

Section 2



The Bushfire Hazard

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Bushfires: Glossary of Key Terms

Backburning: Burning of vegetation in advance of the main fire front to reduce the availability of fuel.

Bushfire: An Australian term which refers to any fire occurring in the open and burning out of control.

Convective burning: This occurs when very hot fires 'feed' on their own heat by sucking in air from all sides, and so providing added fuel.

Crown fires: Bushfires which spread to the tops (or crowns) of trees.

Firebreaks: Wide strips of vegetation which have been burnt to stop the advance of the main fire front by starving it of fuel.

Fire-resistant adaptations: Plant characteristics which enable certain species to survive periodic burning.

Forest fires : Bushfires which have the trees and undergrowth of a forest as their the principal fuel.

Grass fires: Bushfires which have grass as their the principal fuel.

Prescribed burning: The periodic lighting of low intensity fires in forests and woodlands to prevent excessive build-up of fuels such as twigs, leaves, bark and low vegetation. Also called 'contolled' or 'fuel reduction' burning.

Pyrophytes: Fire-loving plants (i.e plants with fire-resistant adaptations which enable them to thrive in a community which suffers periodic burning).

Running crown fires : Bushfires which are driven by strong winds causing the flames to jump from the crown of one tree to the next.

Spot-fires: Fires which are ignited ahead of the main fire front by burning leaves and bark carried by the wind.

Surface fires: Bushfires which burn grass, forest litter, bushes and shrubs at ground level.

Water-bombing: Fire fighting technique which uses fixed-winged aircraft and helicopters to drop water (or fire retardants) onto fires.

