

The 1982-83 forest fires in Victoria

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Summary

The 1982-83 fire season in Victoria is described with the losses in major fires listed. Fire behaviour is discussed with examples from two of the fires which occurred on 16 February 1983 (Ash Wednesday). Some new aspects of fire suppression are outlined.

Introduction

The 1982-83 fire season in Victoria was one of the most severe in forested areas since 1938-39. It began early, in August, because of the prolonged drought conditions experienced throughout most of the State, and continued until well into March.

A major crisis occurred on 16 February 1983, Ash Wednesday, when on a day of exceptionally high fire danger several outbreaks rapidly became serious conflagrations which, in the space of a few hours, caused loss of life and widespread damage to forests and private property.

A number of other large forest fires occurred, in particular two in the vicinity of Cann River during February and March. As a consequence fire suppression forces were extended from November until well into March.

During the season the Forests Commission Victoria attended 878 fires. Of these, 823 burnt 486 000 hectares within the Fire Protected Area.¹

Background

Throughout most of Victoria during the 12 months prior to February 1983 rainfall was less than 70% of average and for the six months preceding February 1983 it was less than 60% of average (Table 1). This prolonged drought was to predispose the forest areas of the State to a series of very intense fires. The drought did, however, reduce the hazard in most grasslands

because growth was poor and the fuel quantities were correspondingly low.

The severity of the drought was visibly demonstrated to city-dwellers when dust storms twice reached Melbourne to envelop the city in thick red dust. These storms, which occurred only one week before Ash Wednesday, originated in the north west of the State when strong winds lifted tens of thousands of tonnes of unprotected topsoil.

The situation was severely aggravated by prolonged high temperatures throughout the summer. For example, in the four week period prior to the Ash Wednesday fires, Melbourne experienced temperatures above 35 °C on no less than eight occasions, and from the beginning of February the temperature reached 40 °C three times.

Fire restrictions were introduced by the Forests

Table 1. Rainfall recorded in various locations in Victoria during 1982 and early 1983 expressed as a percentage of the long-term average.

Recording station	12 months to 31 Jan 1983	6 months to 31 Jan 1983	1 Jan 1983 to 16 Feb 1983
Ouyen	27.5	11.8	3.4
Nhill	42.7	26.4	23.5
Stawell	39.4	25.8	19.4
Colac	68.1	57.5	56.5
Gellibrand	64.7	56.2	59.9
Hamilton	58.8	50.5	43.2
Heywood	63.7	50.2	64.9
Shepparton	40.9	28.9	36.6
Kyneton	47.4	35.0	21.9
Bright	46.8	34.9	34.5
Drouin	70.3	63.6	59.6
Maffra	64.5	51.8	39.1
Orbost	77.4	53.7	47.8

Manuscript received 6 December 1983

¹The Fire Protected Area includes State forest, national park, protected public land and, unless specifically excluded, private property within 1.5 km of these areas.

Commission and the Country Fire Authority six to eight weeks earlier than usual and, from early December, the Commission's normal field workforce of 450 staff and 650 regular employees was supplemented by a further 610 employees engaged for the duration of the fire season. Four agricultural aircraft, for use in firebombing operations, and two helicopters were retained under contract and supplemented by hire of other aircraft when necessary. A RAAF Hercules equipped with a Modular Airborne Fire Fighting System (MAFFS) (Swanson *et al.* 1976) on loan from the United States Forest Service was also available for firebombing operations.

The peak deployment of resources occurred during the five days following Ash Wednesday. Approximately 4200 men, 460 tanker units, 111 bulldozers, 11 helicopters and 13 other aircraft were engaged in the suppression operations. These resources included substantial numbers of Country Fire Authority and Defence Force personnel.

The Commission's direct expenditure on fire suppression for the season reached \$18.7 million, which may be compared with \$6.1 million in 1980-81 and \$4.2 million in 1981-82.

The losses of human lives and the destruction to private property have overshadowed the substantial damage to the forests. While the damage to forest values associated with water catchment, conservation and recreation is not easily quantified, the loss of wood production potential, both present and future, has been estimated as a loss in revenue to the State of \$11.5 million (Greig² pers. comm.).

