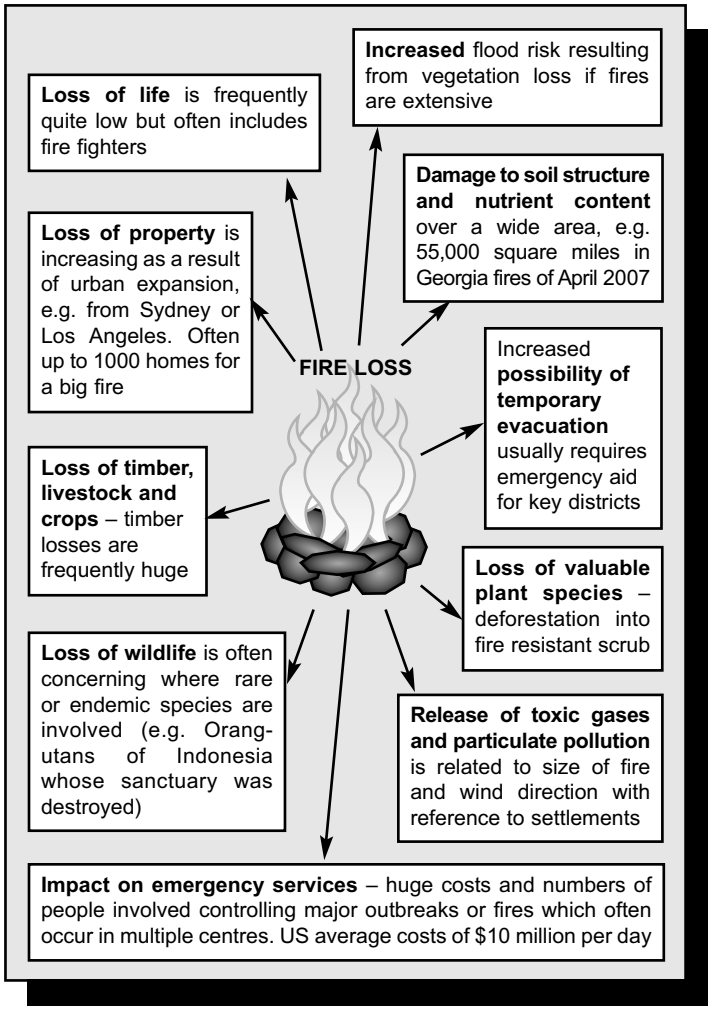
The forest fires associated with the 1997-8 El Nino were enormous and had the greatest impact in SE Asia. They extended across the islands of Sumatra and Borneo (Sarawak) and generated a vast black cloud stretching over 300km from West to East which engulfed several of the world's major cities such as Kuala Lumpur, Jakarta and Singapore. Over 300,000 hectares of forest were affected, often of high ecological value, scorched beyond recovery (see Fig. 3).

Indirectly the pollution from the fires produced a toxic haze which led to breathing difficulties with around 60,000 people requiring hospital treatment.

Environmentally there were international impacts with large scale losses in the tourist industry for nearly 2 years as many tourism trips were cancelled to places as far away from the centre as Southern Thailand.

Transport chaos resulted in some of the world's busiest shipping lanes and International Airports. The widespread distribution and large scale of these forest fires is clearly very difficult from more localised fires.

Fig. 3 The impact of wildfires.



Whilst many truly wildfires are associated with rural areas and cause only a limited impact, the movement of more people into rural areas in SE Australia, California and Florida and South Africa has spread the risk from wildfires. There is also concern that as areas are hit by droughts from global warming induced climate change (e.g. the summer droughts in Europe in 2003, 2006 and 2007) that wildfires could become an increasing hazard for many areas with major economic consequences. Because of nature of the hazard and the ability to warm people, deaths are generally low as shown in *Fig. 3*. Even in the UK, forest fires are a hazard after periods of drought especially for the ecology and environment (e.g. Canford Heath fires 2005, or North York Moors fires in March 2006-2007). This may be a sign of things to come with the advent of climate change making summers in Britain (especially the South East) similar to Spain.

Two recent case studies of Greece and California explore the issues of causes and impacts of wildfires and allow you to compare management.

