5 BURNING STIMULATES GROWTH AND INCREASES FLAMMABILITY

FACTS ABOUT PRESCRIBED BURNING AND WILDFIRE IN SOUTH-WEST FORESTS

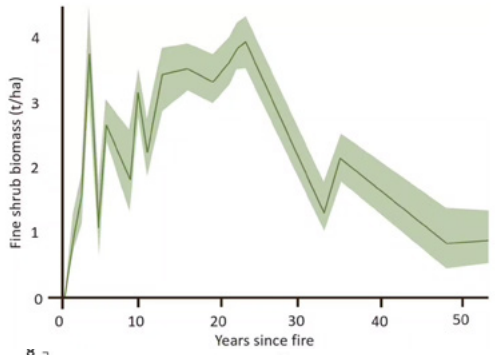
The three requirements for plant growth are sunlight, water and nutrients. Burning vegetation breaks down organic matter and releases nutrients into the soil; fire removes dead or overgrown vegetation allowing more sunlight and water to reach the soil surface. Fire also plays a role in seed germination for some species. Fire often promotes fast-growing, 'greedy' weed species instead of slower-growing native species, so frequent fire will change an ecosystem's species composition.

The recovery of jarrah and karri forests after burning was studied by Burrows (1994)[1] and Burrows et al. (2023)[2]. The fine shrub biomass (tonnes/ha) for jarrah forests and the karri understorey fire hazard in the graphs opposite show that understorey (regrowth) biomass is lowest, immediately after fire, then steadily increases to a peak at around 25 years for jarrah forest and between 10 to 30 years for karri forest. Jarrah forest understorey biomass drops rapidly from its peak to an amount, at about 50 years, similar to that at 2 years after fire. The decrease in understorey biomass in karri forest is less abrupt. The understorey fire hazard of long unburnt karri forest (60+ years since fire) is only slightly greater than recently-burnt forest.

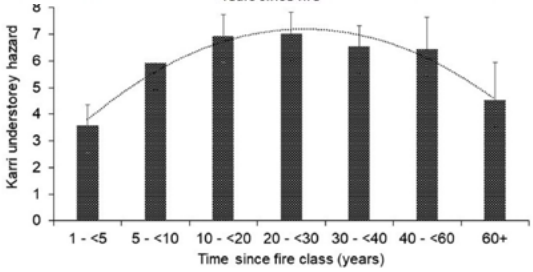
Dense understorey in jarrah forest after burning.
Source: Phil Zylstra[3]

Long unburnt jarrah forest

The left photo shows a jarrah forest several years after burning while the right one shows a jarrah forest that has not been burnt for a long time. The long unburnt forest has less flammable undergrowth, and thus is less fire prone.

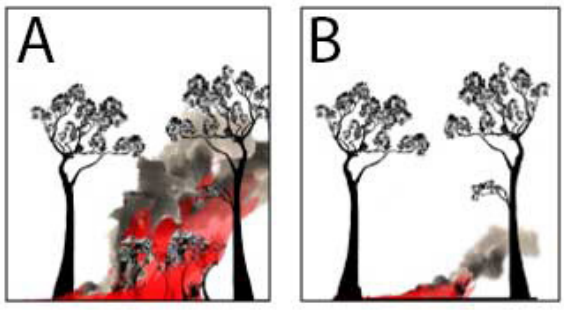


Graph showing the fine shrub biomass taken from figure 5-7 in Burrows[1]. Source: Philip Zylstra[3].



Karri forest understorey fire hazard. Source: Burrows et al. 2023[4].

Forest flammability is affected far more by structure than by fuel load[4,5,6,7]. The mechanism for increased flammability of disturbed forests is the dense understorey growth, which causes greater flame height and acts as a pathway to ignite the tree crowns (A, in figure below). Plant communities, through the processes of growth and succession over time, transfer biomass from acting as fuel to acting as overstorey shelter (B, in figure below). In a mature forest where heavy biomass held in taller growth has excluded shorter plants, the only fuel available to a fire may be the layer of leaf litter on the forest floor[6]. The mature canopy acts as overstorey shelter keeping the forest damper and greatly reducing wind speeds at ground level, thus reducing rate of fire spread[5,6,7]. Long unburnt forests in south-western Australia were shown to be 7 times less likely to burn than forests recovering from fire[5].