Major fires

The locations of the major forest fires which occurred during 1982-83 are shown in Figure 1. The first, which started in the Little Desert on 29 August, burnt 3400 hectares. In November major fires occurred near Heyfield (12 800 ha), Murrindal (3400 ha), Annuello (10 000 ha), Mt Elizabeth (33 270 ha), Mt Disappointment (20 950 ha) and Bright (675 ha). The only large fire in December occurred in the semi-arid region of the Big Desert near Wyperfeld where 17 800 ha were burnt.

On 8 January two Commission employees were killed near Greendale while fighting a fire which

very rapidly burnt 15 940 ha. The largest fire the season originated on 31 January from a lightning strike near Cann River and over the next days 127 200 ha were burnt. On 1 February a fire near Mt Macedon burnt 6100 ha and 24 homes

On 16 February, Ash Wednesday, a number of fires raged out of control throughout the State. Though large areas of public land were burnt, losses of life and private property were of alarming proportions. In all, 47 people died, 200 homes and 82 commercial properties were destroyed, 1238 farms damaged, 5900 km of fencing destroyed and some 7000 cattle and 18 000 sheep lost. The economic losses were assessed at the time to be approximately \$190 million (Cann 1983).

The losses sustained in each of the fires which affected the Fire Protected Area are shown below.

East Trentham/Macedon (24 500 ha). Seven people died. Other losses were — 528 houses, 4 sawmills, 1286 ha of pine plantations (the Macedon State Plantation) and 40 ha of pine seed orchard.

Dean Marsh/Lorne (41 200 ha). Three people died. Other losses were — 798 houses, 973 ha of pine plantation (199 ha privately owned) and one sawmill.

Upper Beaconsfield (8500 ha). Twenty-one people died, 230 houses destroyed.

Cockatoo (1833 ha). Six people died, 336 houses destroyed.

Moonlight Head (1440 ha). One house and 40 ha of privately owned pine plantation destroyed.

Warburton (44 500 ha). 23 houses destroyed, 11 765 ha of mountain ash (*E. regnans*) forest burnt.

In addition to these, fires in private property near Warrnambool cost the lives of 10 people while burning an area in excess of 60 000 ha. Other losses were — 160 houses and 7000 head of stock, mainly cattle.

On 17 February a fire burnt 688 ha on very difficult terrain near the western edge of the Buffalo. This fire imposed a further load on manpower resources already extended by the events of the previous day and the work still remaining at the Cann River fire.

During the last week of February and the first week of March lightning activity caused 95 fires, most of which were controlled while still small.

² Greig, P. J., Forest Economist, Forests Commission Victoria, Melbourne.

The largest burnt 3280 ha near Mt Stapylton in the Grampians.

The last big fire of the season was again near Cann River. It started on 4 March and over the next week it burnt 126 100 ha and threatened the towns of Genoa and Mallacoota.

Fire behaviour on Ash Wednesday

At noon on 15 February 1983 a hot north-northwesterly airstream was moving over Victoria as a result of a ridge of high pressure off the east coast of Australia (Figure 2a). By noon the following day the high pressure system had not moved and a deep trough of low pressure with several cold fronts had moved up over the Bight (Figure 2b). As the pressure gradient increased the north-northwesterly winds also increased until by mid-afternoon speeds of 70 km/h were recorded at Avalon (near Geelong) and Melbourne Airport (Figures 3 and 4).

Temperatures were high and Melbourne Airport recorded 43 °C at 1500 hrs together with a relative humidity of 5%. Under these conditions the fuels were extremely dry. For example, fine fuels collected near Stawell at 1330 hrs had a moisture content of 2.7% of oven dry weight. Most forests in western Victoria at this time would have had similar fine fuel moisture contents, and the heavy fuels were also very dry because of the drought.