Case Study 2 – Fires in Greece August 2007

Whilst fires were concentrated in the poor rural areas of Peloponnese in Southern Greece, secondary outbreaks occurred in the Island of Evia and on the fringe of Athens where white ash from forest fires ignited several new fires. 200,000 hectares (including 10% of Greece's forest cover and many olive groves) were devastated, and 67 people were killed, many incinerated in their cars when trying to escape or old people refusing to move out. Thousands of houses were destroyed. The underlying cause was the extreme droughts and heatwave which led to blistering temperatures of 45°C caused by the unusual position (far North of the Polar Jet) which brought major floods to the UK.

The fires were a 'national tragedy', with the government slow to intervene with extra support for the 9000 firefighters, with bungled evacuation plans and chaotic co-ordination of firefighters and aircraft to save lives. It was only after a week that EU support was dispatched to put out the fires. Wildfires were frequently blamed on arsonists working on behalf of developers intent on building coastal resorts on prime forest lands (7 were detained). There are many concerns about the future of the rural areas which were so badly affected with rural depopulation. There are disputes between national, regional and local governments as to how to redevelop the devastated areas.

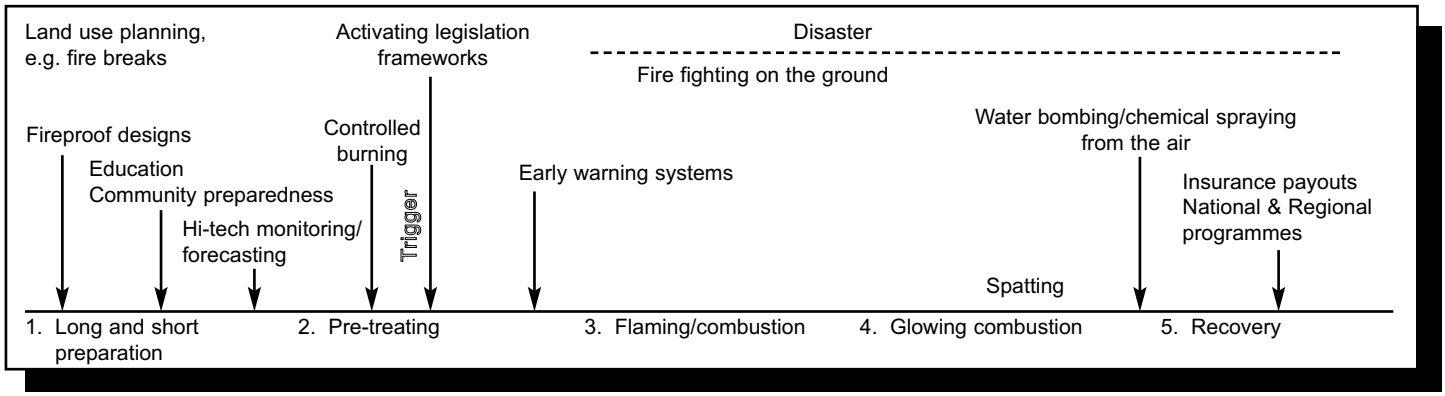
Case Study 3 – Californian Fires October 2007

*Up to 20 individual fires burned across Southern California, displacing 1 million people, destroying 2000 homes and devastating over 160,000 hectares. The fires were triggered by meteorological conditions. La Niña brought extreme drought to SW USA in 2006 and 2007. Paradoxically in 2004-05 a relatively wet winter allowed dense growth of shrubs and trees and dense scrubby undergrowth. Santa Ana winds of up to 100mph (unusually strong), hot dry compression winds were funnelled down the mountainous valleys towards the coast sparking off wildfires. Once the Santa Ana died down the fires were easier to put out. However the underlying factor which led to the Californian fires is **development**. As California is such a desirable state to live in population has tripled since 1950 with over 50% of new housing built in areas of severe fire risk such as forested areas. Wherever there are people especially living in sprawling urban fringe communities, there are dangers from innocent barbecues to more sinister **arson** (thought to have started at least 3 of the fires).*

Overall only a handful of people were killed as a result of exemplary management of escape routes. Reverse 911 (emergency calls) were used to warn people, evacuation was very well managed with graduated departures well ahead of the event and emergency accommodation well planned. The governor declared a state of disaster and Federal help was called in – lessons were learnt from Katrina. 7000 firefighters were well deployed with extra support from all over the USA

Managing the Wildfire Hazard

Fig. 4 Stages in development of a wildfire.