The Bushfire Risk in Australia

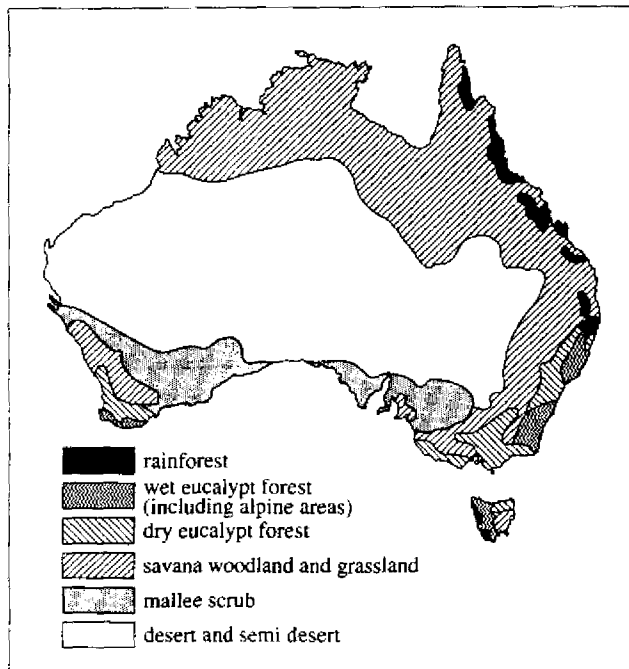


Figure 1: Vegetation regions of Australia

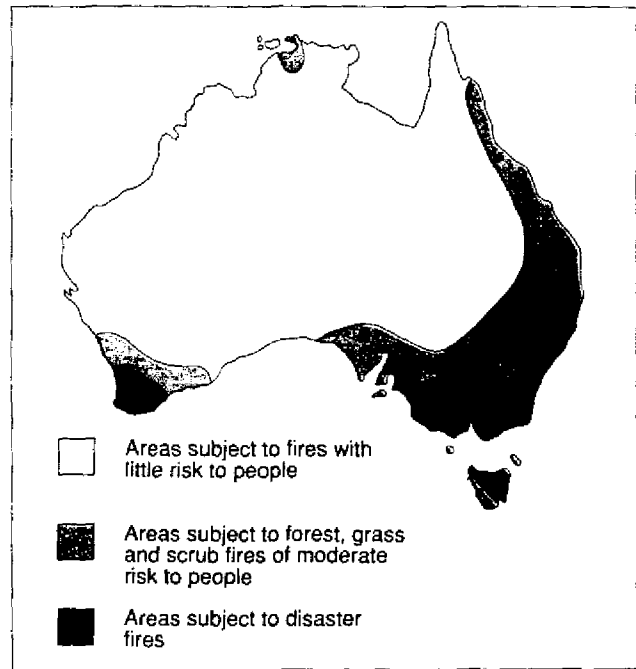


Figure 2: Bushfire risk zones

Activities

- Using information in Figures 1 and 2 above, write a paragraph explaining the relationship between vegetation and bushfire risk in Australia.
- How might each of the following characteristics of the south-east region of Australia also influence the risk of disastrous bushfires:
 - it is the most densely populated area of Australia;
 - its climate is characterised by cool moist winters and hot dry summers;
 - hot northerly winds and low humidity are common in summer;
 - it experiences prolonged periods of drought.
- Figure 2 refers to *areas subject to forest, grass and scrub fires*.
 - Write a paragraph describing the possible differences between these three types of fires. Refer particularly to how they might differ in terms of their impact on people and property.
 - In the United States, *brush fires* are common. What do you think this term means?
- Study Figure 3. Explain how each of the features shown in the diagram make the eucalypt forest an excellent fuel for bushfires.
 - While eucalypts (gum trees) may burn fiercely in a bushfire, they also have many *fire-resistant adaptations*. What does this mean? Try to find out at least three examples of fire-resistant adaptations common amongst eucalypts.
 - Many eucalypts belong to a group of plants called *pyrophytes*. What does this term mean?

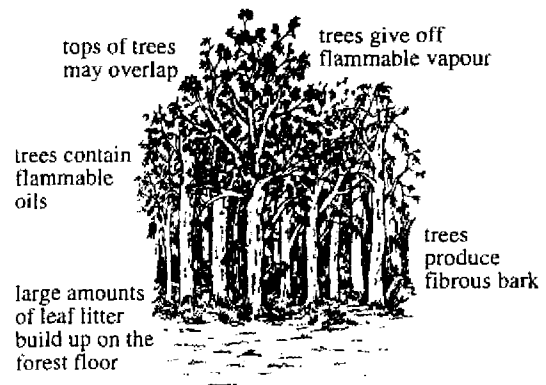


Figure 3: Features of eucalypt forest

The Bushfire Hazard: How Does Your Area Rate?

The aim of this activity is to calculate a fire hazard rating for the area in which you live. This rating will help you predict the possibility of a bushfire occurring in your community. If you live in an area where there is little or no possibility of bushfires, you may wish to choose (i) another area you are very familiar with where there is a significant bushfire risk, or (ii) one of the examples provided in Figure 1.

Complete the following steps.

- Identify the area you will be rating. Work on an area of about 1 km². If you are rating the site of your own (or someone else's) home it should be located in the centre of this area.
- Using the score sheet below, rate your area according to the information provided.
- Based on information on your score sheet, write a description of the fire hazard in your area. Say which factors contribute most to the area being at risk, and, if possible, what can be done about these factors to reduce the risk in the future.
- Comment on the effectiveness of using fire hazard ratings in assessing bushfire risk. The

How would these areas rate?

If your local area was not suitable, or if you would like to rate other areas, calculate a fire hazard rating for the following:

- An area of gently sloping grassland with a north-westerly aspect. A single lane, sealed road connects the area with a small town about 5 km away. Fire-fighting facilities in the area are minimal, although there are adequate reserves of water available.
- An area of dense scrub, on steeply sloping north-facing land. A single lane track connects a house in the middle of the scrub to a sealed highway about 2 km from the house. There is a fire brigade based in the nearest town, 6 km away.

Figure 1

Country Fire Authority of Victoria takes into account much more information in working out its ratings. What other factors could have been added to the list you used to give a more accurate assessment of bushfire risk?