With the passage of a cold front across the State a violent change of wind to south-southwesterly occurred. This change reached Avalon (near Geelong) at 2000 hrs and Melbourne Airport at

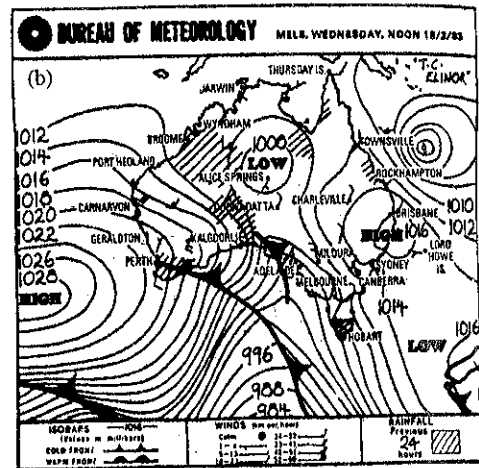
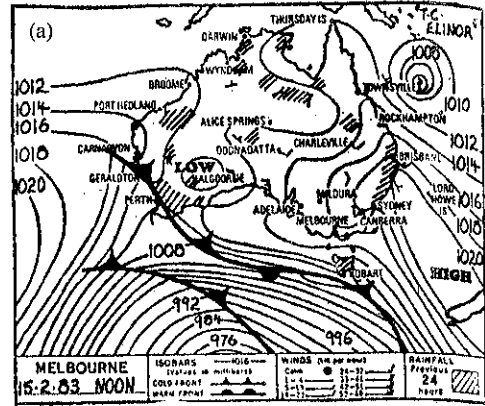


Figure 2. Weather charts for Australia for 15 and 16 February 1983. Source: Bureau of Meteorology.

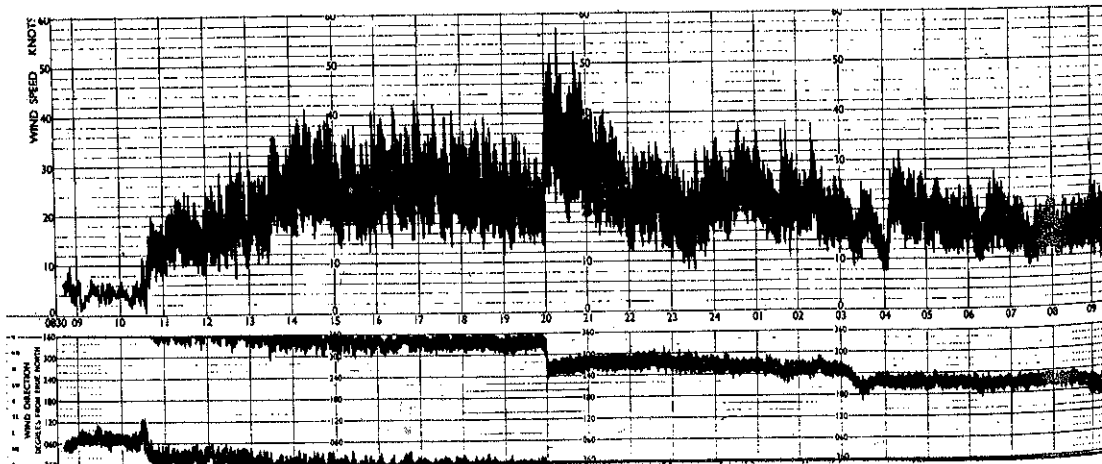


Figure 3. Wind speed/direction — Avalon 16 February 1983. Source: Bureau of Meteorology Preliminary Report on the Ash Wednesday Fires 16 February 1983.

2040 hrs where maximum speeds of 105 km/h and 100 km/h respectively were recorded. Strong winds were maintained long after the front had passed (Figures 3 and 4).

The behaviour of fires early in the season, such as those at Mt Disappointment and Mt Elizabeth, was certainly severe, with rates of forward spread at various times averaging 2-3 km/h, but in line with previous experience. However, the fire behaviour which occurred on Ash Wednesday was exceptional and is illustrated by the following descriptions of two fires.

Dean Marsh-Lorne fire

The fire started in grassland near Dean Marsh at about 1448 hrs, when the Fire Danger Index (McArthur 1967) was about 100³, and was almost controlled in its early stages. However, by 1515 hrs it was out of control and spreading across flat to undulating terrain under a strong wind. The fire then raced upslope to reach Valhalla (Point A on Figure 5) at 1530 hrs. The average rate of spread of the fire in grassland had been 22 km/h.

