

CALM LIBRARY ACQUISITION
NOT FOR LOAN

6

BACKBURNING IN FOREST AREAS

(N.D. BURROWS)

Backburning, the practice of setting a fire to burn back into the head of an oncoming wildfire, can be an extremely effective technique in wildfire suppression. Backburning can also be a difficult and hazardous operation.

The fundamentals of backburning, together with a few simple precautions, are presented in the CALM Fire Fighting Personnel Training Manual. Here, I present some quantitative information on backburning which I hope will help fire controllers.

The following guides, to be used in conjunction with local knowledge and experience, are applicable only to jarrah forest fuels where the dominant fuel types are leaf litter and scrub.

Backburning is safe when:

Weather is;

- . cool ($\leq 25^{\circ}\text{C}$)
- . moist ($\geq 55\%$ RH)
- . stable (winds constant and ≤ 15 kph)
- . low SDI (< 1000)

Fuel is;

- . light (≤ 8 t/ha)
- . moist ($\geq 12\%$)

Topography is;

- . flat or gently undulating

Fire danger rating is;

- . LOW or MODERATE and falling (FDI <40)

As any fire boss will quickly recognize, a direct headfire attack would probably succeed under these mild conditions. However, one major advantage of backburning even under mild conditions is that headfire suppression might be successful from existing firebreaks or roads. There may be no need to chase the headfire with new breaks.

The reality is that when conditions exceed those described above, then backburning becomes increasingly hazardous and eventually a point is reached when backburning will fail.

Backburning in forest fuels is hazardous or risky when:

Weather is;

- . warm to hot (>30°C)
- . dry (RH <40%)
- . unstable (winds are gusty and variable in direction)
- . high SDI (>1200)

Fuels are;

- . heavy and continuous (>8t/ha)
- . dry (<10% moisture content)
- . aerated (thick, dense scrub, tops etc.)

Topography is;

- . steep
- . dissected (gullies)

Fire Danger Rating is;

- . HIGH (FDI >50)

Backburning can be a risky operation. The fire boss aims to set a backburn to break up the main headfire and capture most spotting ahead of the main headfire. However, there is always the possibility that:

- The backburn will not be deep enough and the main headfire will "throw" over the backburn.
- The length of backburning necessary to cut off the headfire may be such that there are insufficient crews and equipment to control or look after the backburn.
- The backburn and the wildfire head may join resulting in extreme fire behaviour and massive long distance spotting behind the backburn - thus aggravating control and endangering fire fighters.

Figure 1 below illustrates the likely spotting pattern and the depth and width of backburn needed to capture most spots.

FIGURE 1: Idealised fire shape and spotting pattern. Depth (d) of backburn needed to capture most spot fires can be calculated from Table 1 below.

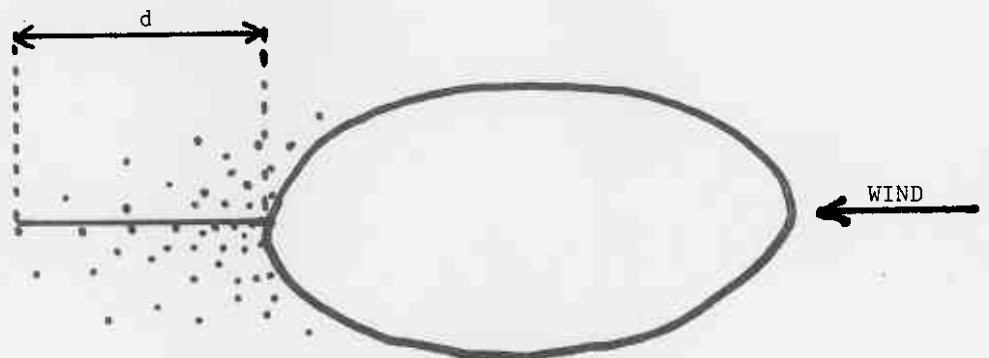


Table 1 below can be used as a guide to determining the depth (metres) of backburn needed to capture most spot fires for headfires travelling at various speeds. Table 2 provides a guide to how far downwind of a headfire backburning should commence.