Factor	Indicators	Score	Area Score
Slope - aspect (which way slope faces)	north to north-west	5	
	north-west to west	4	
	mixed north; west to south	3	
	north to west	2	
	east to south; mixed south	1	
Slope - steepness	very steep (severe)	5	
	steep (steep hills)	4	
	moderate (rolling hills)	3	
	gentle (undulating)	2	
	flat (plains)	1	
Vegetation	very heavy - eg dense forest	5	
	heavy - eg scrub or woodland	4	
	medium - eg open woodland/grassland	3	
	sparse - eg patchy woodland/grassland	2	
	very sparse - eg little or no vegetation	1	
Road links into and out of area	very poor - eg single lane, 4-wheel drive	5	
	poor - eg single lane, 2-wheel drive	4	
	fair - eg two lane, 2-wheel drive	3	
	good - as above, very good condition	2	
	excellent - eg two lane, double width	1	
Fire-fighting services available	none - eg no fire brigade, water supply etc	5	
	poor	4	
	fair	3	
	good	2	
	excellent - eg close fire brigade, water etc	1	

Key to scoring and rating

Points total	Fire hazard rating
21 - 25	very high
17 - 20	high
13 - 16	moderate
9 - 12	low
5 - 8	very low

Case Study (1): Ash Wednesday Bushfires, 1983

Conditions for disaster

Drought conditions had persisted in south-eastern Australia during 1982/83. By early 1983, water supplies were low and the vegetation was tinder dry.

On the 16 February, 'Ash Wednesday', hot and dry north winds from the inland gusted over South Australia and Victoria. By 11.30am temperatures had already climbed to 40°C and relative humidity was less than 10 per cent.

Helped by these conditions, hundreds of small fires spread through forest and farming areas. With wind speeds increasing to above 80km/h by mid-afternoon, many of these grew quickly into major outbreaks, eventually resulting in the most damaging day of bushfires in Australia's history.

At the same time a cold front was approaching from the west, marking the leading edge of a mass of cooler air from the Southern Ocean (Figure 2). At about 3.30pm this cold front passed over Adelaide and later Mt Gambier and Melbourne. Winds switched to south-westerlies, temperatures dropped rapidly and relative humidity increased.

Light rains which accompanied the arrival of the cold front had little effect on the fires. However, in some areas the gusty south-westerlies caused fires to change direction and spread into new areas.

Figure 1

Activities

- 1 From information in Figure 1 explain how (i) the 1982-83 drought and (ii) conditions on the day, contributed to the severity of the Ash Wednesday fires.
- 2 Using information in Figures 1 and 2:
 - a Describe how the arrival of the cold front in Adelaide affected wind direction on Ash Wednesday.
 - b In some places the change in wind direction helped firefighters, in others it was a hindrance. Explain why the change might have had different effects in different places.
 - c Explain why temperatures dropped after the arrival of the cold front in Adelaide.
 - d What is 'relative humidity'? At 3.00pm in Adelaide relative humidity was about 8 per cent. By 5.30pm it had risen above 60 per cent. How do you account for this change?
 - e How would (i) a drop in temperature and (ii) a rise in relative humidity have affected the Ash Wednesday fires?

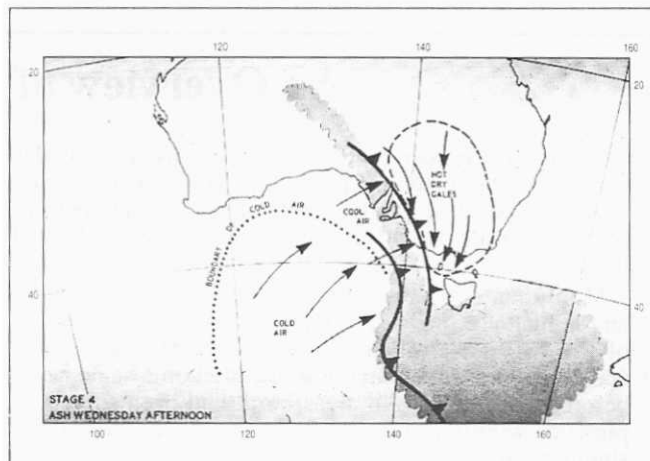


Figure 2: Weather map, 5.00pm 16 February, 1983 - 'Ash Wednesday'.