At about 1545 hrs the front of the fire reached the forest boundary, but before this spot fires had

³ At Gellibrand, 35 km south-west of Dean Marsh, at this time the temperature was 40 °C and the relative humidity 11%. The mean wind speed at Avalon was approximately 50 km/h.

started inside the forest, originating from groups of trees and roadside vegetation included within the grassland. In forest the fire intensity increased dramatically because of the often large accumulations of fuel (fine fuel quantities were estimated to be as high as 30-35 t/ha in the denser forest types dominated by messmate (*E. obliqua*) and mountain ash (*E. regnans*)).

At 1555 hrs the fire was close to Benwerrin and spotting was occurring up to 10 km ahead. These individual fires developed rapidly and formed a series of new fronts. At 1600 two large fires were reported on Haines Ridge and at 1605 another along the road between Benwerrin and Lorne. At 1615 there was fire in the Little Erskine River (B) and at 1618 near Reedy Creek (C) on the coast northeast of Lorne. The average rate of spread in the forest from Valhalla to the coast was about 10 km/h.

By 1630 hrs houses in North Lorne were under threat, most of the forest along the Dean Marsh-Lorne Road was burning and the fire had crossed the Great Ocean Road to reach the beach. During the next 1½ hours the wind continued from the north-west so that the eastern flank of the fire was most active and by 1815 it had reached Cinema Point on the coast.

The situation stabilised somewhat while the wind remained in the northwest, but at about 1900 hrs the change arrived. The wind turned to the