To use these guides, firstly, determine the recommended depth of backburn (to capture most spots) by entering the rate of spread of the wildfire and the fuel moisture content into Table 1. The left hand side of Table 1 shows the likely success of stopping a headfire with a backburn.

TABLE 1: The minimum depth (m) of backburn required to capture most spots from wildfires. When fire fuel moisture falls below 7%, then spots may start up to 3km downwind of wildfire. This Table applies to 5 - 7 y.o. jarrah forest fuel.

Headfire rate of spread (m/h)	Likely Success of Main Fire Containment						
	4	6	8	10	12	14	16
1400 - 1680			550	450	400	300	
1120 - 1400	1400	1100	450	380	320	250	
840 - 1120	1000	820	350	300	250	200	Low
560 - 840	650	550	260	230	180	150	
280 - 560	300	270	170	150	120	100	90
252 - 280	150	135	85	75	60	50	45
224 - 252	140	125	80	70	55	45	40
196 - 224	130	115	75	65	50	40	35
168 - 196	120	105	70	60	45	35	30
140 - 168	110	95	65	55	40	30	25
112 - 140	100	85	60	50	35	25	20
84 - 112	90	75	55	45	30	20	15
56 - 84	80	65	50	40	25	15	10
28 - 56	65	55	45	35	20	10	3

4 6 8 10 12 14 16 18

Fuel Moisture Content %
(Ground litter)

LOW means this depth of backburn will probably fail to contain the wildfire and HIGH means this depth of backburn will probably succeed.

The second step is to enter the depth (m) obtained from Table 1 and the wildfire rate of spread into Table 2. This will give you the distance downwind of the headfire that you will have to set the backburn to achieve the recommended backburn depth.

TABLE 2: Recommended distances between headfire and origin of intended back-burn. Bracketted figure is approximate burning time in hours needed to achieve back-burn depth.

DEPTH OF BACK-BURN NEEDED TO CONTAIN MOST SPOTFIRES (m)	HEADFIRE RATE OF SPREAD (m/hr)								
	50	100	150	200	300	400	500	600	700
600 (10)	1500								
400 (8)	1000	2000							
200 (5)	500	1000	1200	1500	1700	2000			
100 (3)	250	500	600	750	850	1000	1100	1300	1500
50 (2)	125	250	300	375	425	500	550	650	750
20 (1)	70	100	120	150	170	200	220	260	300

You will see from this process that backburning is unlikely to succeed when fire danger conditions are in excess of HIGH, or when the Jarrah Rate of Spread Index exceeds 130. The depth of backburn is impractical to achieve. Remember, this does not apply to flank fires.

Some Other Pointers

- . When the SDI is in excess of 600, then backburning should be carried out using well spaced spots, not a continuous line of fire.
- . When fuel moisture falls below 7%, then anticipate long distance (2-3 km) spotting and erratic fire behaviour, especially in heavy fuels and on windy days.
- . Backburns lit too close to the main headfire can "pull" into the headfire and set alight to trees, stags, logs etc. along the edge.
- . Backburning when conditions are hazardous should only be carried out under the control of an experienced fire boss who understands the risks and who has due regard for the safety of his fire fighters.
- . Always allow yourself plenty of time to set a safe, deep backburn. Use forecast weather and the fire behaviour guides to plan well ahead.

Further Reading

Anon., (1986) - Fire Fighting Personnel Training Manual.
Department of Conservation and Land Management.

Burrows, N.D. (1984) - Predicting Blow-up Fires in the Jarrah Forest. For. Dept. of W.A. Tech. Paper No. 12.

Luke, R.H. and McArthur, A.G. (1978) - Bushfires in Australia.
Department of Primary Industry, Forestry & Timber Bureau,
C.S.I.R.O. Div. of Forest Research, Canberra.