1. Modify the event

In many countries such as Australia, Greece or Spain the main approach to fire management has been to extinguish all fires, especially in populated areas, or near to high value timber reserves. Fire fighters refer to the **fire triangle** when managing fires; oxygen, fuel and a source of ignition being the apexes. Clearly in a wildfire situation, oxygen is always abundant, so foam cannot be used to exclude the oxygen supply unlike in industrial fires, so management to modify the event concentrates on reducing/eliminating the fuel supplies from the potential path of the fire by prescribed/controlled burning. This practice is extremely controversial (it is a high risk, polluting, labour intensive measure which has a damaging effect on local ecosystems). In US National Parks such as Yellowstone, whilst the removal of litter and lower vegetation is routinely used to minimise the possibility of unintentional, renewed ignition, it is prescribed burning which is so widely used as a strategy in remote areas of the Mountain West. Wildfires are one of the few hazards where management – using a combination of ground and air fire fighting, can actually control and ultimately prevent the hazard becoming a disaster. Helicopters and planes act as water bombers and slurry bombers (fire retardant). Where the benefits, e.g. conserving large areas of housing in ever sprawling suburbs, clearly outweigh the costs of control, extreme management measures are taken to put out usually smaller scale wildfires.

2. Modify the vulnerability

- A combination of the **technological fix** and community preparedness is vital in the management of wildfires. The technological fix is vital in more remote areas in warning of fires – aircraft and satellite remote sensing are both used to carry out infrared sensing to check surface temperature and signs of eco-stress from desiccation. Depending on the cause of the fire, in many US forests there are lightning detection systems and also infrared sensors, weather monitors and video cameras scan the forests of Florida for early warning precursors of wildfires. The technological fix is becoming increasingly useful during the fires with computer modelling of the predicted spread of the fire to allow the most efficient deployment of fire fighters. It is increasingly used to predict areas of high fire risk not only weeks but months or even years ahead. Other software is emerging that can gauge how future fires might be mitigated by thinning forests, or allowing some fires to burn thus informing planning and policies.
- **Community preparedness** is also vital as again using fire towers it can lead to early warning. Also citizens can be trained up as an auxiliary fire fighting force, to organise evacuation and co-ordinate emergency fire fighting.
- **Public education** concerning home safety in high risk areas is also vital e.g. ensuring households reduce supplies of fuel (guidance on the correct stacking of wood stores, ensuring there is adequate water hose and ladders, as well as ensuring all green waste is composted and shrubs are regularly pruned). All households are reminded to remove dead leaves from gutters and the need for flush screening of windows. Warning levels of fire risk are also a vital component, as high risk puts communities on alert.
- **School education** concentrates on ensuring young people understand the dangers of arson and casual cigarette use, and the need to adhere to barbecue laws where there are high risk conditions.
- **Land use planning** is again very important. Risk management identifies areas of high vulnerability, and then planning legislation ensures houses are built in low density clusters and that there is at least 30 metres of set back from any forested area. New developments are designed with fire breaks and wide roads for access of fire fighting equipment. Hazard resistant housing design is also increasingly important in areas of risk.

3. Modify the loss

Insurance is a common approach in MEDCs but is expensive and difficult to obtain in fire prone areas. Aid is more likely to apply at a national, regional or local level in areas of hardship or poverty where people have lost all their houses and possessions.

Questions

(1) Is it true that wildfires are a **quasi** natural hazard?
(2) Which of the three strategies in your view is the most important in responding to wildfires?
(3) Compare and contrast the 2007 wildfires in Greece and California in terms of causes, impacts and management.

Answer Guidance

1. Spontaneous combustion via lightning strikes **never** accounts for more than 10% of all occurrence anywhere in the world. Whilst certain natural conditions promote fire risk vulnerability is clearly linked to the amount of settlement in a fire risk area. As the chart shows there are many human induced activities which increase the chance of fire, some deliberate such as arson. Most outbreaks are a combination of a variety of triggers. Quasi natural hazard is on this evidence a fair classification of the wildfire hazard.
2. Modify the vulnerability is the key strategy for minimising the impacts associated with the growing risk for increasing numbers of vulnerable people and increasing potential for periods of climate change induced drought although unlike many tectonic hazards the event can be modified by controlled burn etc. Modify the **loss** invariably applies to those people who can afford the cost of insurance which is inevitably very high in high fire risk zones.
3. Use the 3 headings for the structure to your answer.

Useful websites

www.time.com special report on wildfires 5th November 2007
www.nifcgov/information.html
www.firewise.org

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