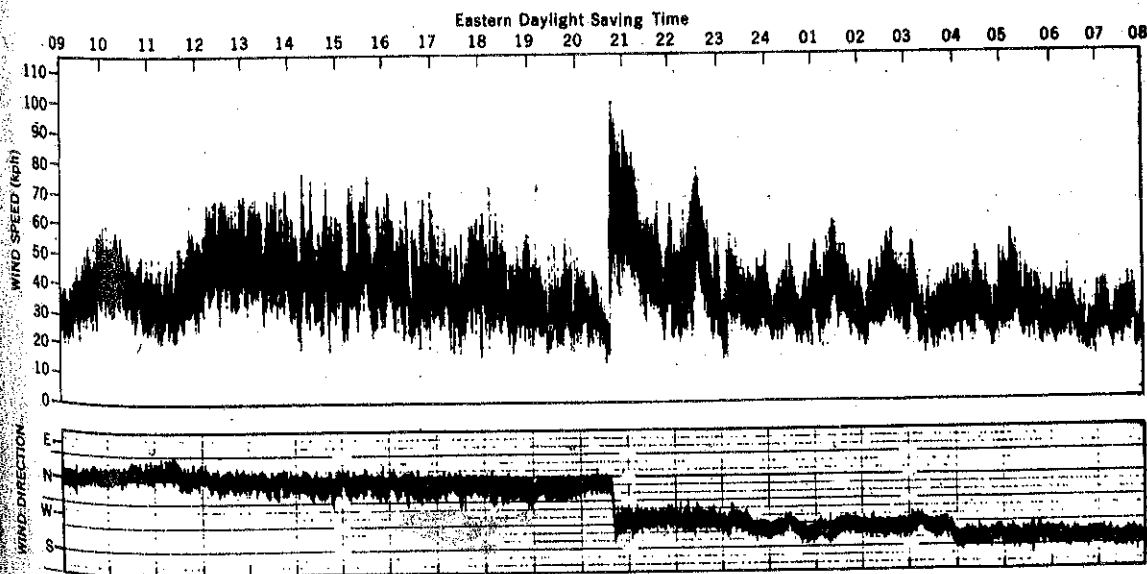
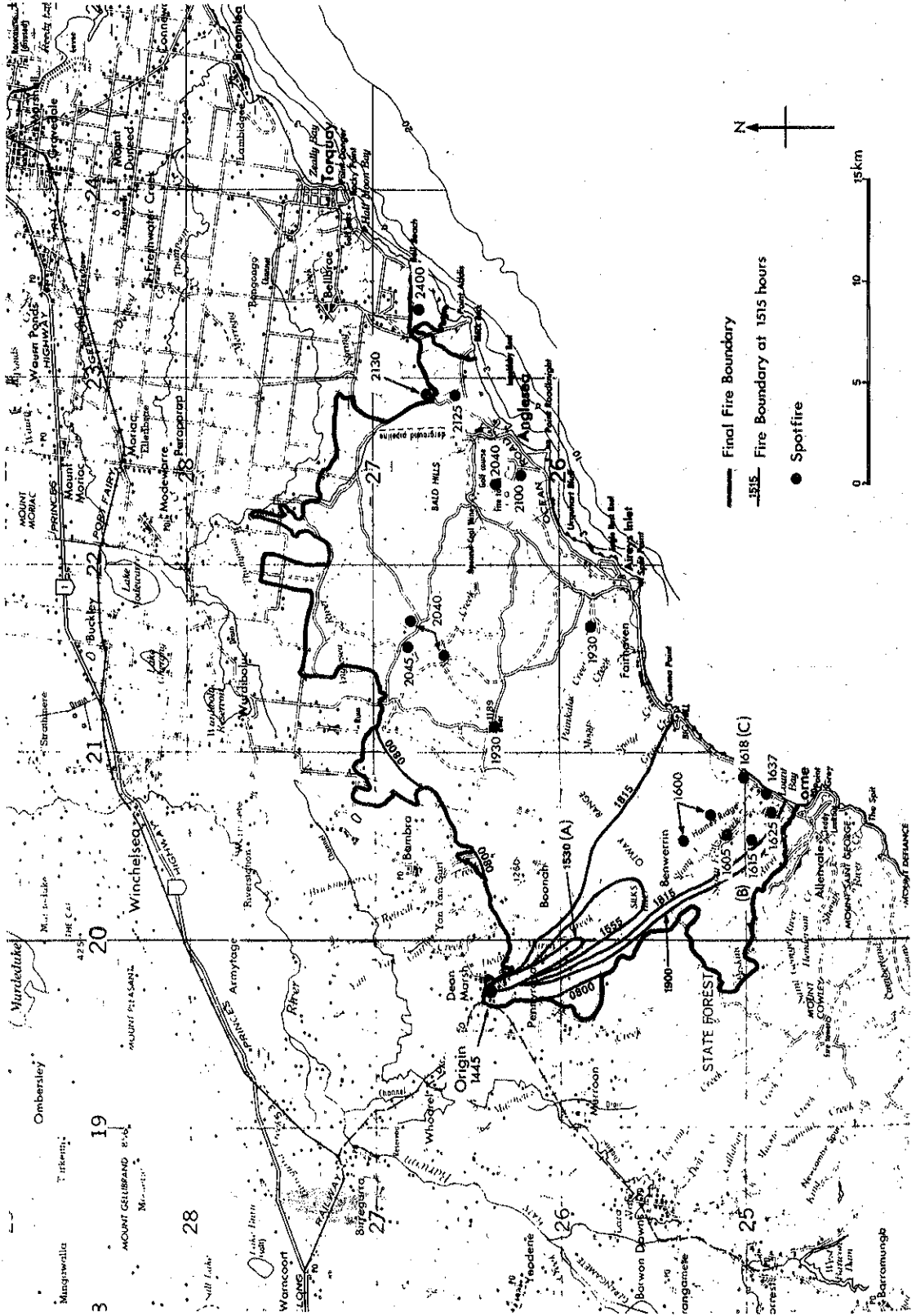


Figure 4. Wind speed/direction — Melbourne Airport 16 February 1983.
 Source: Bureau of Meteorology
 Preliminary Report on the Ash Wednesday Fires 16 February 1983.



southwest and strengthened with gusts around 100 km/h, and the eastern flank of the fire was transformed into a fast moving crown fire with mass spotting. The Fire Danger Index greatly exceeded 100 and the average rate of spread was about 10 km/h immediately after the wind change.