HAZARD DATA

The Impact of the Ash Wednesday Bushfires

- 75 people died and more than a thousand were treated for injuries;
- 11 volunteer fire-fighters were killed;
- 1,707 families lost their homes;
- 552,000 hectares were burnt, including large areas of forests and grazing land;
- 340,000 sheep and 18,000 cattle either died in the fires or had to be destroyed afterwards;
- Hundreds of native animals, such as kangaroos, wallabies, possums and koalas, were killed;
- More than 14,000 kilometres of fencing was destroyed;
- 4,540 insurance claims, totalling almost \$280 million, were made.

- f A resident of Mt Macedon in Victoria said of Ash Wednesday that *the final blow came late at night when the wind changed direction*. What caused this change of wind direction? Why do you think it was described as 'the final blow'?
- 3 Complete a comparative study of Ash Wednesday and one other major bushfire in Australia's history (e.g. 'Black Friday' in 1939, Hobart in 1967, NSW in 1994). In your study compare the different impact categories shown in 'Hazard Data' above as well as:
 - location and timing of the fires;
 - climatic conditions leading up to the fires;
 - fuel (i.e. vegetation) conditions;
 - weather conditions on the day;
 - areas affected;
 - the type of relief operations mounted.

Case Study (2): NSW Bushfires 1994

An Overview of the Fires.....

In early January, coastal New South Wales experienced an extended period of extreme fire weather north of Sydney to the Queensland border and south of Sydney to Bateman's Bay. The areas primarily affected included the coastal plains and nearby ranges.

More than 800 fires started between December, 1993 and January 16, 1994. The total area burnt was in excess of 800,000 hectares. Intrusion by fire into the Sydney and nearby metropolitan areas occurred on a scale never before documented. All areas burnt had been subject to previous wildfire, but never before had they been burnt simultaneously.

The headquarters of the Department of Bushfire Services became the focal point of the operation and resources were rapidly marshalled from every state and territory in the nation. International resources from New Zealand were utilised. Defence forces assisted in strength. At the height of the campaign about 20,000 persons were deployed on suppression, life and property protection and support activities. Fire suppression of this magnitude has never before happened in Australia.

Despite the extent of the fires and their severity, particularly in and near the large urban areas from



Fires in the Eurobodalla Council area - taken from Surfside looking towards Batemans Bay

Sydney to the Blue Mountains to the Central Coast, losses were remarkably light.

Tragically, two civilians and two volunteer firefighters lost their lives. Another civilian apparently suffered a fatal heart attack while attempting to protect his home from fire.

About 205 properties, mostly in urban areas, were totally destroyed. Many others sustained minor to severe damage. Much of this damage occurred in the extremely destructive Como-Jannali fire on the afternoon of January 8, when fire weather conditions reached their peak. This fire caused the loss of one civilian life, severe injuries to two people and was responsible for approximately half of all residential losses in the entire campaign.

This level of loss under the conditions which prevailed is testimony to the skill, courage and untiring endeavours of the many emergency services personnel and others who played a role in life and property protection, and fire suppression.



Royal National Park, south of Sydney, reduced to a moonscape by the fires

Phil Koperberg

Commissioner, Department of Bushfire Services, NSW

Activities

- 1 Study the information in 'An Overview of the Fires....' above.
 - a Describe at least two aspects of the NSW fires which were unique in Australia's history.
 - b What do you understand by the term 'fire weather conditions'? When did they reach their peak in the NSW fires of 1994?
 - c How does the author account for the 'remarkably light' losses from the fires?
 - d The following is a list of characteristics of the Ash Wednesday bushfires of 1983 in Victoria and South Australia:

- lives lost: 75
- total area burnt: 552, 000 hectares
- homes destroyed: 1,707
- duration of fires: about 12 hours on February 16, 1983
- fire-fighters deployed: 21,000 (approx)

Write a similar list for the NSW bushfires of 1994. From this evidence, write 2-3 sentences comparing the fires.

contd....

