2 PRESCRIBED BURNING DOES NOT REDUCE THE AREA OF WILDFIRE

FACTS ABOUT PRESCRIBED BURNING AND WILDFIRE IN SOUTH-WEST FORESTS

The Western Australian Forests Department began prescribed burning in the south-west forests in the 1950s. It aimed to protect the timber resource from wildfires by burning the flammable vegetation (the ‘fuel load’) on the forest floor. The relatively long history of prescribed burn and wildfire areas (Table 1) can be used to examine the effect that the prescribed burning regime has had on reducing wildfire area using statistical modelling.

A 2009 study[1] estimated a **leverage** of 0.25 for the south-west forests, that is, on average, 4 ha of prescribed burning has reduced wildfire extent by 1 ha. Campbell et al. (2022)[2] re-visited this work using data from 1953 to 2020 from the Perth, Northern Jarrah, Southern Jarrah and Warren bioregions. Their results detected relationships between antecedent fire area and wildfire area in the Warren and Southern Jarrah bioregions. In forest in the Warren bioregion, it was estimated that, on average, 17 ha of prescribed burning had reduced wildfire extent by 1 ha. In the Southern Jarrah forests, a valid relationship existed but with the finding that no amount of prescribed burning reduced the extent of wildfire. When data for all four bioregions were combined, the finding was that, on average, 50 ha of prescribed burning had reduced subsequent wildfire extent by just 1 ha.

These values highlight the ineffectiveness of prescribed burning in reducing the extent of wildfire. Fire literature[3,4] discusses ‘fuel-driven fires’ versus ‘weather-driven’ fires. The uncontrollable wildfires in the south-west forests occur during hot, dry, windy conditions. Other authors[5] also discuss forest structure. A few years after a prescribed burn, understorey vegetation such as karri wattle and netic has sufficient height and flammability to function as fire ‘ladders’ that carry ground level fire to the tree tops where the wind is strongest, temperatures are highest and fire is uncontrollable.

Experimental bushland burning Source: CSIRO.

These statistical analyses use historic data. In a hotter and drier future, weather-driven fires will be more frequent and ground level fuel loads even less important.

Statistical modelling seeks to reveal valid relationships between causes or ‘drivers’ and a particular effect or ‘outcome’, in this case the area of wildfire subsequently occurring. Drivers might be:

- Antecedent burn area over the past, e.g. 1, 2, 5 or 8 years
- Weather drivers, such as temperature, relative humidity and rainfall
- Landscape attributes.

Statistical techniques are used to determine the relative importance of the drivers in influencing the extent of subsequent wildfires.

The term **leverage** is used to report the effect of antecedent burn area on subsequent wildfire area. For example, a leverage of 0.25 means that, on average, an antecedent burn area of 1 ha would reduce subsequent wildfire area by 0.25 ha.

Table 1

Year	Prescribed Burn Area (ha)	Wildfire Area (ha)	Year	Prescribed Burn Area (ha)	Wildfire Area (ha)
1981	264 550	7 407	2002–2003	144 835	139 744
1982	316 507	2 380	2003–2004	192 119	22 226
1983	272 986	4 225	2004–2005	213 102	50 569
1984	252 851	9 164	2005–2006	194 105	21 905
1985–1986	268 951	16 951	2006–2007	138 602	31 774
1986–1987	250 360	8 079	2007–2008	143 681	9 862
1987–1988	277 283	9 433	2008–2009	151 818	23 910
1988–1989	242 379	11 364	2009–2010	212 017	47 380
1989–1990	278 364	1 766	2010–2011	136 746	28 189
1990–1991	365 164	1 656	2011–2012	103 165	103 837
1991–1992	309 350	14 452	2012–2013	23 468	2 216
1992–1993	159 749	12 726	2013–2014	78 234	17 118
1993–1994	250 830	6 150	2014–2015	147 082	178 240
1994–1995	260 846	29 051	2015–2016	154 149	96 223
1995–1996	233 758	10 101	2016–2017	247 360	9 171
1996–1997	157 721	18 443	2017–2018	218 965	7 066
1997–1998	126 085	76 798	2018–2019	168 043	7 551
1998–1999	98 117	9 148	2019–2020	132 940	26 692
1999–2000	174 455	10 866	2020–2021	171 236	31 731
2000–2001	87 866	14 647	2021–2022	146 154	34 856
2001–2002	74 739	18 989	2022–2023	175 414	21 343

Other studies

Price et al.[4] analysed fire data from 30 eastern states bioregions. Here the drivers were: antecedent fire in the preceding 1, 2 and 5 years; maximum annual temperature; number of days above 35°C; number of days with relative humidity below 15%; and July–Dec and Jan–May rainfall anomalies. Of the 20 bioregions with enough data, only four exhibited any leverage – all in mountainous eucalypt forests on the Great Dividing Range. However, two of the bioregions with no leverage (South East corner and South Eastern Queensland) had very similar driver characteristics (e.g. rainfall, percent forest and fuel load) to the four with leverage.

Price et al. concluded:

- *Our results suggest that the contention of Burrows and McCaw (2013)[6] and Sneeuwjagt et al. (2013)[7] that prescribed fire is universally effective is not supported by historical fire records in southeast Australia, even when restricted to forests.* ***In all Bioregions, measures of weather variation had a stronger influence on area burnt than did past fire area.*** *It seems that strong effects of past fire on area burnt are the exception rather than the rule.*
- *Our results imply that in most Bioregions in southeast Australia, the potential for prescribed burning to significantly reduce the area of unplanned fire is limited.*
- *The most efficient use of prescribed fire is applying it in the immediate proximity of assets, where a resultant reduction of fire intensity can be of immediate benefit in terms of impacts on structures and ease of suppression (Price & Bradstock, 2010, 2012)[8,9].*

Brown et al. (1991)[10] concluded that although the number of unplanned fires decreased following the introduction of prescribed burning, the annual area burnt by unplanned fire decreased only slightly (average size of unplanned fires had doubled).

Another South African study analysed a 72-year fire history of the Swartberg Mountain Range and revealed a greater number of large (>3000 ha) unplanned fires, but no change in total annual extent of unplanned fires when prescription burning was replaced with a minimal intervention policy (Seydack et al., 2007)[11].

Conclusions

Analysis of historic prescribed burn and wildfire data from south-west forests showed that prescribed burning had negligible or no effect in reducing subsequent wildfire area.

The only bioregion where prescribed burning was seen to have contributed to reduced wildfire area was the Warren, where it was estimated that, on average, every 17 ha of prescribed burning had reduced wildfire extent by 1 ha.

Another Australian study also deduced little benefit from prescribed burning, and challenged the long-held belief that prescribed fire is universally effective in reducing wildfire extent. Measures of weather variation were seen to have had a stronger influence on area burnt than past burn area.

The most efficient use of prescribed burning is to apply it in the immediate proximity of assets, in locations where the ground-level fuel load can be monitored frequently and addressed through burning or clearing. Broad-scale use in remote areas has been shown to be ineffective and therefore a waste of public money and resources. It is also harmful to biodiversity.

Redirect resources from broad-scale, ineffective prescribed burning to

- **targeted, localised burning or clearing**
- **rapid detection and response.**

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