At 1930 hrs the fire was close to Fairhaven and because there were so many large spot fires developing new fire fronts, its behaviour was very erratic. The fire induced great turbulence in some areas and particularly on the more exposed aspects along the coast. The ferocity of the fire and associated winds is well illustrated by the following:

- In some areas, particularly on exposed aspects, the fire intensity was so high that the seed capsules and fine branches on mature eucalypts were burnt.
- near Fairhaven, on an exposed site burnt by wildfire in October 1981, there were extensive areas of vegetation scorched in locations up to 100 m from the fire edge.
- strong winds near Moggs Creek cut a swathe through the forest for a distance of over 800 m. Mature ironbarks up to 15 m tall were uprooted or snapped off.
- wind storms with gusts of more than 100 km/h occurred after the change. Aireys Inlet and Fairhaven were fully exposed to the onshore wind and damage was extensive. Some houses lost roofs, trees were smashed or uprooted and some buildings disintegrated. A house on a very exposed site at Fairhaven was blown apart just before the fire reached it.

By 2130 hrs the fire had spread to the east of Anglesea and at 2400 a spot fire was established in scrub between Point Addis and Bells Beach. The intensity decreased as weather conditions moderated, although the fire burnt virtually all of the forest in its path. At dawn on 17 February it was still active in only a few locations.

Further details of fire spread are shown in Table 2.

East Trentham/Macedon fire

The course of this fire is shown in Figure 6. The fire was reported at 1424 hrs at East Trentham and by 1434, under conditions of very high to extreme fire danger, the front had burned 800 m through grassland. At this time as the fire reached

small groups of eucalypts the spotting process started to become significant. The severity of the conditions is indicated by the following records taken at Trentham at 1500 hrs: temperature 38°C, relative humidity 18%, wind NNW 20-40 km/h, Fire Danger Index 40-60.

After travelling about 1.5 km the fire reached forest comprising messmate (*E. obliqua*) and narrowleaf peppermint (*E. radiata*) in association with candlebark (*E. rubida*) and manna gum (*E. viminalis*). Stand heights ranged from 15 to 40 m and fine fuel quantities were estimated to be as high as 30 t/ha in some locations. Significant spot fires were recorded at 1528, 1535 and 1543 hrs at distances from the origin of 5, 7 and 9 km respectively.

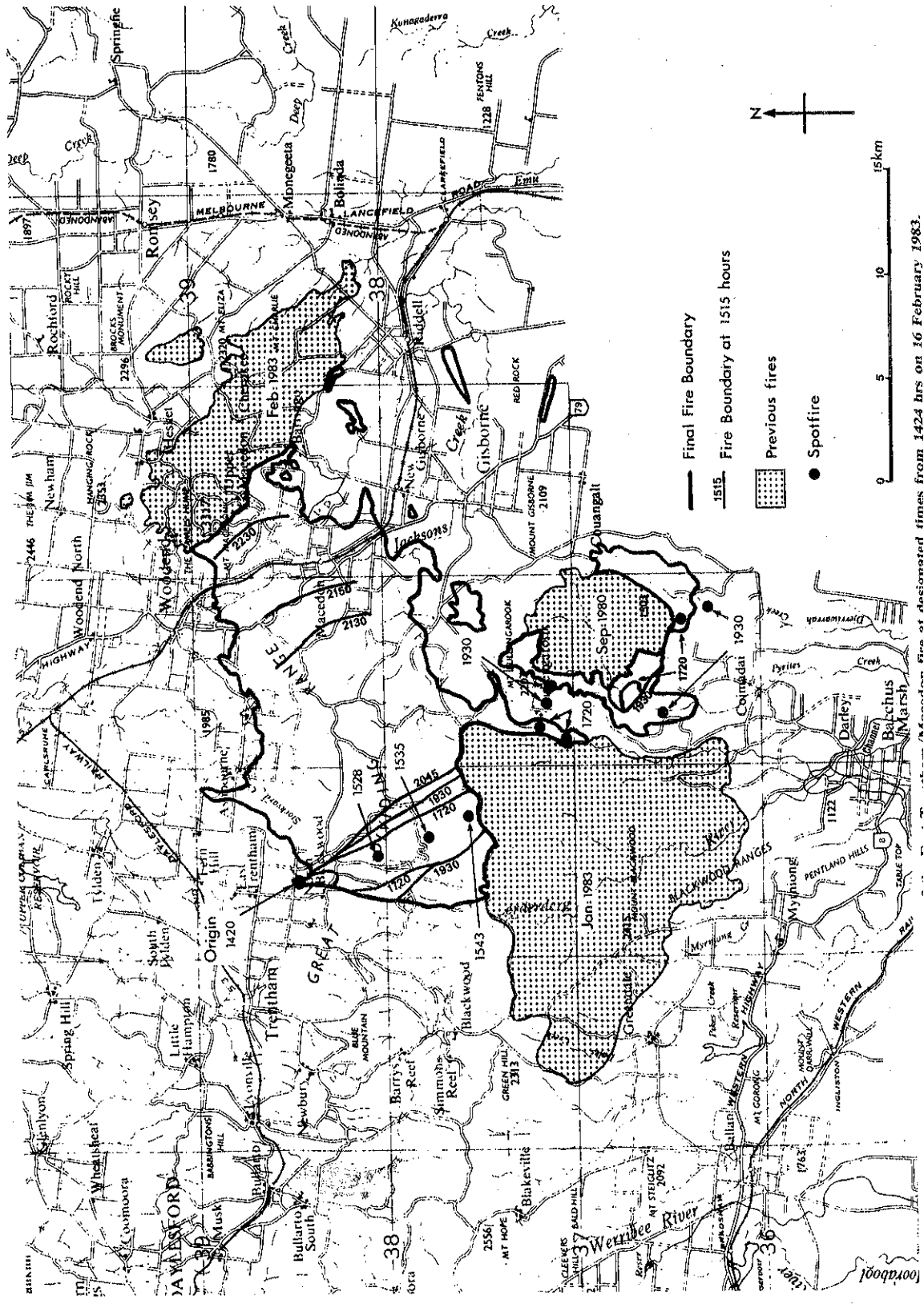
The southerly spread of the main fire was stopped after 1600 hrs when it reached the area burnt by the Greendale fire of 8 January, but spots occurred at distances up to 10-12 km from this point and spread fire into the forest block north of Coimadaí. Further spotting also occurred into grassland near Melton and Deer Park at distances up to 25 km from the main fire, but these were rapidly controlled by Country Fire Authority units (Brown⁴, pers. comm.).