Case Study (2): NSW Bushfires 1994 (contd)

..... and an Eyewitness Account**THURSDAY, JANUARY 6**

I flew into Sydney knowing that bushfires existed in the countryside of New South Wales. I could see these from the aircraft. The weather was hot and a strong northerly wind was blowing. I drove to my brother's house in the southern suburbs - part of a relatively new subdivision with plenty of native scrub and gum trees as well as river views.

Most television reports discussed the growing bushfires in the countryside outside of Sydney and extending to the Blue Mountains.

FRIDAY, JANUARY 7

The weather was still hot and windy and by lunchtime the news reports said the fire had reached the northern suburbs and a national park south of Sydney.

Within a few hours the severity escalated and radio and television ran uninterrupted news reports - the northern suburbs were being evacuated, the major freeways north and south of Sydney were closed and firefighters from all over Australia were coming to assist.

That same night we lost power and the telephone and we could smell smoke faintly in the air. Radio broadcasts (battery powered) indicated the safety measures people needed to take to protect life and property.

SATURDAY, JANUARY 8

The next morning the sky was filled with smoke and took on an orange glow. My brother was unable to go to work because the fires had jumped the main roads into Sydney. We cleared the gutters of the house, blocked the gutters with towels and filled them with water. Combustible material was removed from near the house.

This took a few hours to do and we could see every neighbour standing on their roof looking in every direction for signs of the fire. The confusing thing was not knowing how close the fire was.

The chap next door told us to put the garden sprinkler on the roof, close all doors and windows and remove any curtains from windows. He advised us not to wear shorts and tank tops, despite the heat. It was far safer to wear denim jeans and long-sleeved cotton shirts, a hat and a

tea-towel around our faces - cowboy style!

By early afternoon the smoke was thicker and ash began to fill the air. We could hear police and fire sirens in every direction. Our neighbour told us to water the outside of the house continuously. Some people were evacuating their homes.

Traffic was bumper to bumper with people evacuating or seeing how close the fire was. Our nearest shopping centre was surrounded by fire and the roads were blocked. We packed some emergency clothing, food and water for the two young children and waited.

Within thirty minutes we could see gigantic flames canopy-hopping across the gully five hundred metres away. Fire crews arrived quickly and began back-burning the scrub. They did not use any water except when the flames endangered property. We were ready to evacuate, but all roads were either choked with cars or cut by fire. It all happened so quickly, so we were forced to stay in the house.

The radio report at 6.00pm said that one hundred houses in Como and Jannali had burnt within ten minutes. We could see those suburbs from where we were. That night the fires could be seen in all directions and most people in the street wanted to stay and protect their property. Most of the traffic had cleared, and we felt that if the need arose we could evacuate quickly.

SUNDAY, JANUARY 9

At 3.00am firetrucks screamed down our street and a firefighter knocked on our door. The message was 'be ready to evacuate at a minutes notice'. A fire had surrounded a house at the end of the street. Firefighters used loudspeakers to explain that the fire was totally unpredictable in its direction and velocity. No house was necessarily safer than any other.

By midday, huge amounts of scrubland had been backburned near us and the immediate danger had passed. The northerly winds had dropped and many fire crews were patrolling the area looking for spot fires and flare-ups.

Enver Malkic

Activities (contd)

- 2 Study the information in the eyewitness account above.
 - a List the different measures mentioned in the account which were taken to reduce the risk of property damage.
 - b What advice was provided regarding clothing to be worn? Explain the reasons for the choice of clothing made by the author.
 - c From evidence in this account, why is it important to have a battery powered radio during the bushfire season?
 - d What do you think is meant by 'flames canopy-hopping across the gully'? Why would this type of fire be very difficult to control?
 - e What is meant by 'back burning'? Why is it done?
 - f What problem did people who decided to evacuate their homes have to face? Why do you think most people chose to stay rather than evacuate?
 - g How might spot-fires and flare-ups still occur after the main fire danger has passed?