Source: Phil Zylstra[5].

Burning stimulates growth and makes forests more flammable.

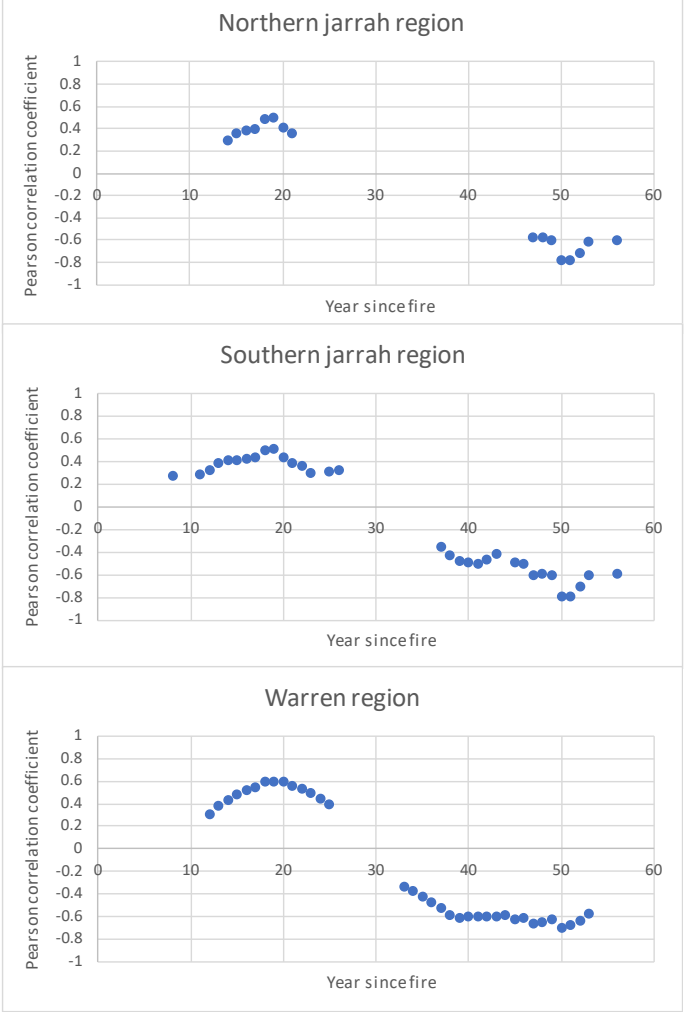
Campbell et al.[8] showed that burning makes forests more flammable by correlating the probability of large wildfires (>1000 ha) against previous prescribed burn data.

All regions show a significant positive correlation between large wildfires 10–25 years after prescribed burning and a significant negative correlation at 30 or more years after prescribed burning. In the southern forests, the strongest positive correlation occurs at around 18 to 19 years after prescribed burning, which roughly corresponds to the peak of fine scrub biomass in jarrah and understorey hazard in karri forests (see graphs on previous page). From 20 years onwards the southern forests become increasingly less prone to large wildfires. The negative correlation at 50 years post-fire shows that large fires are infrequent in rarely-burnt forests. This relationship was more apparent in the Warren region, which is predominantly karri-marri forest, than in the jarrah forests further north, but it is clear in both.

Recent research has shown the lower flammability of mature forests, even when the expected future climate is accounted for[5]. Prescribed burning should be minimal in forests distant from human settlements so that the forest can mature to a less flammable state, which would also benefit fire-sensitive plant and animal species (Fact Sheet 3).

The forest on alternate sides of the road have different periods since last burnt; karri forest near Walpole. Source: South-West Forests Defence Foundation Inc.

The Pearson correlation coefficient quantifies the strength of the relationship between two variables. Its values range from -1 to 1. A value of 1 indicates a perfect linear relationship, that is, as one variable increases the other increases proportionally. A value of -1 indicates a perfect inverse relationship.



Graphs from Campbell et al.[8] Figure 9: Statistically significant (p<0.05) Pearson Correlation between median probability of large wildfires per year versus annual prescribed burn extent for time lags 0–60 years.

References

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