⁴ J. P. Brown, District Forester, Forests Commission, Trentham.

Table 2. Rate of spread of fire in sections of the Dean Marsh-Lorne fire on 16 February 1983.

Spread Distance	Period (hours)	Average rate of forward spread (km/h)	Spotting Distance (km)
Dean Marsh to Valhalla (5½ km)	1515-1530	22	Short distance (grass)
Valhalla to Benwerrin (4½ km)	1530-1555	10.8	8-10
Benwerrin to coast (7 km)	1555-1637	10	8*
Cinema Point to Painkalac Creek (Fairhaven) (5 km)	1900-1930	10	10
Painkalac Creek to west Anglesea (9 km)	1930-2040	7.7	5
West Anglesea to Forest Road (5½ km)	2040-2130	6.6	0.5

* Limited by extent of forest.



Final Fire Boundary
1515 Fire Boundary at 1515 hours
Previous fires
Spotfire

At 2045 hrs the change arrived and the wind, which had been a northwesterly reaching 40 km/h, changed to the southwest at a speed much in excess of 40 km/h. The wind pattern was probably similar to that recorded at Melbourne Airport, 40 km to the southeast, where a peak wind speed of 100 km/h was recorded (Figure 4). The uncontrolled section of the eastern flank of the fire became an 8 km wide front which rapidly advanced in a northeasterly direction. Massive spotting occurred and within 1½ hours the fire had engulfed Macedon township, the Macedon Plantation and Nursery. After travelling 16 km the fire reached the area burned on 1 February and its major run was halted.

Observations from aerial photographs taken after the fire showed that before the wind change about 20% of the area affected was burned by crown fire. This proportion increased to about 80% in the area burnt after the change (Brown⁴, pers. comm.).

Some aspects of fire suppression

Some techniques which were mostly new to forest fire suppression operations in Victoria were employed during 1982-83. The major innovations occurred in the area of firebombing operations where both the Hercules aircraft equipped with MAFFS and a helicopter bucket system were used extensively to complement normal firebombing operations using agricultural aircraft. Infra-red systems capable of detecting fire edges through smoke were also used on a few occasions when aerial reconnaissance was limited by poor visibility.

The MAFFS was widely used during suppression operations in 1982-83 after limited use in 1981-82. Between 31 January and 10 March it made 175 retardant drops using 93 full loads, or approximately 1.046 million litres. An extensive evaluation (Rawson and Rees 1983) showed that while the system was effectively incorporated into suppression operations, it did not significantly expand the Commission's aerial attack capability. It was not effective on fires more intense than those successfully attacked using the small-volume agricultural aircraft, and the high operating costs and lengthy turn-around times associated with such a large aircraft meant that, in general, a number of agricultural aircraft could do a similar job for less cost.

The National Safety Council of Australia (NSCA) operated a Bell 212 helicopter, with a bucket of approximately 1600 litre capacity, for the Com-

mission on a number of occasions. Provided it can operate from a water supply close to the fire the system is economically viable and it will be used in future years (Rawson and Rees 1983).

A CSIRO-owned Daedalus line-scanner installed in a Fokker F27 aircraft was used over the Warburton fire which started on Ash Wednesday. The information provided was adequate to help define the boundaries of one section of the fire perimeter and of a large unburnt area within the proposed control lines. A smaller Forward Looking Infra-Red (FLIR) unit operated by the NSCA was also available for use from a helicopter over a number of fires. This system showed potential and, along with a similar unit owned by the Commission and a new-generation Daedalus line-scanner owned by the NSCA, will provide a range of infra-red fire detection and mapping services during 1983-84.

The lessons of 1982-83

The probability that 1982-83 would be a very severe fire season was recognised at an early stage, and steps were taken to increase the size of the suppression force available and make it as well prepared as possible. Despite these preparations the fire losses were the worst experienced for many years. What steps need to be taken to minimise the chances of similar events in future years?

Conditions were often such that once fires escaped the first attack there was little that the suppression forces could achieve to slow or control the head fire until more favourable weather returned. However, resources were often a limiting factor during both the initial and subsequent attack phases. First attack on the East Trentham-Macedon fire, for example, was hindered by the prior commitment of a large proportion of the available forces to other fires within the region.

It is unrealistic to expect that permanent fire suppression forces can be maintained at a level capable of coping with future situations similar to those which applied on Ash Wednesday. The emphasis must be on maintaining a core of well trained personnel that can efficiently direct the operations of other resources when emergencies do arise. Defence Force personnel were very important in the operations following Ash Wednesday, and training is already proceeding to help improve their incorporation into any future suppression operations.

While fuel reduction burning is a major component of the protection work carried out within forest areas in Victoria, fuel reduced areas were not always extensive enough or of sufficient standard to retard the forward spread of the head fire under conditions of very high to extreme fire danger. There are enough examples to confirm the important role that fuel reduction burning can play in the protection of both forest and adjacent private land. However, operational techniques which achieve greater reductions in fuel quantity need to be implemented, particularly where broad area burning using aerial ignition is planned.

Probably the major lesson was the often inadequate planning and preparation for fire which had been undertaken in areas outside the forest estate. The repeated failure of property owners to recognise that high fuel quantities mean potentially high fire intensities contributed substantially to the losses which eventually occurred. There must be greater emphasis placed on hazard removal on private lands and landholders need to adopt a more responsible attitude. In the harsh environment of one of the most fire hazardous areas in the world there is no room for a "trade-off" or compromise between conservation issues and effective removal of hazards, particularly in the immediate environs of buildings. Greater attention must be given to protection of life and property. Some of the deaths that occurred could have been avoided if the persons concerned had

been better informed on fire survival techniques. More emphasis needs to be placed on public education in this aspect.

Finally, the 1982-83 statistics confirm the major problem of the deliberately or maliciously-lit fire. Of fires which affected the Fire Protected Area 149 (18.1%) were known or suspected to have been lit with intent to do harm. These fires burnt 103 800 ha (21.4%) of the total area burnt. Greater emphasis needs to be placed on finding a solution to this problem.

Acknowledgements

The map indicating the spread of the East Trentham-Macedon fire was prepared by staff of the Forests Commission, Trentham District. Bryan Rees prepared the figures for printing.

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